

## 2. ORGANIC MICROFOSSILS FROM HUNGARIAN CRETACEOUS SEDIMENTS

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### Abstract

This paper deals with the LM results of the organic microfossils isolated from Hungarian Cretaceous sediments from the following three localities: Lippó, Boly and Bácsalmás. The results and the evaluation of the data is presented by the different localities.

*Key words:* Palynology, fossil, Cretaceous, Hungary.

### Introduction

There are several publications concerning the spore-pollen assemblages of the Cretaceous layers of Hungary. The most important papers are as follows; Lower/Middle Cretaceous: the fundamental works were published by DEÁK (1961, 1962, 1963, 1964a,b, 1965), further papers by JUHÁSZ (1972, 1975, 1977a,b,c, 1979a,b, 1980, 1983a,b), and JUHÁSZ and GÓCZÁN (1976). Upper Cretaceous: GÓCZÁN (1961, 1963, 1964a,b, GÓCZÁN, GROOT, KRUTZSCH, and PACLTOVÁ (1967), GÓCZÁN et al. (1986), GÓCZÁN and SIEGL-FARKAS (1989, 1990), SIEGL-FARKAS (1984, 1986, 1988, 1993a,b), SIEGL-FARKAS and KEDVES (1995), KEDVES (1983, 1984), KEDVES and DINIZ (1983). The global paleophytogeographical problems of the Senonian were discussed by KEDVES (1985). Within Europe this problem was investigated in particular by KEDVES and DINIZ (1983). The peculiarities of the *Eunormapolles* assemblages of the Carpathian Basin were discussed in comparison to the Iberian ones in the first place to the assemblages of Portugal.

The aim of this paper is to present the whole organic material of the samples for investigation. Based on the organic microfossil data we try to get paleoecological conclusions to compare with the Hungarian and European Cretaceous spore-pollen assemblages. In this respect the data of spore-pollen published by SIEGL-FARKAS (1986) from samples of the bore-hole Bácsalmás I. are noteworthy.

### Materials and Methods

Lippó-1 bore-hole. Five limestone samples were investigated from the following depths: L-1-1, 753.0-1173.0 m., L-1-2, 1187.3-1632.0 m., L-1-3, 1655.8-1656.0 m., L-1-4, 1673.85-1674.1 m., L-1-5, 1690.1-1999.2 m.

Boly-I bore-hole. Twelve samples were the subject of our investigations from the following depths: 600.72-600.05 m., 612.80 m., 671.05 m., 730.55 m., 730.70 m., 831.00 m., 892.00 m., 951.00 m., 1023.00 m., 1088.00 m., 1131.20 m., 1170.80 m.

Bácsalmás-I bore-hole. Eleven samples were investigated: 607.10-607.20 m., 616.60-616.65 m., 627.00-627.05 m., 644.35-644.65 m., 653.50-653.55 m., 663.90-664.00 m., 674.80-674.85 m., 685.60-685.70 m., 692.20-692.30 m., 1192.30 m., 1194.60 m.

The samples were limestone, in general 1000 g material was treated by samples. When we had not enough material at least about 500 g was the starting quantity.

## Results

### 1. LIPPÓ-1 BORE-HOLE

Tissue remnants. - Secondary xylem remnants are relatively common in the slides investigated (Plate 2.1., figs. 1-3, 5-8), but in a poor preservation. The type of pits is a modern *gymnosperm*. The detailed results of the samples investigated may be summarized as follows:

Lippó-1-1. - The quantity of the tissue remnants is high, with few *Mycophyta* spores. Some *angiosperm* pollen grains were observed which are in a poor preservation: *Psilatricolporites* fsp., *Normapolles* fgen et fsp. indet., Cf. *Triatriopollenites* fsp.

Lippó-1-2. - A great quantity of degraded tissue remnants (Plate 2.1., fig. 4), and one pollen grain type (cf. *Interporopollenites guineti* KEDVES et HEGEDÜS 1975) was observed (Plate 2.1., figs. 9,10).

Lippó-1-3. - The amorphous black organic remnants are in a high quantity with few xylem and epidermis fragments. Some inaperturate microfossils were also observed.

Lippó-1-4. - The occurrence of the inaperturate forms is relatively high together with the dark tissue remnants.

Lippó-1-5. - This sample is rich in amorphous organic remnants, some fragments of *gymnosperm* tracheids also occurred.

The few data indicate Senonian age for these samples.

### 2. BOLY-I BORE-HOLE

Chitinous *Foraminiferae* shells are common in the samples investigated. Based on the work of DEÁK (1964a) *Trochiliascia cuvillieri* DEÁK 1964a was observed. (Plate 2.1., fig. 11). Similar microfossil was published later by COURTINAT and MÉON (1991) as "Morphotype TS 1". Following TAPPAN and LOEBLICH (1965) as affinity the *Globigerinelloides* was given. Occurrences from the Berriasian until the Campanian-Maestrichtian were established by COURTINAT and MÉON (1991). Regarding the tissue remnants there are well preserved fragments such as *angiosperm* vessels (Plate 2.1., fig. 12), and *gymnosperm* tracheids. Epidermis with *Gramineae* type stoma also occurred (Plate 2.1., fig. 13, plate 2.2., fig. 1). Salt water conditions indicating *Hystrichosphaeridae* were observed on the top and on the basis of the section investigated (Plate 2.2., figs. 2-7). Sporomorphs occurred in all of the samples investigated in a relatively good preservation.

List of the observed organic microfossils:

#### *Hystrichosphaeridae*

*Hystrichosphaeridium* cf. *recurvatum* (WHITE 1842) DAVEY et WILLIAMS 1966 (Plate 2.2., figs. 2,3), *Amphorosphaeridium fenestratum* DAVEY 1969 (Plate 2.2., figs. 4,5),

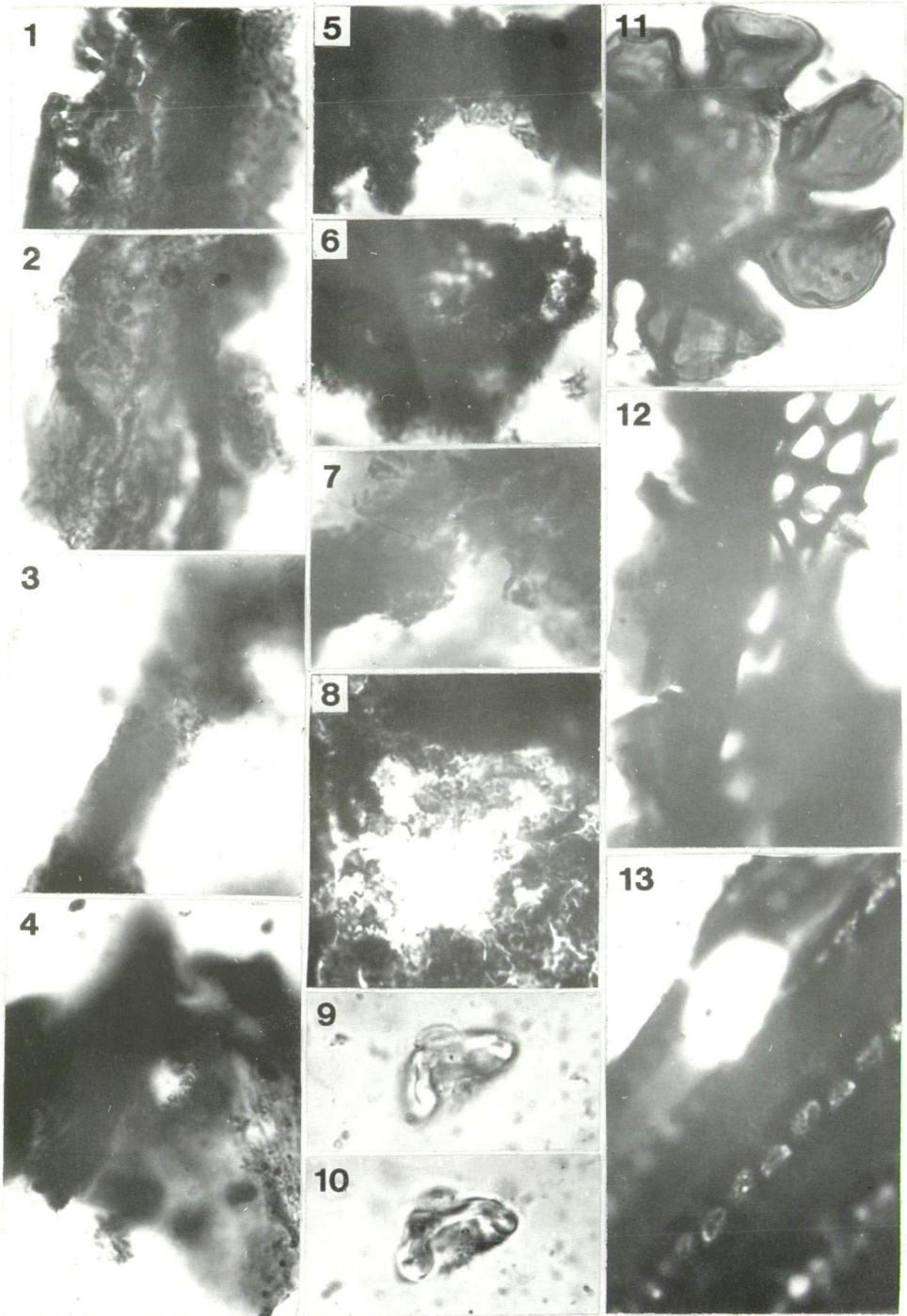


Plate 2.1.

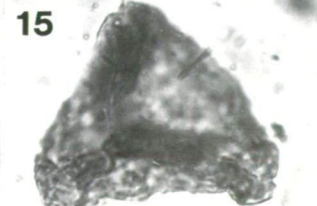
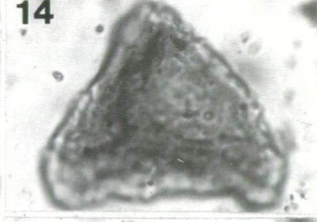
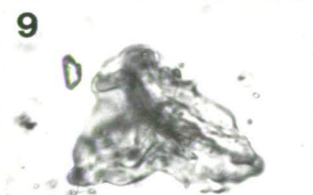
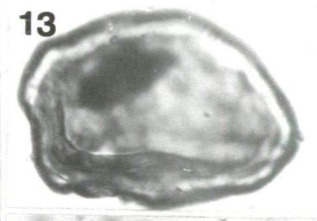
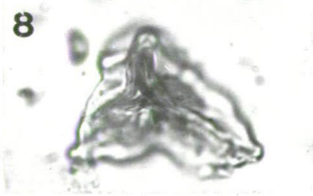
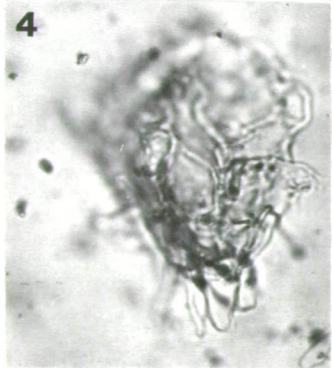
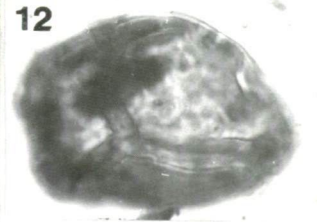
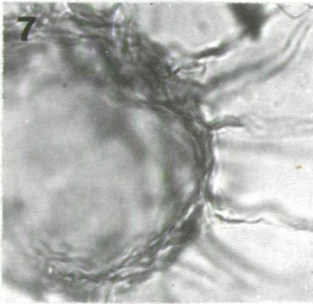
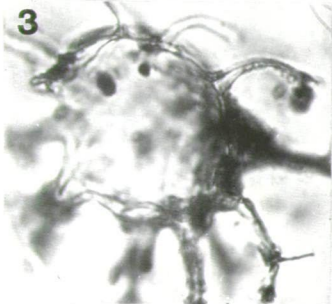
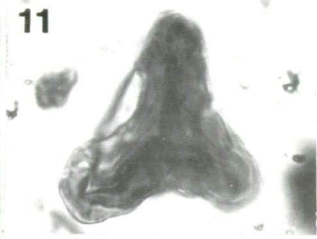
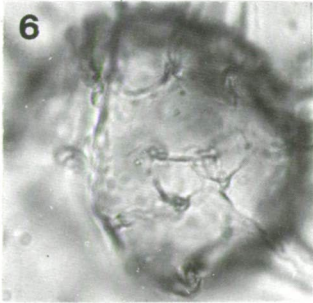
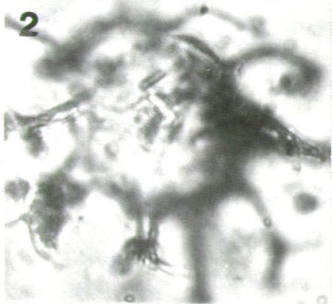
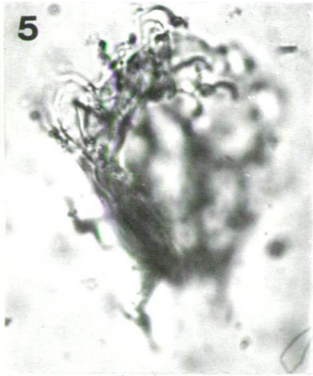
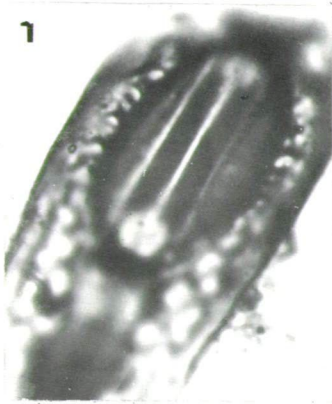


Plate 2.2.

*Lingulodinium machaerophorium* (DEFLANDRE et COOKSON 1955) WALL 1967 (Plate 2.2., figs. 6,7).

#### Sporites

*Matonispores elegans* HUNT 1985 (Plate 2.2., figs. 10,11), Cf. *Trilites* fsp.; (Plate 2.2., figs. 12,13), *Clavifera* fsp. 1, *Gleicheniaceae* (Plate 2.2., figs. 8,9), *Clavifera* fsp. 2, (Plate 2.3., figs. 11,12), Cf. *Ornamentifera* fsp., (Plate 2.2., figs. 14,15), cf. *Kluki-sporites pseudoreticulatus* COUPER 1958 (Plate 2.3., figs. 3,4), *Cicatricosisporites furcatus* DEÁK 1963, *Schizaeaceae* (Plate 2.3., figs. 5,6), *Cicatricosisporites* fsp. 1, *Schizaeaceae*, (Plate 2.3., figs. 1,2), *Cicatricosisporites* fsp. 2, *Schizaeaceae* (Plate 2.3., figs. 7,8).

#### Pollenites

*Gymnosperm pollen grains*

*Vitreisporites pallidus* (REISSINGER 1950) NILSSON 1958 (Plate 2.3., figs. 9,10).

*Angiosperm pollen grains*

#### Normapolles

*Oculopollis minoris* KRUTZSCH 1973 (Plate 2.3., figs. 13,14), *Interporopollenites rugulus* KEDVES et HEGEDÜS 1975 (Plate 2.3., figs. 15,16), *Normapolles* massula (Plate 2.3., figs. 17,18).

#### Postnormapolles

*Labraferoidaepollenites rurensis* (PFLUG et THOMSON 1953) KEDVES 1982 in KEDVES et RUSSELL, *Myricaceae* (Plate 2.3., figs. 19,20), *Alabroidaepollenites convexus* KEDVES 1982 in KEDVES et RUSSELL, *Myricaceae* (Plate 2.3., figs. 21,22).

The quantity of the plant microfossils is not enough for a paleoecological evaluation, but the following may be pointed out:

#### Plate 2.1.

Magnification of all microphotographs are 1000x.

1. Degraded *gymnosperm* xylem fragment; slide: Lippó-1-5-1, cross-table number: 14.9/143.8.
2. Degraded *gymnosperm* xylem fragment; slide: Lippó-1-3-2, cross-table number: 16.2/139.1.
3. Extremely degraded xylem remnant; slide: Lippó-1-4-3, cross-table number: 16.3/129.8.
4. Degraded cuticle fragment; slide: Lippó-1-2-3, cross-table number: 22.7/142.1.
5. Degraded xylem remnant; slide: Lippó-1-4-3, cross-table number: 18.5/138.9.
6. Degraded xylem remnant; slide: Lippó-1-4-3, cross-table number: 24.9/142.8.
7. Degraded xylem remnant; slide: Lippó-1-4-3, cross-table number: 22.4/136.6.
8. Degraded xylem remnant; slide: Lippó-1-5-2, cross-table number: 23.2/133.2.
- 9,10. Cf. *Interporopollenites guineti* KEDVES et HEGEDÜS 1975; slide: Lippó-1-2-1, cross-table number: 14.5/132.7.
11. *Trochiliascia cuvillieri* DEAK 1964a; slide: Boly I, 0/2-4, cross-table number: 8.3/148.7.
12. *Angiosperm* vessel fragment; slide: Boly I, 0/2-3, cross-table number: 6.6/144.9.
13. Epidermis fragment of "*Gramineae* type"; slide: Boly I, 0/10-2, cross-table number: 9.8/147.5.

#### Plate 2.2.

1. Stoma remnant of "*Gramineae* type"; slide: Boly I, 0/4-4, cross-table number: 12.4/143.6.
- 2,3. *Hystriospheraedium* cf. *recurvatum* (WHITE 1842) DAVEY et WILLIAMS 1966; slide: Boly I, 0/12-1, cross-table number: 18.2/141.1.
- 4,5. *Amphorosphaeridium fenestratum* DAVEY 1969; slide: Boly I, 0/11-3, cross-table number: 12.9/140.6.
- 6,7. *Lingulodinium machaerophorium* (DEFLANDRE and COOKSON 1955) WALL 1967; slide: Boly I, 0/12-3, cross-table number: 9.3/132.9.
- 8,9. *Clavifera* fsp., *Gleicheniaceae*; slide: Boly I, 0/5-5, cross-table number: 7.1/131.2.
- 10,11. *Matonispores elegans* HUNT 1985; slide: Boly I, 0/11-2, cross-table number: 17.3/149.1.
- 12,13. Cf. *Trilites* fsp.; slide: Boly I, 0/11-2, cross-table number: 9.9/128.4.
- 14,15. Cf. *Ornamentifera* fsp., *Gleicheniaceae*; slide: Boly I, 0/9-3, cross-table number: 12.8/128.7.

1. The quantity of the plant tissue remnants is relatively high in all the samples investigated.
2. *Normapollis* pollen grains are represented also in all the samples investigated richer spore-pollen assemblage.

### 3. BÁCSALMÁS-I BORE-HOLE

#### General establishments:

1. Chitinous *Foraminiferae* shells (*Scytinascia*) occurred in the greatest part of the samples investigated.
2. The plant tissue remnants are relatively well preserved; *angiosperm* xylem fragment (Plate 2.3., figs. 23,24) and epidermis remnant of *dicotyledonous* type was also observed (Plate 2.4., fig. 1).
3. *Hystrichosphaeridae* occurred in the greatest part of the samples investigated except the lower sample (1194.60 m.). The preservation of these remnants is quite good.
4. *Botryococcus* colonies occurred sporadically.

#### The observed organic microfossils:

##### Algae

*Chlorophyceae: Botryococcus* sp. (Plate 2.4., figs. 8,9)

##### *Hystrichosphaeridae*

*Hystrichosphaera ramosa* (EHRENBERG 1838) O. WETZEL 1932 var. *ramosa* DAVEY et WILLIAMS 1966 (Plate 2.4., figs. 2,3), cf. *Micrhystridium gracile* DEÁK et COMBAZ 1967 (Plate 2.4., figs. 4,5), *Spiniferites splendidus* HARLAND 1979 (Plate 2.4., figs. 6,7).

##### *Sporites*

*Vadaszsporites urkuticus* DEÁK (1964b) DEÁK et COMBAZ 1967 (Plate 2.4., figs. 10,11).

##### *Pollenites*

##### *Angiosperm pollen grains*

##### Longaxones

Corroded pollen grains of "*quisqualis*" and "*oviformis*" type.

##### Normapollis

Cf. *Trudopollis* fsp. (Plate 2.4., figs. 12,13), *Semioculopollis daniensis* KEDVES 1979 (Plate 2.5., figs. 1,2), *S. croxtonae* KEDVES 1979 (Plate 2.5., figs. 3,4), *Oculopollis minoris* KRUTZSCH 1973 (Plate 2.5., figs. 5-14), *Papillopollis cf. cretacicus* KEDVES et PITTAU 1979, cf. *Druggipollenites* fsp. (Plate 2.5., figs. 17,18), *Interporopollenites cf. initium* (PFLUG 1953a) PFLUG 1953b (Plate 2.5., figs. 21,22), *I. triangulus* KEDVES et HEGEDÜS 1975 (Plate 2.5., figs. 23,24), *I. guineti* KEDVES et HEGEDÜS 1975 (Plate 2.5., figs. 25,26).

##### Postnormapollis

*Triatriopollenites minimus* (GLADKOVA 1965) KEDVES 1974, *Juglandaceae, Engelhardtia* (Plate 2.5., figs. 19,20), *Subtriporopollenites constans* PFLUG 1953a *subfsp. crassiexinus* KEDVES 1970, *?Juglandaceae* (Plate 2.5., figs. 27,28).

The quantitative data will be discussed by the formations established by JOCHAEDELÉNYI and HAAS published by SIEGL-FARKAS (1986):

#### 1. Bácsalmás Formation

Madaras Sandstone Section



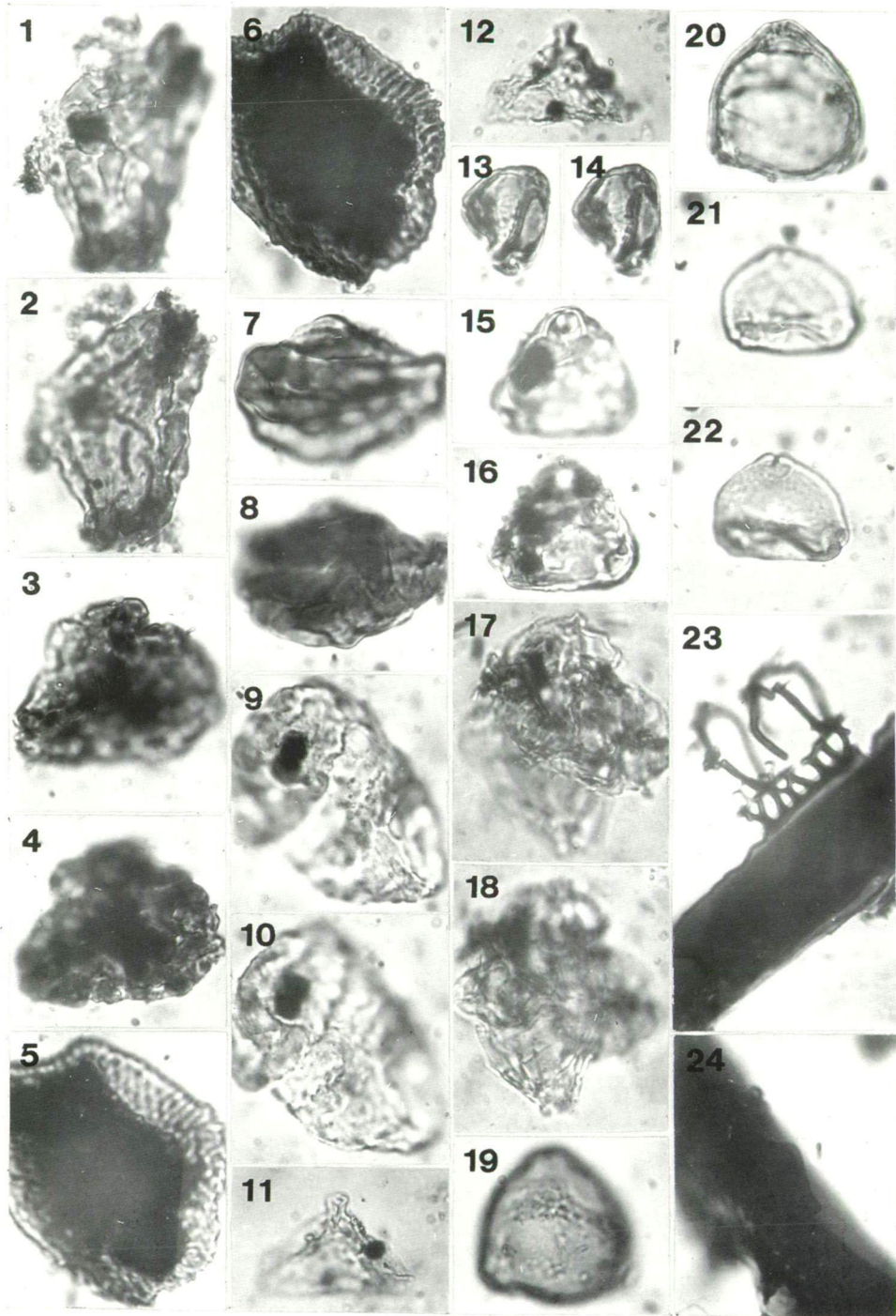


Plate 2.3.

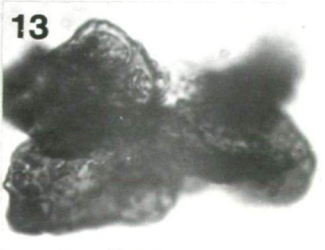
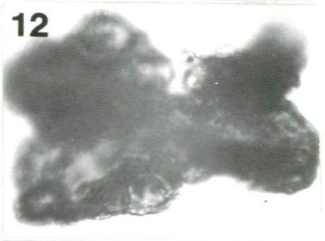
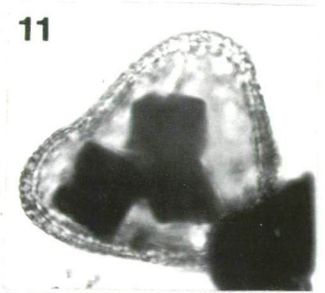
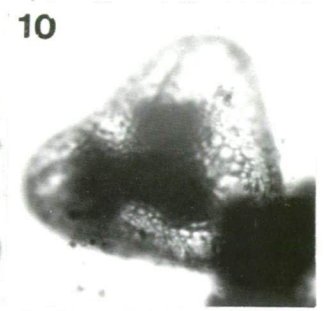
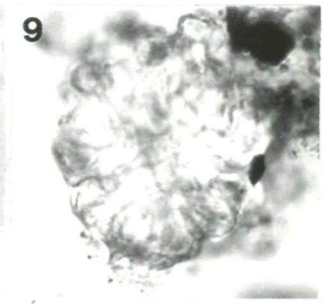
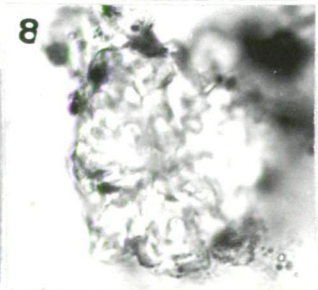
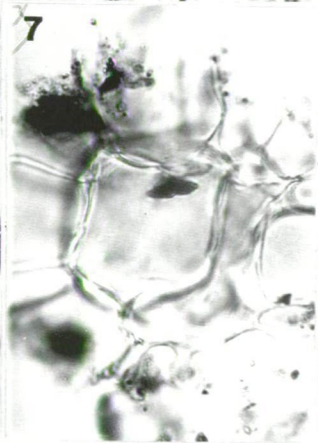
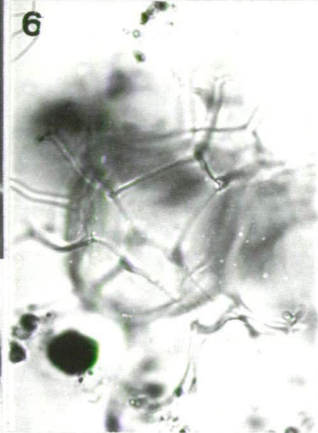
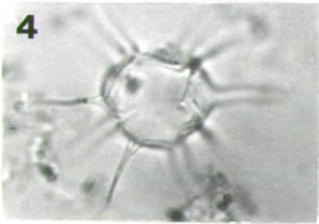


Plate 2.4.



*Hystrichosphaeridae* and *Scytinascia* occurred with plant tissue remnants. *Longaxones* (*oviformis* and *quisqualis* type) and among the *Brevaxones*, *Normapolles* taxa occurred in a few quantity.

#### Csávoly Marl Section

The occurrence of the *Hystrichosphaeridae* and the *Scytinascia* is characteristic. *Botryococcus* colonies occurred in a small quantity. The most important characteristic is the relatively richness of the *Normapolles* taxa.

Marl with bulbous limestone and antigenous brecca.

Similarly to the previous section the occurrence of the salt water indicating remains is important together with the *Normapolles* taxa indicating the Senonian age.

2. Csikéria Marl Formation was not investigated during this research program.

#### 3. Ágasegyháza Pebble Formation

Following the paper of SIEGL-FARKAS (1986) this formation is represented by the sediments from 793.0-816.3 m. We have investigated two samples below this depth: 1192.30 m., and 1194.6 m. These layers preserved some organic microfossils in a poor preservation (*Hystrichosphaeridae*, *tricolpate* form, *Normapolles* taxa).

#### Plate 2.3.

- 1,2. *Cicatricosisporites* fsp. 1, *Schizaeaceae*; slide: Boly I, 0/7-4, cross-table number: 8.5/143.7.
- 3,4. Cf. *Klukisporites pseudoreticulatus* COUPER 1958; slide: Boly I, 0/10-4, cross-table number: 24.1/132.7.
- 5,6. *Cicatricosisporites furcatus* DEÁK 1963, *Schizaeaceae*, cf. *Anemia*; slide: Boly I, 0/11-5, cross-table number: 10.1/146.2.
- 7,8. *Cicatricosisporites* fsp. 2, *Schizaeaceae*; slide: Boly I, 0/10-4, cross-table number: 16.7/143.1.
- 9,10. *Vitreisporites pallidus* (REISSINGER 1950) NILSSON 1958; slide: Boly I, 0/10-2, cross-table number: 15.2/139.1.
- 11,12. *Clavifera* fsp., *Gleicheniaceae*; slide: Boly I, 0/3-3, cross-table number: 22.6/131.6.
- 13,14. *Oculopollis minoris* KRUTZSCH 1973; slide: Boly I, 0/21-1, cross-table number: 19.2/147.7.
- 15,16. *Interporopollenites rugulus* KEDVES et HEGEDŰS 1975; slide: Boly I, 0/12-1, cross-table number: 8.2/135.0.
- 17,18. *Normapolles* massula; slide: Boly I, 0/10-4, cross-table number: 12.4/131.5.
- 19,20. *Labraferoidaepollenites rurensis* (PFLUG et THOMSON 1953) KEDVES 1982 in KEDVES et RUSSELL, *Myricaceae*; slide: Boly I, 0/4-2, cross-table number: 11.4/130.9.
- 21,22. *Alabroidaepollenites convexus* KEDVES 1982 in KEDVES et RUSSELL, *Myricaceae*; slide: Boly I, 0/6-2, cross-table number: 10.7/131.2.
- 23,24. *Angiosperm* vessel fragment; slide: Bácsalmás-I, 0/22-4, cross-table number: 16.0/146.5.

#### Plate 2.4.

1. Carbonified epidermis remnant with a stoma; slide: Bácsalmás-I, 0/16-1, cross-table number: 18.7/136.6.
- 2,3. *Hystrichosphaera ramosa* (EHRENBERG 1938) O. WETZEL 1932 var. *ramosa* DAVEY and WILLIAMS 1966; slide: Bácsalmás-I, 0/20-2, cross-table number: 23.1/140.0.
- 4,5. Cf. *Micrhystridium gracile* DEÁK et COMBAZ 1967; slide: Bácsalmás-I, 0/20-1, cross-table number: 14.2/145.3.
- 6,7. *Spiniferites splendidus* HARLAND 1979; slide: Bácsalmás-I, 0/17-1, cross-table number: 9.2/132.3.
- 8,9. *Botryococcus* sp.; slide: Bácsalmás-I, 0/16-4, cross-table number: 16.2/132.2.
- 10,11. *Vadaszsporites urkuticus* (DEÁK 1964) DEÁK et COMBAZ 1967; slide: Bácsalmás-I, 0/17-2, cross-table number: 26.8/142.2.
- 12,13. Cf. *Trudopollis* fsp., massula; slide: Bácsalmás-I, 0/21-3, cross-table number: 20.2/137.5.

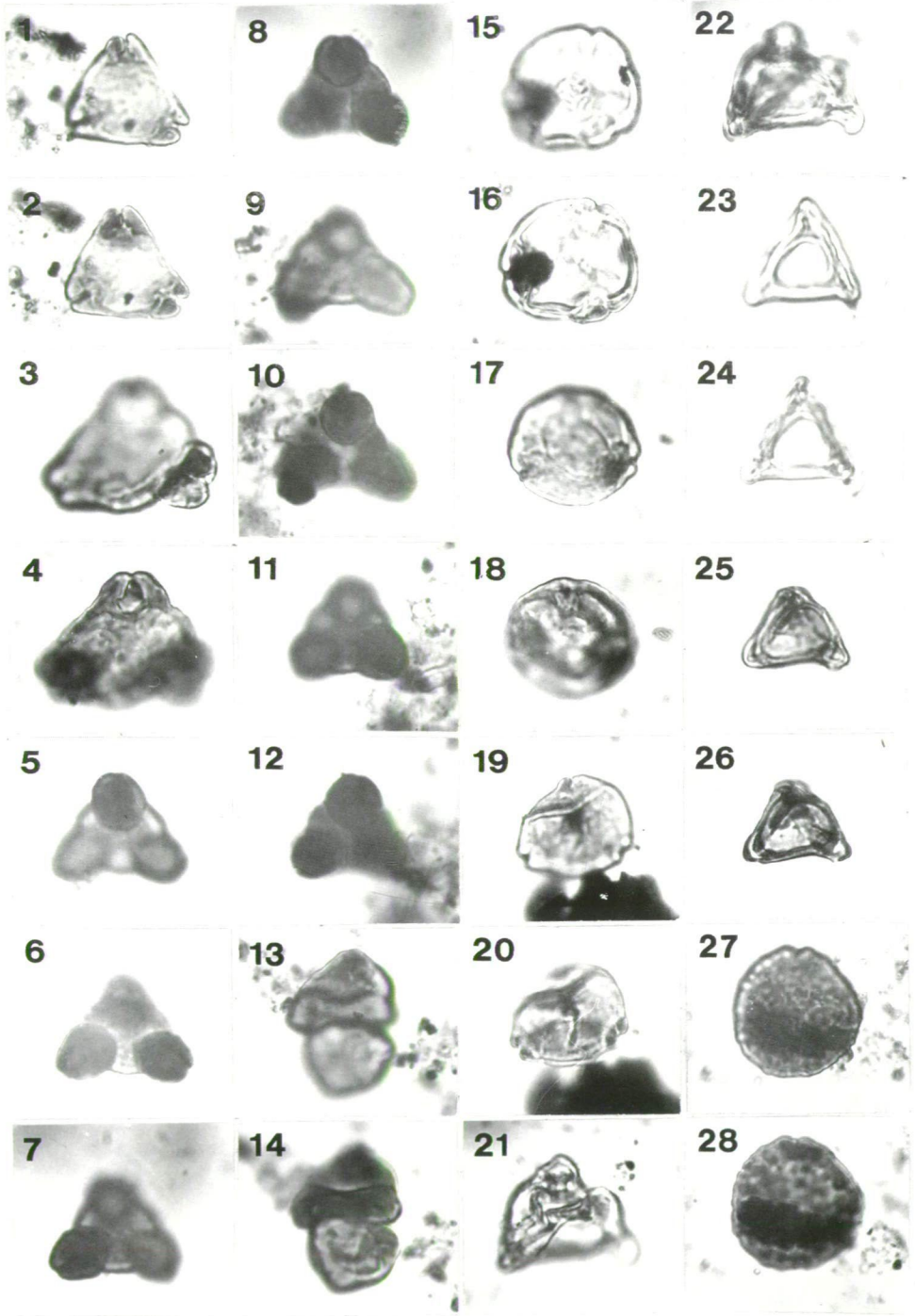


Plate 2.5.

## Discussion and Conclusions

The organic microfossil content of the samples investigated is not rich but the data presented herein may be useful for the further investigations. Regarding the details the following may be pointed out:

1. The samples investigated are of Senonian age.
2. Among the plant tissue remnants the *monocotyledonous* (*Gramineae* type) epidermis remnant is worth of mentioning.
3. Some spores of *Gleicheniaceae* spores isolated from the layers of Boly are mostly characteristics for the Middle and/or Lower Cretaceous sediments. A reworking may be presumed.
4. The samples of the Csávoly Marl Section are poor in sporomorphs in comparison to the spore pollen assemblage from the samples investigated from the bore-hole Csávoly I. previously (KEDVES, 1983, 1984), and this assemblage was denominated as "Upper Senonian, Csávoly type". Taking into consideration our newest data about the upper part of the Senonian the Maestrichtian age may be excluded at these Senonian sediments. To this see the papers on the type locality of the Maestrichtian and the Fish Clay assemblages for the K/T boundary.

## Acknowledgements

This work was supported by Grant OTKA T/9 023208.

### Plate 2.5.

- 1,2. *Semioculopollis daniensis* KEDVES 1979; slide: Bácsalmás-I, 0/17-1, cross-table number: 12.2/145.1.
- 3,4. *Semioculopollis croxtonae* KEDVES 1979; slide: Bácsalmás-I, 0/14-3, cross-table number: 16.1/139.9.
- 5,6. *Oculopollis minoris* KRUTZSCH 1973; slide: Bácsalmás-I, 0/17-2, cross-table number: 22.7/137.3.
- 7,8. *Oculopollis minoris* KRUTZSCH 1973; slide: Bácsalmás-I, 0/17-4, cross-table number: 24.4/136.8.
- 9,10. *Oculopollis minoris* KRUTZSCH 1973; slide: Bácsalmás-I, 0/17-4, cross-table number: 21.9/132.8.
- 11,12. *Oculopollis minoris* KRUTZSCH 1973; slide: Bácsalmás-I, 0/17-5, cross-table number: 16.9/142.2.
- 13,14. *Oculopollis minoris* KRUTZSCH 1973; slide: Bácsalmás-I, 0/17-5, cross-table number: 10.9/137.8.
- 15,16. *Papilopollis* cf. *cretacicus* KEDVES et PITTAU 1979; slide: Bácsalmás-I, 0/17-1, cross-table number: 10.2/129.2.
- 17,18. Cf. *Druggipollenites* fsp.; slide: Bácsalmás-I, 0/15-2, cross-table number: 14.9/128.1.
- 19,20. *Triatriopollenites minimus* (GLADKOVA 1965) KEDVES 1974, *Juglandaceae*, *Engelhardtia*; slide: Bácsalmás-I, 0/14-3, cross-table number: 14.9/141.6.
- 21,22. *Interporopollenites* cf. *initium* (PFLUG 1953a) PFLUG 1953b; slide: Bácsalmás-I, 0/17-1, cross-table number: 11.2/137.3.
- 23,24. *Interporopollenites triangulus* KEDVES et HEGEDÜS 1975; slide: Bácsalmás-I, 0/17-3, cross-table number: 11.4/130.3.
- 25,26. *Interporopollenites guineti* KEDVES et HEGEDÜS 1975; slide: Bácsalmás-I, 0/16-1, cross-table number: 24.1/138.3.
- 27,28. *Subtriporopollenites constans* PFLUG 1953 subfsp. *crassixinus* KEDVES 1970, ?*Juglandaceae*; slide: Bácsalmás-I, 0/15-1, cross-table number: 8.6/142.2.

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