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NEW PLANT ELEMENTS IN THE TARD CLAY FORMATION FROM EGER-KISEGED

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ABSTRACT. The Early Oligocene flora of the Tard Clay Formation is represented at several localities in northern Hungary. One of the richest is situated near Eger on the Kiseged hill, Although evaluation of this site has not been completed, several newly recognized species can be added by the present study: *Doliostrobus taxiformis* (Sternberg) Kvaček var. *hungaricus* (Rasky) Kvaček & Hably, stat. n., *Tetraclinis brachyodon* (Brongniart) Mai & Walther, *Calocedrus suleticensis* (Brabenec) Kvaček, *Laurophyllum acutimontanum* Mai, *Laurophyllum markvarticense* Kvaček, *Laurophyllum* cf. *markvarticense* Kvaček, cf. *Matudaea menzelii* Walther, *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, *Craigia bronnii* (Unger) Kvaček, Bužek & Manchester and *Cedrelospermum* sp.

KEY WORDS: Early Oligocene, land plants, Hungary

INTRODUCTION

Knowledge of the Early Oligocene flora of Central Europe has been improved by several recent studies primarily concerning three regions each in a different setting: the coal deposits of the Weisselster Basin of Germany (Mai & Walther 1978), the volcanic landscape of the Česke Středohoři Mts, Northern Bohemia (Bužek et al. 1976, Kvaček & Walther 1995) and the coastal plains of the Tard Clay Formation in northern Hungary (Hably 1992, Manchester & Hably 1997). Before general comparisons between the localities can be undertaken, more detailed taxonomical revisions are necessary to obtain a complete picture of the different vegetation types and their elements. The present account continues these studies and concentrates on one of the richest sites of the Tard Clay, Eger-Kiseged, which has yielded thousands of plant fossils.

The locality of Eger-Kiseged [lat. 47°54' N, long. 20°30' E] is situated in north-eastern Hungary, about 130 km north east of Budapest. The exposure lies at the foot of the Kiseged hill on the road leading from Eger to Noszvaj. Details of the flora were first published by Andreánszky (1949), but most of the material, which is housed in the Hungarian Natural History Museum, was collected by Legányi in the nineteen fifties and sixties. The collection comprises more than five thousand specimens and although several papers deal with this site (Andreánszky 1949, 1951, 1954, 1955, 1956, 1959, 1964, 1965, 1967a,b, Andreánszky & Cziffery-Szilágyi 1964, Novák, 1950, Andreánszky & Novák 1957, Pálfalvy 1981, Manchester & Hably 1997) there are still new elements to be described. For twenty years the outcrop was inaccessible, because of contruction work, but eventually became accessible again enabling the collection to be completed by Hably and others. In addition to the material studied in this paper, there are more than one hundred specimens from this site, among them several type specimens described by Prof. Andreánszky, housed in the Mátra Museum at Gyöngyös.

The age of the flora was estimated as Early Oligocene by Andreánszky (1964); the exact stratigraphical study (Báldi 1983), complemented with nannoplankton examination, was published later (Nagymarosy & Báldi-Beke 1988). The plant remains commonly occur in the so-called "fish scale bearing layers" of the Tard Clay Formation and here occur in the upper part of the Formation, which belongs to the NP 23 nannoplankton zone. The base of the NP 23 zone is indicated by the sudden scarcity or total extinction of *Reticulofenestra placomorpha* and by a sudden increase in the abundance of *Reticulofenestra lockeri*. The zone-boundary defining species *Sphenolithus distentus* is extremely rare. In the upper part of the NP 23 zone a few specimens of "early" *Helicopontosphaera recta* have been observed (Nagymarosy & Báldi-Beke 1988).

Most of the plant remains are leaves but several winged fruits occur at the site. Altogether more than one hundred species, including Fern and Conifer as well as dicotyledonous species, have to date been described by a number of authors (see Hably 1985), with some of the previous specimens revised (Kvaček & Bůžek 1995, Manchester & Hably 1997). However, most of the material remains unrevised or even undetermined. Preservation of leaf cuticles is very poor at Eger-Kiseged, only in rare cases was the preparation successful when transfer-film-technique with the aid of collodion was employed.

The flora of Eger-Kiseged shows great similarity with the other palaeobotanical locality of the Tard Clay Formation at Budapest (Óbuda) which is of the same age as Eger-Kiseged. The most common elements are *Tetraclinis salicornioides, Zizyphus zizyphoides, Eotrigonobalanus furcinervis, Platanus neptuni, Engelhardia orsbergensis, E. brongniartii, Raskya vetusta* and Leguminosae sp. div.. Although the two localities are of the same age and originate from the same formation, and although several dominant elements are common to both, there are also differences in the compositions of the flora. For example, no remains of *Ailanthus* have been recovered at Eger-Kiseged, while *Alnus* is absent at Óbuda. The similarites and differences will only be clear after a revision of the whole flora of the Tard Clay Formation is accomplished.

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SYSTEMATIC PART

Araucariaceae vel Taxodiaceae

Doliostrobus Marion

Doliostrobus taxiformis (Sternberg) Kvaček var. ***hungaricus*** (Rásky) stat. n.

Pl. 1. figs 1, 2

1943 *Araucaria hungarica* Rásky, p. 524, Pl. 22, fig. 1. (basionym)

1968 *Doliostrobus hungaricus* (Rásky) Bůžek, Holy et Kvaček, p. 155.

Material. BP 97.132.1 (with counterpart BP 97.133.1), BP 97.134.1.

Description. Two cone scales 10–15 mm wide and 12–17 mm long widely rounded and broadened apically with an apical thorny process (3–4 mm long), and cuneate at the base. Fine striations run throughout the scale, being bent admedially in the distal part.

Discussion. Cone scales of *Doliostrobus* occur but rarely in the Early Oligocene Tard Clay Formation (Hably 1992). At Kiseged they are associated with *Doliostrobus*-like foliage, which was previously determined as *Sequoia sternbergii* (Goeppert) Heer (Novák 1950). In gross morphology, these twigs are very similar to coalified remains known from the Tard Clay in Budapest, which, according to the preserved cuticular structure (Hably 1992) belong exclusively to *Chamaecyparites* Endlicher (syn. *Protosequoia* Miki, *Cupressistrobus* Chandler). Thus we hesitate to identify the foliage from Kiseged as *Doliostrobus* without evidence of cuticular structure. Hungarian populations of *Doliostrobus* exceed the average cone scale size so far described from the Eocene of Central Europe (see Bužek et al. 1968, Mai & Walther 1985, Wilde 1989). The absence of well-preserved foliage showing differences in the topography of the stomata prevents the maintenance of *D. hungaricus* as an independent specific entity. In any case, this variety represents the youngest remnants of *Doliostrobus* in Central Europe documented by cone scales. (Mere sterile foliage is inadequate evidence, as noted above).

Cupressaceae

Tetraclinis Masters

Tetraclinis brachyodon (Brongniart) Mai & Walther

Pl. 1. figs 3–5, Fig. 1

1822 *Equisetum brachyodon* Brongniart, p. 328, pl. 16, fig. 3.
1985 *Tetraclinis brachyodon* (Brongniart) Mai & Walther, p. 30 (non pl. 3, figs 17–19).

Material. BP 70.402.1, BP 97.130.1, BP 97.131.1, BP 97.136.1.

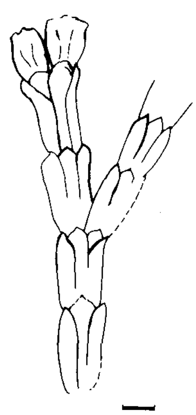

Fig. 1. *Tetraclinis brachyodon* (Brongniart) Mai & Walther, details of foliage, No. BP 97.130.1, scale bar 1 mm

Description. Twigs alternately but rarely oppositely branched, scale leaves almost homomorphous, whorled, differentiated in two appressed facial leaves wedged between two boat-like, parallel-sided lateral leaves which are not fully merged with the twig, tips blunt, adhering to the next pair. Leaf segments usually 1–2 mm wide and 2–3 mm long, in the basal branches up to 7 mm long. Where branching leaves are slightly dimorphic, the facial smaller and the lateral with recurved tips.

Discussion. This species differs from *Tetraclinis salicornioides* (Unger) Kvaček, which also occurs at Kiseged, in its stomatal topography and because the scale leaves are not fully merged together (Kvaček 1989). One specimen (BP 97.136.1) shows repeated opposite branching, which is rare in this species (e. g. Watelet 1866).

Calocedrus Kurz

Calocedrus suleticensis (Brabenec) Kvaček

Pl. 1. fig. 6, Fig. 2

1910 *Libocedrus suleticensis* Brabenec, pp. 60, text-fig. 42.
1950 *Thuites* sp., Novák, pp. 53, 58, 61, pl. 1, fig. 5.
1998 *Calocedrus suleticensis* (Brabenec) Kvaček, p. 7.

Material. BP 97.186.1.

Description. A twig fragment, at first alternately, higher up oppositely branched. The scales leaves are dimorphic. At points of branching the lateral leaves are falcate and the facial minute, three in number, on one side of the twig, the median longer than the neighbouring two. Elsewhere the scale leaves are decussate, almost homomorphous, the facial with widely triangular blunt tips and the lateral boat-shaped, slightly falcate blunt; they form short, flat leaf segments, c. 2 mm long and wide.

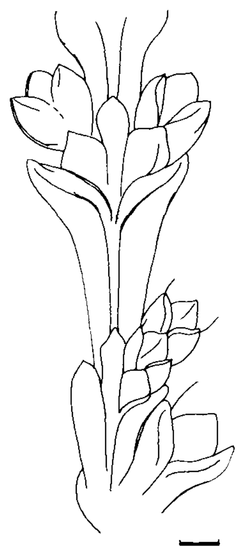

Fig. 2. *Calocedrus suleticensis* (Brabenec) Kvaček, details of foliage, No. BP 97.135.1, scale bar 1 mm

Discussion. A single fragmentary twig impression was located in the collections. Another impression better preserved than that described above, was identified from Kiseged by Novák (1950) as *Thuites* sp..The same foliage type occurs in the Early Oligocene of the Česke Středohoří volcanic complex in Northern Bohemia, identified as *Libocedrus* by Brabenec (1910). An ovoid cone and a seed newly recovered at Holy Kluk in Northern Bohemia from the same volcanic complex suggest an affinity with *Calocedrus* Kurz. The cone has three pairs of scales, the basal pair being the smallest, these of the terminal one fused together. A narrow triangular extension divides the wing into two unequal parts (Kvaček 1998). This Conifer shows oppositely branched sprays, a feature recalling some species of extant *Libocedrus, Austrocedrus* and *Papuacedrus* confined to the Southern Hemisphere. This type of branching has been rarely observed in *Calocedrus* but it is present in other extinct Cupressaceae (e. g. *Mesocyparis* Basinger & McIver, *Tetraclinis salicornioides* (Ung.) Kvaček and *Fokienia ravensgravensis* Basinger & McIver).

Lauraceae

Laurophyllum Goeppert

Laurophyllum acutimontanum Mai

Pl. 2. figs 1–6, Fig. 3

1963 *Laurophyllum acutimontanum* Mai, p. 72, pro parte, pl. 8, figs. 7–9, 12, text-fig. 11 f-h.

Material. BP 97.124.1, BP 97.125.1.

Description. Incomplete elongate leaves, 12–13 mm wide and more than 8 cm long, entire-margined, shortly petiolate (petiole 5 mm), base cuneate to narrow-cuneate, lacking preserved apex. Venation camptodromous, midrib thick, straight, secondaries forming an acute angle with the midribs, widely spaced, looping indistinct, higher-order venation not visible. Cuticular structure poorly preserved. On the abaxial side occur scattered stomata, amphiparacytic, with sunken guard cell pairs and thickened subsidiary cells approximately 17–21 μm long.

Discussion. The coriaceous nature and slender form of these laurel-like leaves refers

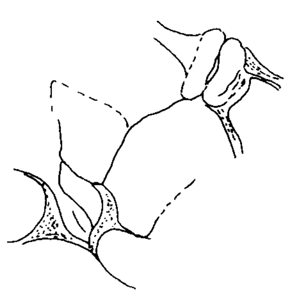

Fig. 3. *Laurophyllum acutimontanum* Mai, stomata, preparation No. BP 97.125.1/1, scale bar 10 μm

the remains to *L. acutimontanum,* a species widespread in the European Oligocene. The preserved cuticular structure corroborates this identification. Better preserved specimens have been recorded in the Tard Clay Formation in Budapest (Hably 1992).

Laurophyllum markvarticense Kvaček

Pl. 3. figs 1–3, 5, Fig. 4

1971 *Laurophyllum markvarticense* Kvaček, p. 52, pl. 1, fig. 7, pl. 6, figs 1–3, text-fig. 2.

Material. BP 97.129.1.

Description. Leaf narrowly obovate, 36 mm wide and more than 140 mm long, incomplete in length, entire-margined, shortly petiolate (petiole 6 mm), base narrowed but rounded. Venation camptodromous, midrib thick, straight, secondaries widely and irregularly spaced, curved, inclined to the midrib at an angle of c. 45 in the lower part of the leaf, the angle greater towards the apex, looping very near the margin and sending out occasional side veins towards it, intersecondaries rarely present, tertiaries perpendicular to the midrib and oblique to the secondaries, usually forked, higher order venation forming elongate meshes almost parallel to the tertiaries. The mesophyll contains lense-shaped secretory cells. Abaxial cuticle thick, showing straight-walled epidermal cells and occasionally epidermal secretory cells are observed as thin spots. Stomata amphibrachyparacytic, stomatal pairs slightly sunken, without well demarcated limits to the subsidiary cells. Stomatal complexes 20–28 μm wide and 25–28 μm long.

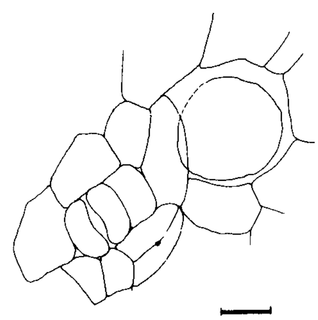

Fig. 4. *Laurophyllum markvarticense* Kvaček, stoma and epidermal secretory cell, preparation No. BP 97.129.1/1, scale bar 20 μm

Discussion. This leaf deviates from the common form of *L. markvarticense* by its large size and form. However, the details of the stomatal structure and secretory epidermal cells are exactly the same as in the type specimen from the Early Oliogocene of Markvartice (Kvaček 1971, Bůžek, Holy & Kvaček 1976).

Laurophyllum cf. ***markvarticense*** Kvaček
Pl. 3, figs 4–6, Pl. 4. figs 1–6, Fig. 5

? 1971 *Laurophyllum markvarticense* Kvaček, p. 52, pl. 1, fig. 7, pl. 6, figs 1–3, text fig. 2.

Material. BP 97.126.1, 97.127.1., 97.128.1.

Description. Leaf elongate, 25 mm wide, incomplete in length (longer than 85 mm), and entire-margined. Venation camptodromous, midrib straight, thick, secondaries widely spaced, curved, making an angle of more than 60^0, with the midrib, looping less close to the leaf margin than in the preceding species, intersecondaries regularly present and joined within the lamina, tertiary veins oblique to subparallel with the secondaries and intersecondaries. Cuticle structure poorly preserved, only solitary slightly sunken paracytic small stomata forming rounded stomatal complexes 17–28 μm wide and 17–22 μm long.

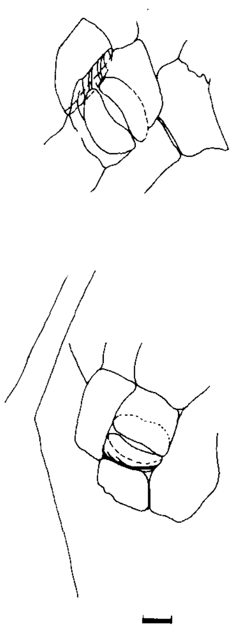

Fig. 5. *Laurophyllum* cf. *markvarticense* Kvaček, stomata, preparation No. BP 97.126.1/1, scale bar 10 μm

Discussion. This species was found in the Tard Clay Formation in Budapest and compared tentatively with *L. markvarticense* (Hably 1992). However, the exact identity of this specimen cannot be guaranted due to poor preservation.

Hamamelidaceae

cf. ***Matudaea*** Lundell

cf. ***Matudaea menzelii*** Walther in Mai et Walther
Pl. 5. figs 1–6

? 1978 *Matudaea menzelii* Walther in Mai et Walther, p. 81, pl. 3, figs 1–4, pl. 11, figs 2–3, pl. 24, figs 1–9.

Material. BP 70.158.1, BP 70. 159.1, BP 70.160.1, BP 70.167.1, BP 70.168.1, BP 70.172.1, BP 70.178.1, BP 70.180.1.

Description. Leaves elongate oval to broadly ovate, 26–38 mm wide and 58–86 mm long, shortly petiolate (petiole 6–9 mm), entire-margined, base widely cuneate to rounded, apex narrowly acuminate. Venation camptodromous, three-veined, midrib straight, thin, basal veins curved, reaching higher than one half of the leaf length; they tend towards the apex giving off thin, widely spaced side veins and possess widely spaced loops, the curved secondaries also looping together near the margin; tertiaries rarely preserved, thin and dense, perpendicular or oblique to the midrib and basal veins.

Discussion. This leaf form was identified by Andreánszky (in sched.) as *Ficus titanum* Ettingshausen but it decidedly differs from the type and topotypical material of *F. titanum* (= *F. truncata* Heer) from the Early Miocene of the Most Basin, by its three-veined leaves (5-veined in *F. titanum*/*truncatum* – see Bůžek 1971) and much thinner venation. The petiole attachment is basal, unlike *F. titanum* where it is from beneath the lamina. The leaves available are similar to *Matudaea menzelii* described from the Oligocene of the Weisselster Basin, Germany (see Walther 1980), but the Kiseged population has less regular tertiary venation and the basal veins are camptodromous rather than acrodromous. In this respect the Kiseged material matches better the extant species *M. trinervia* Lundell and *M. hirsuta* Lundell (Mexico). We refrain from describing a new species because the cuticular structure is not preserved in the material studied.

Fagaceae

Eotrigonobalanus Walther & Kvaček

Eotrigonobalanus andreanszkyi (Mai) Kvaček & Walther

Pl. 2. figs 7–9, Pl. 4 fig. 9, Fig. 6

1970 *Trigonobalanus andreanszkyi* Mai, p. 384, pl.1, figs 1–18, pl. 3, figs 7–13.
1989 *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, p. 579, pl. 37, figs 1–2, pl. 38, figs 1–2, pl. 48, figs 1–4, text-fig. 1–2.

Material. BP 67.271.1, (and counter-impression BP 67.279.1), BP 67.277.1, BP 67.278.1, BP 67.395.1, BP 67.400.1, BP 67.912.1.

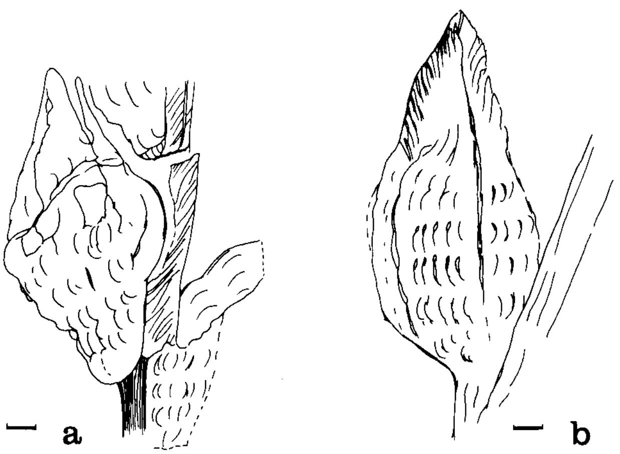

Fig. 6. *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, details of cupules, a – No. BP 67.279.1, b – No. BP 67.277.1, scale bars 2 mm

Description. Amentaceous infructescences, up to 50 mm long, bearing up to 10 cupules (on still incomplete specimens), cupules closely set, alternate on the main axis, and always solitary, subsessile, broadly ovate in outline asymmetric, 4–6 mm wide and 5–14 mm long, dehiscent in the upper part, occasionally with elongate triangular free tips (number of valves uncertain); main body covered by dense small tubercles in many transverse rows; the apices of the cupules are flat and smooth.

Discussion. Andreánszky did not describe these remains from Kiseged believing them to be catkins of *Myrica* (in sched.). The cupules agree well with those described from the Palaeogene of the Weisselster Basin (Mai & Walther 1978, 1985 as *Trigonobalanus andreanszkyi* Mai. The copious foliage associated with them corresponds to *Eotrigonobalanus furcinervis* (Rossm.) Walther & Kvaček and includes both dentate and entire-margined forms.

Tiliaceae

Craigia W. W. Smith & Evans

Craigia bronnii (Unger) Kvaček, Bůžek & Manchester

Pl. 5 figs 7–9

1845 *Ulmus bronnii* Unger, p. 79, pro parte, pl. 25, figs 2–4 (not fig. 1).
1948 *Pteleaecarpum bronnii* (Unger) Weyland, p. 130, pl. 21, fig. 5, text-figs 5–9.
1964 *Ulmus*-Früchte, Andreánszky & Cziffery-Szilagyi, p. 125.
1991 *Craigia bronnii* (Unger) Kvaček, Bůžek & Manchester, p. 522.

Material. BP 67.347.1 – BP 67.354.1.

Description. Detached valves of fruit capsules, rounded-oval to roundish in outline, slightly bilobate, 10–13 mm wide and 11–21 mm long, innervated with radially disposed, elongated meshes of venation, more isometric over the central locule, steeply orientated in the apical region and perpendicular to the column in the basal half; the locule is rarely clearly demarcated. Seeds reniform, 2–3 mm wide and 4 mm long, attached solitarily or in subopposite pairs by a short broad funicle to the column approximately half way along the length of the capsule.

Discussion. Andreánszky & Cziffery-Szilágyi (1964) described these as two species of *Ulmus* with differently sized fruits. The fossils do not represent elm samaras but isolated valves of disintegrated fruit capsules. Whereas Bůžek et al. (1989) compared these fruits with some members of the Sapindaceae, Kvaček et al. (1991) described them as fruits belonging to the extant genus *Craigia*. This species is commonly known as *Pteleaecarpum bronnii.* At most of the sites where it occurs in Europe it is associated with the large trilobate-simple leaves of *Dombeyopsis lobata* Unger (Kvaček 1993). At Kiseged, the only fossil leaf of a malvaceous nature was assigned to *Byttneria apiculata* E. Kovács by Andreánszky (1965, pl. 68, text-fig. 14.). We believe that transport processes were responsible for the discrepancy, with large leaves not reaching the depositional site at Kiseged; alternatively the foliage differed from the standard form due to local climatic conditions.

Ulmaceae

Cedrelospermum Saporta

Cedrelospermum sp.

Pl. I4 figs 7–8

1955 *Embothrites borealis* Unger; Andreánszky, p. 226, pl. 3, fig. 11.

Material. BP 67.795.1 (and counter-impression BP 67.819.1), BP 67.841.1., BP 67.844.1.

Description. Winged fruits, samaras, with seed body oval in outline 2.5 mm wide and 4 mm long at most, complete fruits, including the wing, 4 mm wide and 10–11 mm long. Wing lateral, obliquely inclined to the main axis of the fruit, narrowly oval, asymmetric in the apical part, with 6–8 longitudinal primary veins merging just short of the adaxially inclined apex and appearing as a slight protuberance on the wing margin (remains of stigma).

Discussion. Only a few specimens of this easily recognized plant have been traced among the thousands of fossils found at Kiseged. The Kiseged specimens do not vary in size and shape but are smaller than those of the younger Middle Miocene populations of Magyaregregy (Andreánszky 1959). Following his studies of material from Europe and North America Manchester (1987) concluded that the size of the fruits increases in the younger localities. The environment may also have had an influence on fruit size. Thus *Cedrelospermum leptospermum* (Ettingshausen) Manchester (Häring, late Eocene or earliest Oligocene) and *C. aquense* Saporta (Aix, latest Oligocene) are on average smaller, and come from subxerophytic vegetation, while the other populations from Cerestre (Saporta 1889, wrongly referred to by Manchester 1987 as from Aix), Manosque and Rott are comparable to the Kiseged specimens, the associated vegetation being mesophytic. The Middle Miocene population from Randeck Maar produced still bigger fruits and matches the Magyaregregy specimens. Therefore at least three taxonomic entities are recognizable in Europe. However, a solution to the specific differentiation problems of *Cedrelospermum* within Europe requires a more detailed study including the associated foliage. Foliage comparable with that of the American species with attached leaves and fruits (Manchester 1989) is scarce in the available collections of Kiseged material, e. g. a leaf identified as *Ulmus affinis* Massalongo by Andreánszky (in sched., No. 71.254.1, pl., fig.). Details of another set of larger specimens have been published under the same name by Andreánszky & Cziffery-Szilagyi (1964, text-fig. 5, pl. 2, fig. 10).

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PLATES

Plate 1

1. *Doliostrobus taxiformis* (Sternberg) Kvaček var. *hungaricus* (Rásky) stat. n., BP. 97.132.1., × 4
2. *Doliostrobus taxiformis* (Sternberg) Kvaček var. *hungaricus* (Rásky) stat. n., BP. 97.134.1., × 2
3. *Tetraclinis brachyodon* (Brongniart) Mai & Walther, BP. 70.130.1., × 4
4. *Tetraclinis brachyodon* (Brongniart) Mai & Walther, BP. 70.131.1., × 4
5. *Tetraclinis brachyodon* (Brongniart) Mai & Walther, BP. 70. 402.1., × 4
6. *Calocedrus suleticensis* (Brabenec) Kvaček, BP. 97.135.1., × 5

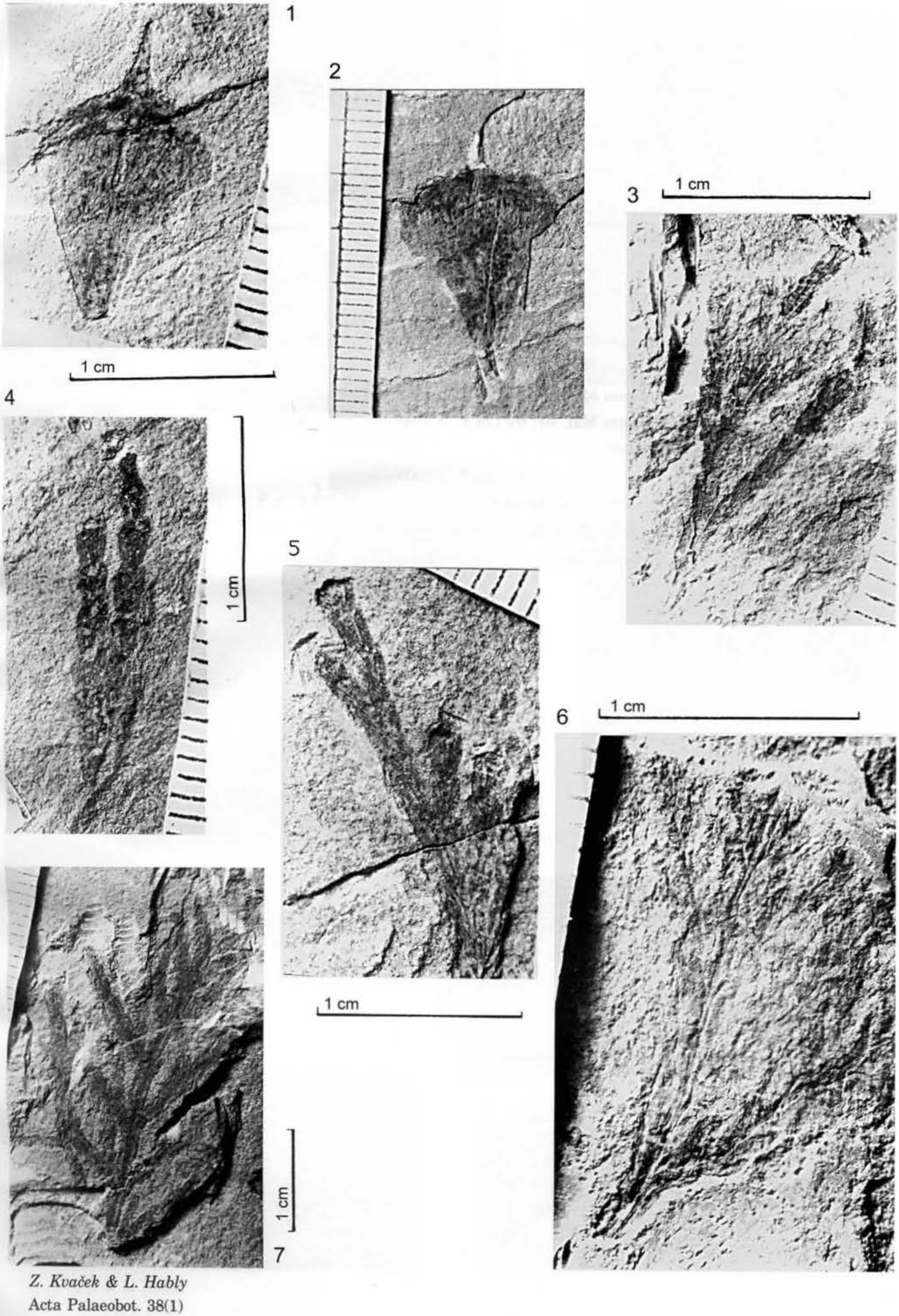
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Plate 2

1. *Laurophyllum acutimontanum* Mai, BP. 97.124.1., × 1
2. *Laurophyllum acutimontanum* Mai, BP. 97.124.1., × 500
3. *Laurophyllum acutimontanum* Mai, BP. 97.124.1., × 500
4. *Laurophyllum acutimontanum* Mai, BP. 97.124.1., × 500
5. *Laurophyllum acutimontanum* Mai, BP. 97.125.1., × 1
6. *Laurophyllum acutimontanum* Mai, BP. 97.125.1., × 500
7. *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, BP. 67.279.1., × 2
8. *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, BP. 67.312.1., × 3
9. *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, BP. 67.400.1., × 3

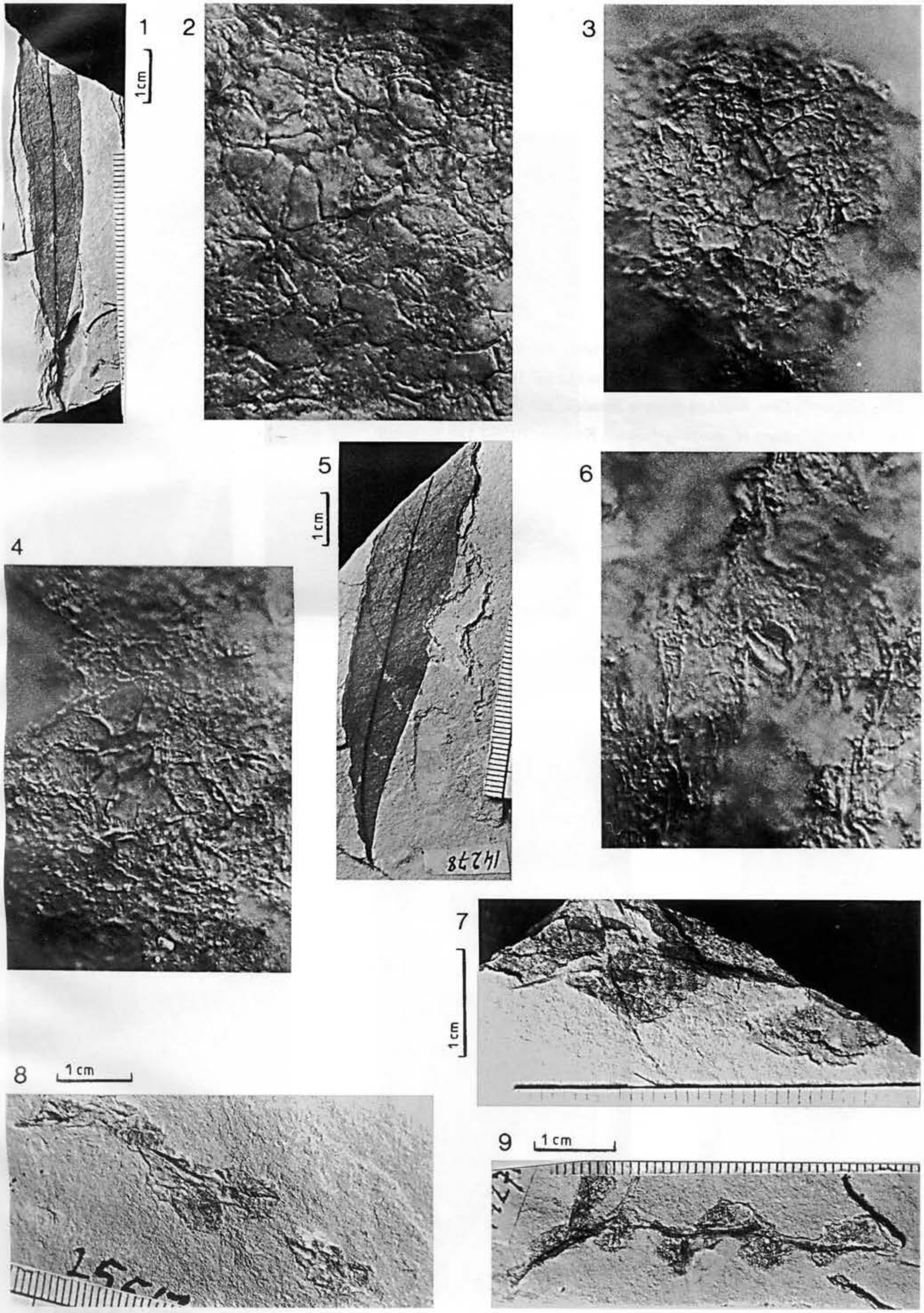
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Plate 3

1. *Laurophyllum markvarticense* Kvaček, BP 97.129.1., × 1
2. *Laurophyllum markvarticense* Kvaček, BP 97.129.1., × 500
3. *Laurophyllum markvarticense* Kvaček, BP 97.129.1., × 500
4. *Laurophyllum cf. markvarticense* Kvaček, BP 97.128.1., × 500
5. *Laurophyllum cf. markvarticense* Kvaček, BP 97.127.1., × 1
6. *Laurophyllum cf. markvarticense* Kvaček, BP 97.128.1., × 1

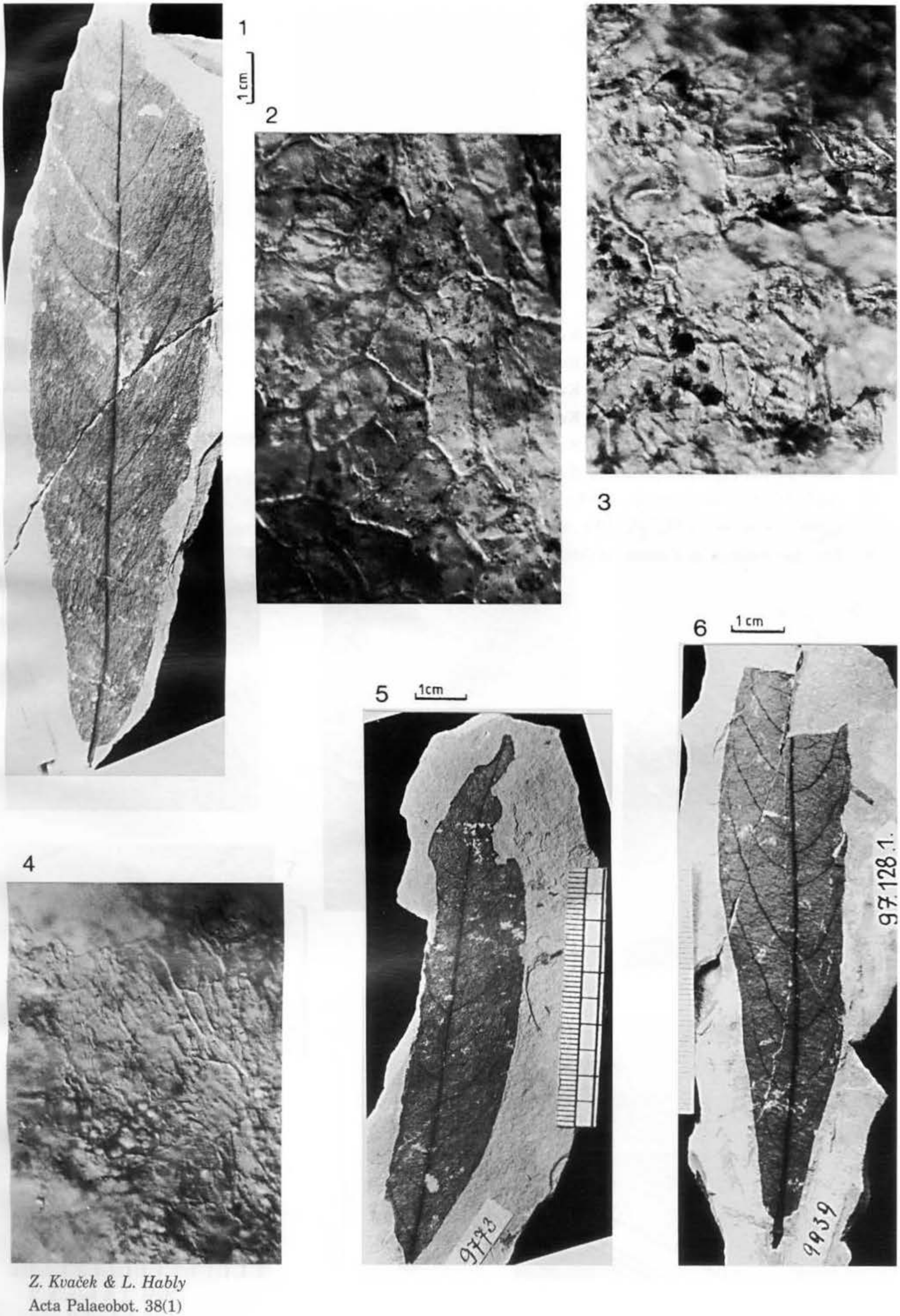
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Plate 4

1. *Laurophyllum cf. markvarticense* Kvaček, BP 97.126.1., × 1
2. *Laurophyllum cf. markvarticense* Kvaček, BP 97.126.1., × 500
3. *Laurophyllum cf. markvarticense* Kvaček, BP 97.126.1., × 500
4. *Laurophyllum cf. markvarticense* Kvaček, BP 97.126.1., × 500
5. *Laurophyllum cf. markvarticense* Kvaček, BP 97.126.1., × 500
6. *Laurophyllum cf. markvarticense* Kvaček, BP 97.126.1., × 500
7. Leaf of *Cedrelospermum* sp., BP 71.254.1., × 3
8. *Cedrelospermum* sp., BP 67.819.1., × 4
9. *Eotrigonobalanus andreanszkyi* (Mai) Kvaček & Walther, BP. 67.277.1., × 1.5

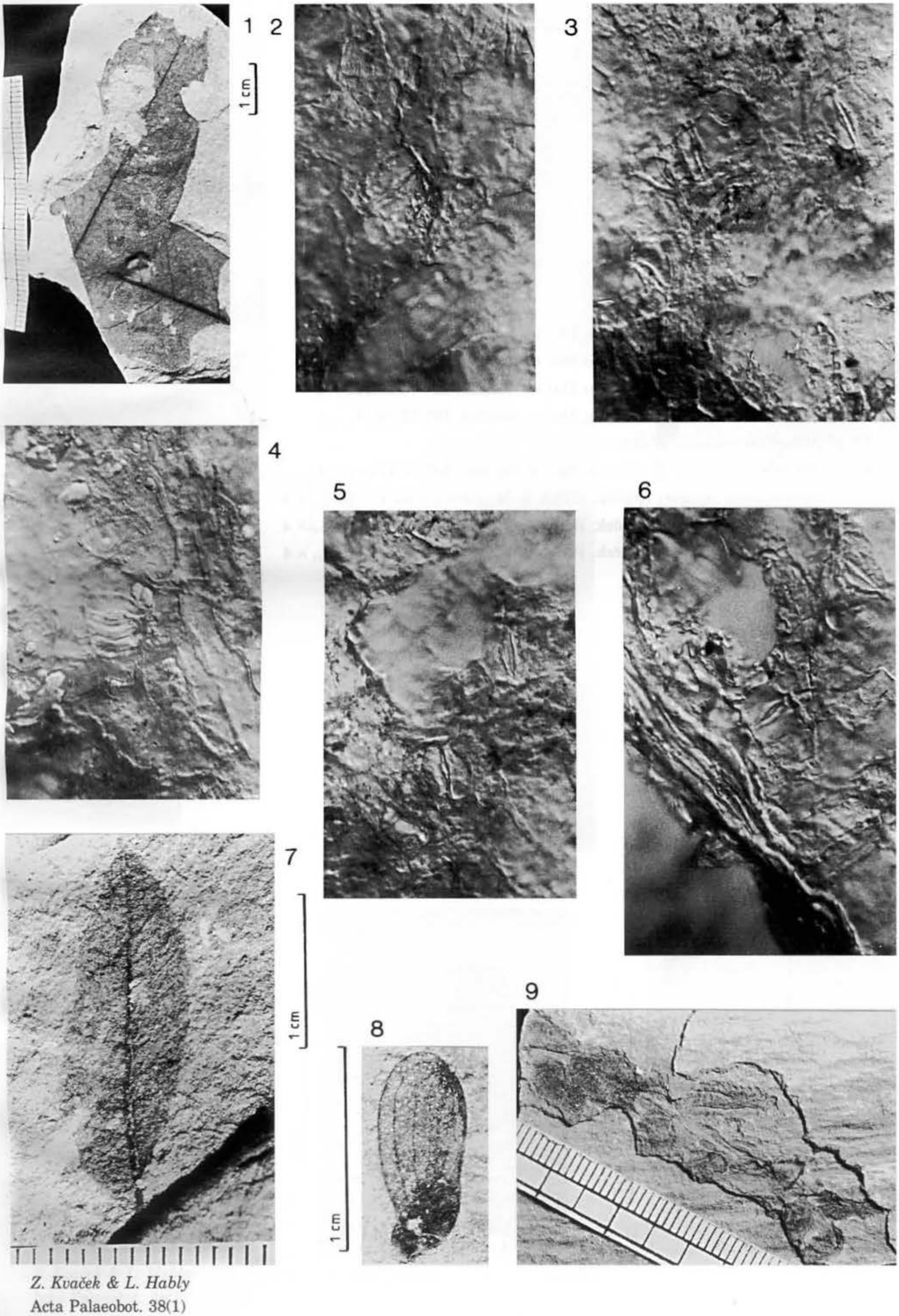
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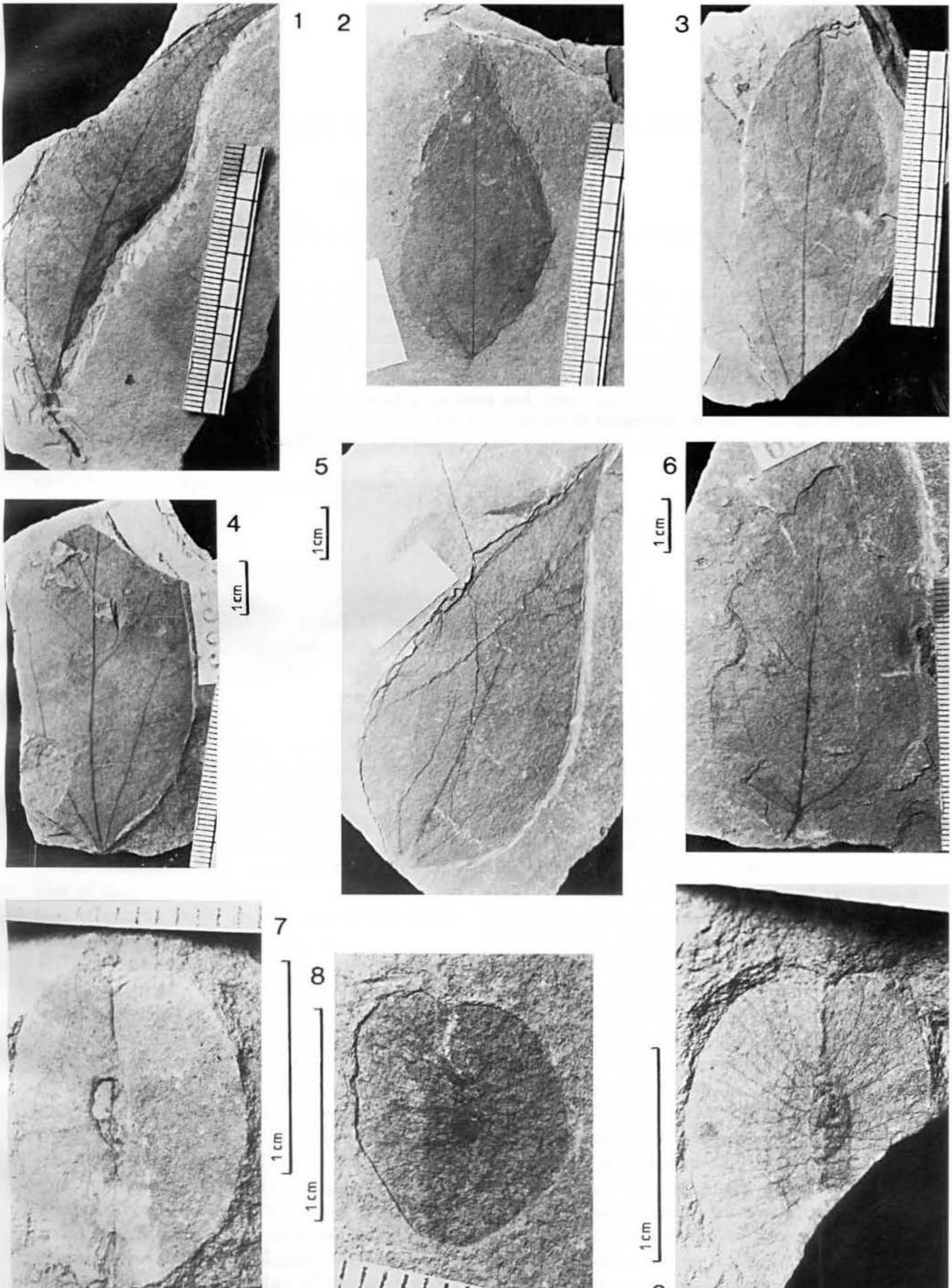
Plate 5

1. cf. *Matudaea menzelii* Walther in Mai et Walther, BP. 70.167.1., × 1
2. cf. *Matudaea menzelii* Walther in Mai et Walther, BP. 70.158.1., × 1
3. cf. *Matudaea menzelii* Walther in Mai et Walther, BP. 70.178.1., × 1
4. cf. *Matudaea menzelii* Walther in Mai et Walther, BP. 70.180.1., × 1
5. cf. *Matudaea menzelii* Walther in Mai et Walther, BP. 70.159.1., × 1
6. cf. *Matudaea menzelii* Walther in Mai et Walther, BP. 70.172.1., × 1
7. *Craigia bronnii* (Unger) Kvaček, Bůžek & Manchester, BP 67.351.1., × 4
8. *Craigia bronnii* (Unger) Kvaček, Bůžek & Manchester, BP 67.353.1., × 4
9. *Craigia bronnii* (Unger) Kvaček, Bůžek & Manchester, BP 67.352.1., × 4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