

UPPER CARBONIFEROUS FLORA FROM NEWLY COLLECTED PEBBLES OF LOWER MIOCENE CONGLOMERATE IN THE WESTERN MECSEK MTS. (SOUTHERN HUNGARY)*

MARIA BARBACKA¹, GYÖRGY SZAKMÁNY² and SÁNDOR JÓZSA²

¹ Department of Botany, Hungarian Natural History Museum, H-1476 Budapest, P.O.Box 222, Hungary

² Department of Petrology and Geochemistry, Eötvös L. University, H-1088 Budapest, Múzeum krt. 4/A, Hungary

ABSTRACT. The authors have collected new specimens of pebbles containing Carboniferous macroflora remnants in a Miocene conglomerate sequence in the Mecsek Mountains. From some of these localities (south of the football pitch in Bükkösd village, south of Egéd, Gorica Valley, Garadóc Graben, Mészáros Valley) pebbles with Carboniferous macroflora have not been previously reported. The specimens determined belong to: *Pecopteris* sp. (two types), *Neuropteris* cf. *scheuchzeri* Hoffman, *Sphenophyllum* cf. *emarginatum*, *Alethopteris* ex group *serlii*, *Asterophyllites* cf. *equisetiformis* (Sternberg) Brongniart and *Alethopteris grandinioides* Kessler var. *grandinioides*. All the above species as well as the genus *Asterophyllites* have not been mentioned from this formation by previous authors (Soós & Jámboor 1960, Wéber 1964). This is the first detailed palaeobotanical description of Carboniferous macroflora from Hungary. The new specimens confirm the Upper Carboniferous (Westphalian) age of these pebbles.

KEY WORDS: fossil plants, Carboniferous, taxonomy, Southern Hungary

INTRODUCTION

The Miocene conglomerate sequences in the Mecsek Mountains are widespread and occupy large areas in the whole mountain range and its surroundings (Szakmány & Józsa 1994). The pebble material of the conglomerate is very varied, but Carboniferous pebbles occur only in the Western Mecsek. These Carboniferous pebbles derived from a clastic sequence with sediments from the coarse grained conglomerate to the finest grained aleurolite (silt). Carboniferous pebbles in the Miocene conglomerate occur in very variable amounts. In the southern part of the conglomerate territory (for example in the Sormás valley, north of Bükkösd) there are outcrops with more than 60% of study material. Towards the north and east, the proportion of Carboniferous pebbles generally decreases.

Upper Carboniferous plant remains in the Mecsek Mountains were first mentioned by Soós & Jámboor (1960), who found them in two

localities (south of Bakóca and south-east of Kisbeszterce) in pebbles in a lower Miocene conglomerate sequence (Fig 1). A few years later Wéber (1964) found similar pebbles in other outcrops of the Miocene conglomerate (in the Sormás valley and around Egéd and Cserdi). The plant remains contained in them were determined by Gábor Andreánszky. In the sixties two boreholes (Tésény-5, Bogádmindszent-1), to the south of the Mecsek, brought up a Carboniferous macroflora assemblage, which was determined by Miklós Földi (Jámboor 1969, Hetényi & Ravaszné 1976). On the basis of these determinations the age of this assemblage is Westphalian (Hetényi & Ravaszné 1976). These and other boreholes, which reached Carboniferous carbonic layers but did not contain any plant remains, opened up an Upper Carboniferous clastic sedimentary sequence (Tésény Sandstone Formation), which represents a continental intramontane molass environment (Fülöp 1994), forming the marginal part of the Dinarian Basin (Kassai 1983). On the basis of the boreholes and geophysical measurements, the Carboniferous sequence is

* This work has been supported by a Grant of the National Scientific Research Fund (OTKA) No. T 014121 and T022938.

situated south and south-west of the western part of the Mecsek Mountains (Kassai 1983).

The pebbles containing macroflora remains are black to dark grey, fine grained, sericitic coal bearing shales and silts with much sericite on their bedding plane. Excess sericite or coarser grained sediment does not allow good preservation of leaves.

The localities of the new pebbles with Carboniferous plant remains are in part those mentioned by Soós and Jámbor (1960), south of Bakóca and south-east of Kisbeszterce, and Wéber (1964), north of Bükkösd in the Sormás valley, and around Egéd and Cserdi villages, and are partly new. The latter are south of the

football pitch in Bükkösd village, south of Egéd, the Gorica Valley, Garadóc Graben and the Mészáros Valley (Fig. 1).

DESCRIPTION OF THE FLORA

Sphenophyllum cf. *emarginatum*

Brongniart

Pl. 1, fig. 1, 2

Material. No BP 96.94.2., 96.97.2.

Two specimens were collected. One of them is a part of a stem with four nodes 65 mm long. The second consists only of two separate incomplete verticils with five leaves on each.

Description. The more complete fragment has a rather thin stem about 1 mm wide with 10–15 mm long internodes. Leaves in verticils. The six leaves of each verticil have an almost straight distal edge, sometimes slightly dentate. The longest leaves are about 14 mm, the shortest about 7 mm. Venation is invisible. The second specimen, despite its small size (leaves ca. 4 mm long) shows more details of the edge – more visible teeth with slightly obtuse tips and relatively more clearly distinguished venation. It seems that each leaf has a single (or double) vein which divides dichotomously into 6–8 branches running to the teeth.

Remarks. Since the specimens are very fragmentary and are preserved in coarse-grained rock, a lot of details are indistinct. Some features, however, suggest that they belong to *S. emarginatum*: the general shape and size of the leaves, the type of venation and morphology of the teeth. The specimen described above corresponds with the description of *S. emarginatum* given by Remy (1959) and Halle (1927).

Locality. Sormás 1.

Asterophyllites equisetiformis (Sternberg)

Brongniart f. *jongmansii*

Pl. 1, fig. 3, 4

Material. No BP 96.352.1.

Two fragments of branches with 6 nodes (75 mm long) and with 7 nodes (80 mm long); both of them are parts from near the top of the stem.

Description. The stem, finely striped longitudinally is about 0.5 mm wide at the top of the fragments and about 2 mm broad near

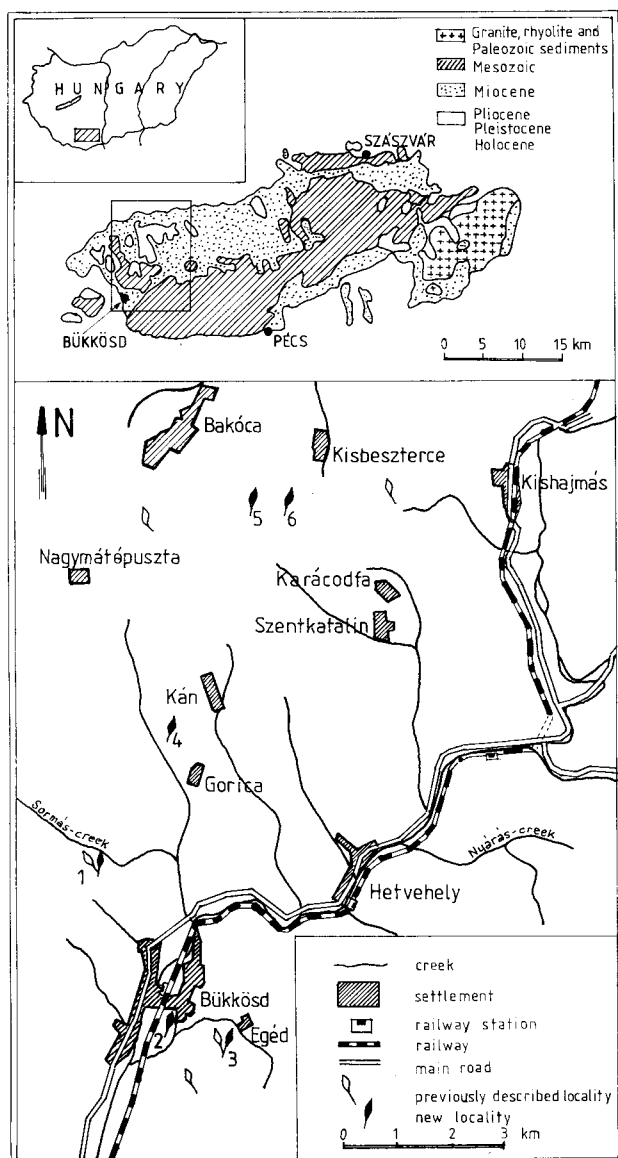


Fig. 1. An outline geological sketch map of the Mecsek Mts. and the localities of the carboniferous pebbles with plant remains in the Miocene conglomerate from the Mecsek Mts. New localities: 1 – Sormás Valley, 2 – South of the football pitch in Bükkösd village, 3 – South of Egéd, 4 – Gorica Valley, 5 – Garadóc Graben, 6 – Mészáros Valley

their base. The internodes become shorter towards the tips of shoots, from 24 mm at the base to 4–5 mm near the tip.

Leaves verticillate, 7–11 in each verticille, linear, with entire margins and acute apex. In each case their length exceeds the length of the internodes. They are at least 5 mm long and 0.8 mm wide at the top of the fragments and 28 mm long and 1.5 mm wide towards the base. Leaf bases free, but crowded, partly overlapping. The prominent simple median vein reaches the leaf apex.

Locality. Bükköst.

Remarks. The specimen from Hungary is close to *A. equisetiformis* f. *jongmansii* (Josten 1991), but differs in some details from the typical form. One difference is the number of leaves in the verticils, which is lower in the case of the Hungarian specimen. The second difference concerns the size of leaves and internodes, both of which are longer than usual but correspond with the large forms mentioned by Geinitz, Jongmans and Kukuk (Josten 1991).

***Alethopteris* cf. *grandinioides* Kessler
var. *grandinioides***

Pl. 1, fig. 5–8

Material. No BP 96.98.2.

The material consists of three impressions of pinnae, two of which are the tips of pinnae. The length of each fragment is no more than 40 mm, the breadth about 10–13 mm.

Description. The pinna is elongate triangular in the upper part and, subpinnate towards the base. The pinnules are 4–7 mm long and 3–5 mm wide, alternate, elongate or as long as wide, with parallel margins. The apex of the pinnule is broad and rounded. The midvein is prominent and extends to about three quarters of the length of the pinnule, the lateral veins as well as the subsidiary veins are fine, simple or once branched, about 25 per cm at the margin of the pinnule.

Remarks. Like all other specimens found in the Mecsek Mountains, those described above are small and poorly preserved, so their determination is uncertain. It was particularly difficult to measure the density of veins since they are only just visible.

In general, the morphology of the described specimens corresponds with the morphology of

A. grandinioides var. *grandinioides* (Simunek 1988, Wagner 1968), but the Hungarian material should not be considered as typical or representative of that species.

Locality. Sormás.

cf. ***Alethopteris* ex group *serli* Brongniart**

Pl. 1, fig. 11

Material. No BP 96.95.2.

Only one small pinnule, 13 mm long and 11 mm wide at the base.

Description. Pinnule with attenuate, rounded apex. The base is cordate, slightly asymmetrical, broader on the basal side. The margins are clearly convex. The midrib is conspicuous and extends almost to the top of the pinnule. The lateral veins are fine, once or twice branched, about 35 veins per cm at the pinnule margin.

Remarks. The pinnule, although well preserved, is difficult to determine. Its shape is not typical because of the position of the pinnule on the leaf (it may have been near the apex or the base). Its morphological features such as concave margins, type of venation and size of pinnule generally agree with those of the group *Alethopteris serli* Brongniart (Wagner 1968). Also, its geographical distribution in Europe (Belgium, Bohemia) does not exclude its occurrence in Hungary.

Locality. Garadóc Graben.

***Pecopteris* sp. 1**

Pl. 1, fig. 10

Material. No BP 96.92.2.

Only one, poorly preserved, small fragment of a pinna 30 mm long and 13 mm wide.

Description. Pinnules alternate, distant, 6–8 mm long and 2 mm wide, parallel margined, free to the base, with rounded apex. The prominent midvein reaches almost the tip. Lateral veins very slender, almost invisible because of bad preservation.

Remarks. Though the fragment is badly deformed, it shows pecopteroid characteristics. It seems to be similar to *P. cyathea* (Schlotheim) Brongniart (Remy & Remy 1959) but exact determination is impossible.

Locality. Sormás.

***Pecopteris* sp. 2**

Pl. 1, fig. 12

Material. No BP. 96.96.2.

The impression of two small fragments of pinnae (or one broken fragment), 60 mm and 20 mm long.

Description. Pinnules small, ca. 3.5 mm long and 2 mm wide at the base. The basal margin is slightly decurrent. The apices of the pinnules vary, from rounded to subacute, the midvein is prominent and extends for most of the length of the pinnule. The lateral veins are infrequent and branched. The rachis is ca. 0.5 mm wide, sunken.

Remarks. Because of the coarse-grained rock in which the specimen is preserved, the morphological details are almost unrecognizable. The lateral veins are visible only in one case, in the other pinnules only their shape is distinguishable. However, the fossil seems to have pecopteroid features.

Locality. Bükkösd.

? *Neuropteris* cf. *scheuchzeri* Hoffmann

Pl. 1, fig. 12

Material. No BP 96.93.2.

One incomplete fragment of a pinnule, 17 mm long and 10 mm wide.

Description. The pinnule is elongate, parallel-sided with entire margins. The apex is missing, the base slightly cordate, nearly straight. Midrib stout, secondary veins broadly arched, branched. In some places there appear to be visible imprints of hairs (?) directed towards the apex of the pinnule.

Remarks. The specimen is difficult to determine since it is preserved in coarse-grained stone. The details of venation are quite unclear, the pinnule is fragmentary and poorly preserved. On the other hand the relatively large size of the pinnule, the type of base, course of veins and, perhaps, the presence of hairs, correspond mostly with the features of *N. scheuchzeri* Hoffmann (Cleal & Zодrow 1989, Josten 1991).

Locality. Bükkösd.

REMARKS ON THE AGE OF THE FOSSILS

Assuming that the determination of the Hungarian specimens is correct, despite their poor and very fragmentary character, we can conclude that all the species are typical for the Upper Westphalian. Particular species are known from different localities from Westphalian A to Upper Westphalian D.

Alethopteris grandinioides var. *grandinioides* – Germany – France: Westphalian C, D; Germany: Lower Westphalian D; Bohemia: Upper Westphalian; British Isles: Middle Westphalian D, Upper Westphalian C, Upper Westphalian D; Westphalian D. Northern France: Upper Westphalian C, Westphalian C, N.W. Spain: Lower Westphalian D, Lower Stephanian A, Upper Westphalian D (Wagner 1968).

Neuropteris scheuchzeri – Germany: Westphalian B-D, the Netherlands: Upper Westphalian C, France: Westphalian C, D; Great Britain: Westphalian B-D (Josten 1991).

Alethopteris serli – British Isles: Westphalian B-D; Belgium: Westphalian B, Westphalian A-D. France Westphalian C, England Westphalian D.; all of species from this group are from the Upper Westphalian (Wagner 1968).

Asterophyllites equisetiformis – Germany: Upper Westphalian A-D, the Netherlands: Westphalian A-C, Great Britain: Westphalian A-C (Josten 1991).

Sphenophyllum emarginatum – Westphalian B – Lower Stephanian (Remy & Remy 1959).

Therefore, on the basis of the above data we can say that the species found in Mecsek Mountains are characteristic for a restricted time period and confirm the age of the conglomerate as Upper Carboniferous.

CONCLUSIONS

1. New specimens of Carboniferous pebbles with plant remains, in part from new localities, have been discovered in Miocene conglomerate in the Mecsek Mountains.

2. The hitherto poorly known Carboniferous flora has been supplemented by a new genus (*Asterophyllites*) and some new species (*Sphenophyllum* cf. *emarginatum*, *Alethopteris* ex group *serli*, *Alethopteris grandinioides* var. *grandinioides* and *Neuropteris* cf. *scheuchzeri*).

3. The plant remains in the pebbles confirm that they are of Upper Carboniferous (Westphalian) age, consistent with earlier findings from similar pebbles and from similar material in the nearby boreholes.

ACKNOWLEDGEMENTS

The authors thank Dr. Z. Kvaček for his advice and Dr. Z. Simunek for help with determination, literature and discussion during their work. We would also like to express our thanks to Dr. László Breuer for collecting and presenting to us the specimen of *Asterophyllites*.

REFERENCES

- CLEAL C. J. & ZODROW E. L. 1989. Epidermal structure of some Medullosan *Neuropteris* foliage from the Middle and Upper Carboniferous of Canada and Germany. *Palaeontology*, 32(4): 837–882.
- FÜLÖP J. 1994. Magyarország geológiája; Paleozoikum II. [The geology of Hungary; Paleozoic II.]. Akadémiai Kiadó, Budapest, (in Hungarian).
- HALLE T.G. 1927. Paleozoic Plants from Central Shansi. *Palaeontologia Sinica*, Ser. A, 2(1): 1–310.
- HETÉNYI R. & RAVASZNÉ-BARANYAI L. 1976. A baranyai antracittelepes felső karbon összlet a Siklósbodony 1. és a Bogádmindszent 1. sz. fúrás tükrében (summary: The anthraciferous upper Carboniferous sequence of Baranya, southern Hungary, in the light of the boreholes Siklósbodony-1 and Bogádmindszent-1) MÁFI Évi Jelentése az 1973. évr l: 323–361.
- JÁMBOR Á. 1969. Karbon képződmények a Mecsek és a Villányi-hegység közötti területen (summary: Carboniferous deposits in the area between the Mecsek and Villány Mountains). MÁFI Évi Jelentése az 1967. évr l: 215–221.
- JOSTEN K. H. 1991. Die Steinkohlen-Floren Nordwestdeutschlands. *Fortschr. Geol. Rheinld. u. Westf.*, 36, Text-Bd., pp. 434(232 figs, 29 tab.), Tafel-Bd. 220 pls, Krefeld, 1991.
- KASSAI M. 1983. A felső karbon elterjedése és nyersanyagkutatási perspektívái a Dél-Dunántúlon (The distribution of the Upper Carboniferous and perspective its exploration] *Földtani Kutatás*, 26(2–3): 53–56.(in Hungarian)
- REMY W. & REMY R. 1959. *Pflanzenfossilien*. Akademie-Verlag Berlin.
- SIMUNEK Z. 1988. Varieties of the species *Alethopteris grandinioides* Kessler from the Kladno Formation (Westphalian C,D, Bohemia). *Časopis pro mineralogii a geologii*, 33(4): 381–394
- SOÓS I. & JÁMBOR Á. 1960. Növénymaradványos felső karbon kavicsok a Mecsek-hegység helvétii kavicsösszletéből (Zusammenfassung: Oberkarbonische Pflanzenreste aus den Helvetschottern des Mecsekgebirges (Südungarn)). *Földtani Közlöny*, 90(4): 456–458.
- SZAKMÁNY GY. & JÓZSA S. 1994. Rare pebbles from the Miocene conglomerate of the Mecsek Mts., Hungary. *Acta Mineralogica-Petrographica*, Szeged, 35: 53–64.
- WAGNER R. H. 1968. Upper Westphalian and Stephanian species of *Alethopteris* from Europe, Asia Minor and North America. *Meded. Rijks Geologische Dienst*, Ser. C, III, 1(6): 1–188.
- WÉBER B. 1964. Újabb növénymaradványos felső karbon kavicsok a NY-i Mecsek helvétii rétegeiből (Zusammenfassung: Neue Oberkarbonische Schotter mit Pflanzenresten aus den Helvetschichten des Westlichen Mecsek). *Földtani Közlöny*, 94(3): 379–381.

PLATE

Plate 1

1. *Sphenophyllum* cf. *emarginatum* Brongniart, No BP 96.97.2.
2. *Sphenophyllum* cf. *emarginatum* Brongniart, No BP 96.94.1.
- 3–4. *Asterophyllites* cf. *equisetiformis* (Sternberg) Brongniart f. *jongmansi*, No 96.352.1.
- 5–8. *Alethopteris* cf. *grandinioides* Kessler var. *grandinioides*, No 96.98.2.
9. ? *Neuropteris* cf. *scheuchzeri* Hoffmann, No 96.93.2.
10. *Pecopteris* sp. 1, No 96.92.2.
11. cf. *Alethopteris* ex group *serli* Brongniart, No 96.95.2.
12. *Pecopteris* sp. 2, No 96.96.1.

