

## GEOLOGIE UND PALÄONTOLOGIE

**The Miocene Flora of Parschlug (Styria, Austria) –  
Revision and Synthesis**By Johanna KOVAR-EDER<sup>1</sup>, Zlatko KVAČEK<sup>2</sup> & Margit STRÖBITZER-HERMANN<sup>3</sup>

(With 5 figures, 11 tables and 15 plates)

Manuscript submitted on 23 October 2002,  
the revised manuscript on 21 January 2003**Abstract**

The first monographic treatment of the famous fossil flora of Parschlug (Styria, Austria) is presented. It comprises more than 60 plant species including 4 ferns, 5 conifers, and over 50 angiosperms. Described for the first time are *Ulmus parschlugiana* and *Antholithes stiriacus*. Newly combined are *Berberis teutonica*, *B. (?) ambigua*, *Mahonia (?) aspera*, *Ternstroemites pereger*, *Cedrelospermum ulmifolium*, *Leguminosites hesperidum*, *L. dionysi*, *L. palaeogaeus*, *L. parschlugianus*, *Prinsepia serra*, *Cotinus (?) aizoon*, and *Ailanthus pythii*. Diversified mesophytic elements prevail over a few dominant or common azonal woody taxa. Among the former, humid temperate components are relatively scarce and humid subtropical ones are rare, while subhumid, physiognomically sclerophyllous woody taxa are well represented. The age is considered as Karpatian/Early Badenian (late Early/early Middle Miocene) based on the floristic composition. Climatically this association indicates a drier warm-temperate/subtropical regime than documented from earlier and later Miocene times.

**Keywords:** Macroflora, palaeoecology, palaeoclimate, floristic comparison, Miocene, Norian depression, Austria.

**Zusammenfassung**

Erstmals wird die Flora von Parschlug (Steiermark, Österreich) monographisch erfasst. Sie enthält mehr als 60 Pflanzenarten, davon 4 Farne, 5 Koniferen und mehr als 50 Angiospermen. *Ulmus parschlugiana* und *Antholithes stiriacus* werden erstmals beschrieben. Neu kombiniert werden *Berberis teutonica*, *B. (?) ambigua*, *Mahonia (?) aspera*, *Ternstroemites pereger*, *Cedrelospermum ulmifolium*, *Leguminosites hesperidum*, *L. dionysi*, *L. palaeogaeus*, *L. parschlugianus*, *Prinsepia serra*, *Cotinus (?) aizoon*, und *Ailanthus pythii*. Außer einigen dominierenden oder häufigen azonalen Gehölzen herrschen mesophytische Elemente vor. Unter diesen sind humid temperate nicht häufig und humid subtropische sogar selten. Aber subhumide, physiognomisch sklerophylle Gehölze sind reichlich vertreten. Basierend auf der floristischen Zusammensetzung wird ein karpatisch/unter-badenisches Alter (oberes Unter-/unteres Mittel-Miozän) angenommen. Im Vergleich mit älteren und jüngeren miozänen Floren deutet die Vergesellschaftung von Parschlug auf relativ trockenere warm-temperat/subtropische klimatische Verhältnisse hin.

**Schlüsselwörter:** Makroflora, Paläoökologie, Paläoklima, floristische Vergleiche, Miozän, Norische Senke, Österreich.

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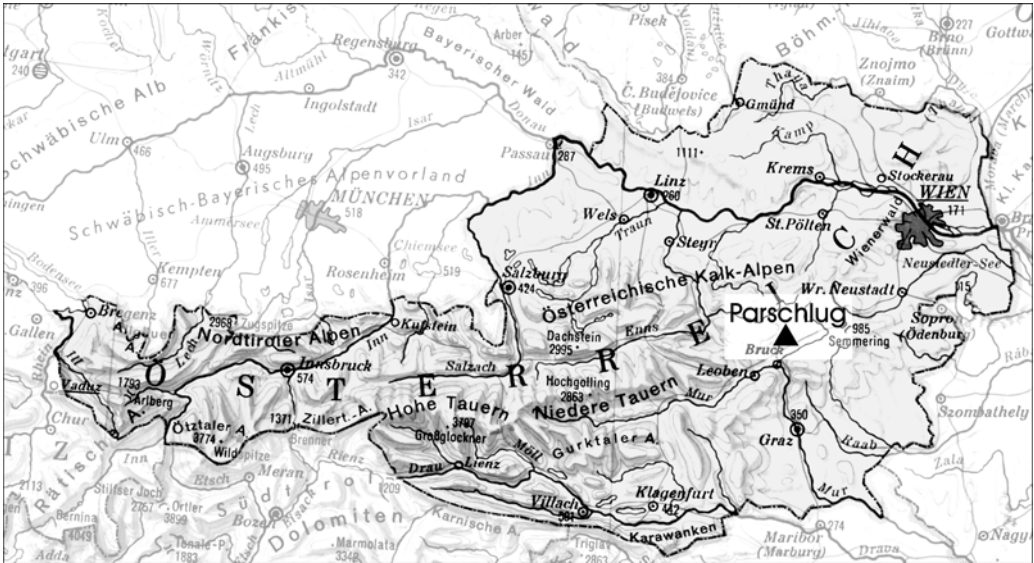


Fig. 1: Geographical and geological position of Parschlug. Background geological map from OBERHAUSER (1980).

## Introduction

The Miocene flora of Parschlug in southeastern Austria is famous thanks to the numerous species currently used in the palaeobotanical literature that are based on it. Most of them were described by F. UNGER and, to a lesser extent, by C. v. ETTINGSHAUSEN. The descriptions and illustrations of the material including the types are scattered over 13 publications edited in the 19<sup>th</sup> century. However, the flora of Parschlug was never treated monographically because ETTINGSHAUSEN (1878 b) was unable to finish his initiated study intended for such a monograph. Plant fossils from Parschlug are located in many European collections, of which the most extensive are certainly those housed in the Natural History Museum and the Geological Survey, both in Vienna, and the Botanical Institute of the Karl-Franzens-University and the Landesmuseum Joanneum, both in Graz. Rich fossil plant material was collected during the times of mining activity in this area, which started in the early 1800s and ended in 1959. We have studied all the mentioned collections as well as the collection at the Montan-University in Leoben and some others in Germany and Hungary. Because of immense number of samples collected at Parschlug, we were only able to examine the most important parts of the collections and have certainly overlooked some interesting, rare fossils. We took advantage of the database called "Palaeontological Types in Austrian Collections" (<http://www.oeaw.ac.at/oetyp/palhome.htm>), which enabled us to locate the preserved type specimens and originals. As a result we present here a monograph including various revisions of elements occurring in the flora of Parschlug hoping that this will be of use for other students of Tertiary palaeobotany. Because of known difficulties with identifying foliage, which in the case of Parschlug is devoid of useful epidermal anatomy, not all entities have been assigned to the natural system and many problems remain to be resolved in future studies. We believe that our investigations are a good starting point for such an endeavour.



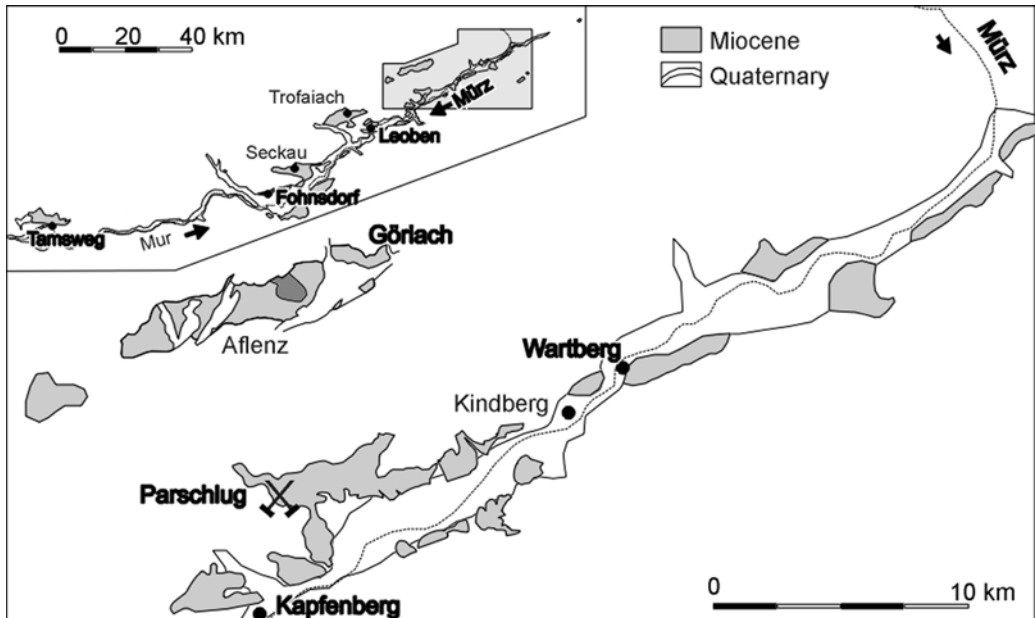


Fig. 2: The Parschlug coal basin in the Norian depression (simplified from SACHSENHOFER et al. 2002: fig. 1).

In our investigations the genus *Acer* was prepared by M. STRÖBITZER-HERMANN, all other taxa jointly by the other two authors.

### Geography and geological frame

The Parschlug basin is situated about 5 km north of Kapfenberg in Styria – ca. 15°17' E longitude / 47°28' N latitude according to Austrian Map, map OEK 1:50 000, sheet 133 (fig.1).

As a consequence of the Miocene lateral extrusion of the Eastern Alps, the Mur / Mürz fault system – known also as the Norian depression – developed between the eastern Alpine margin and the later Tauern window. This yielded several coal-bearing pull-apart basins and half-grabens between Hart / Gloggnitz and Tamsweg. The Parschlug basin is an eastern one situated in the lower Mürz valley; it is classified by NEUBAUER et al. (2000) as a pull-apart basin (fig. 2).

Contrary to other basins along the Norian depression (e.g. the Fohnsdorf basin) the Parschlug basin was never in focus of geological investigations. The available information is largely based on data given by UNGER (1848), PETRASCHEK (1922-1929), WEBER & WEISS (1983), and most recently SACHSENHOFER (in SACHSENHOFER et al. 2002).

In the Parschlug basin, sands and sandstones overlie the basement. A 4-8 m thick coal seam ("Parschlug seam") follows in the section. At the western margin of the basin the seam dips about 45° towards east, while the dipping decreases towards the centre to 12°. Step faults running NNW/SSE and dipping towards NW cut the seam in several fault

blocks (German: Schollen). Towards the east and northwest the seam thickness decreases, and the seam splits up and wedges out. Therefore, mining activity was focussed formerly on the southwestern part of the depression. Clays and marls with up to 10 cm thick marlstone-ironstone intercalations (German: Toneisensteinbänke) overlie the seam. At certain levels they bear plant remains known as the famous flora of Parschlug. UNGER (1848) figured and described a profile taken in 1843 at "dem über dem Fabriksgebäude befindlichen Stollen des Graf'schen Bergbaus", which reflects the local situation at that time (fig. 3).

The ash content of the coal is relatively high (up to 40 %). The sulphur content of 4 to 7 % and the preservation of gastropod shells (*Planorbis aplanatis*) in an inter-seam indicate a relatively high pH-value (around 7) of the mire.

### Material and Methods

ETTINGSHAUSEN, in his old catalogue (housed at the Institute of Botany, University of Graz), recognised three kinds of fossiliferous rocks and distinguished 3 fossiliferous levels in his collections: I – "Weicher Mergelschiefer" (whitish, thin-bedded soft marl), II – "Harter gelber Mergelschiefer" (hard, light brown, often reddish marlstone) and III – "Harter hellgrauer Mergelschiefer" (very hard, light grey, also often reddish marlstone to ironstone). Most of the plant fossils studied are preserved as dark compressions / impressions in reddish ironstone (levels II and III). They are partly covered with fossilised tissue but our attempts to prepare leaf cuticles mostly failed. Most of the carbonised mass bears traces of pyrite. Moreover, venation patterns are only poorly visible. The preservation of venation details on light yellow-brownish impressions from ETTINGSHAUSEN's level I is often more satisfactory. Massive fruit remains, e.g. of *Liquidambar*, which occur in ironstone beds have been often destroyed by pyritisation. Before decomposition, they were probably more common in the collections.

The material investigated in this revision is recognisable by collection file numbers. The quantity of coll. file nos listed under a taxon does not necessarily reflect its true abundance in the Parschlug flora because not all material is numbered and not all numbers of the specimens studied are included in the text.

In the systematic part we restrict ourselves to complementing the descriptions given by UNGER and ETTINGSHAUSEN with diagnostic features that they were unaware of or misinterpreted, and we give full descriptions in the cases of newly characterised taxa. Only the published records from Parschlug are included into synonym lists under the respective taxa.

The following abbreviations are used throughout the text to designate the respective collections:

GBA Geologische Bundesanstalt, Wien

IBUG Institut für Botanik der Karl-Franzens-Universität, Graz

LMJ Landesmuseum Joanneum, Graz

MMG Staatliche Naturhistorische Sammlungen Dresden, Museum für Mineralogie und Geologie Dresden

NHMW Naturhistorisches Museum, Wien

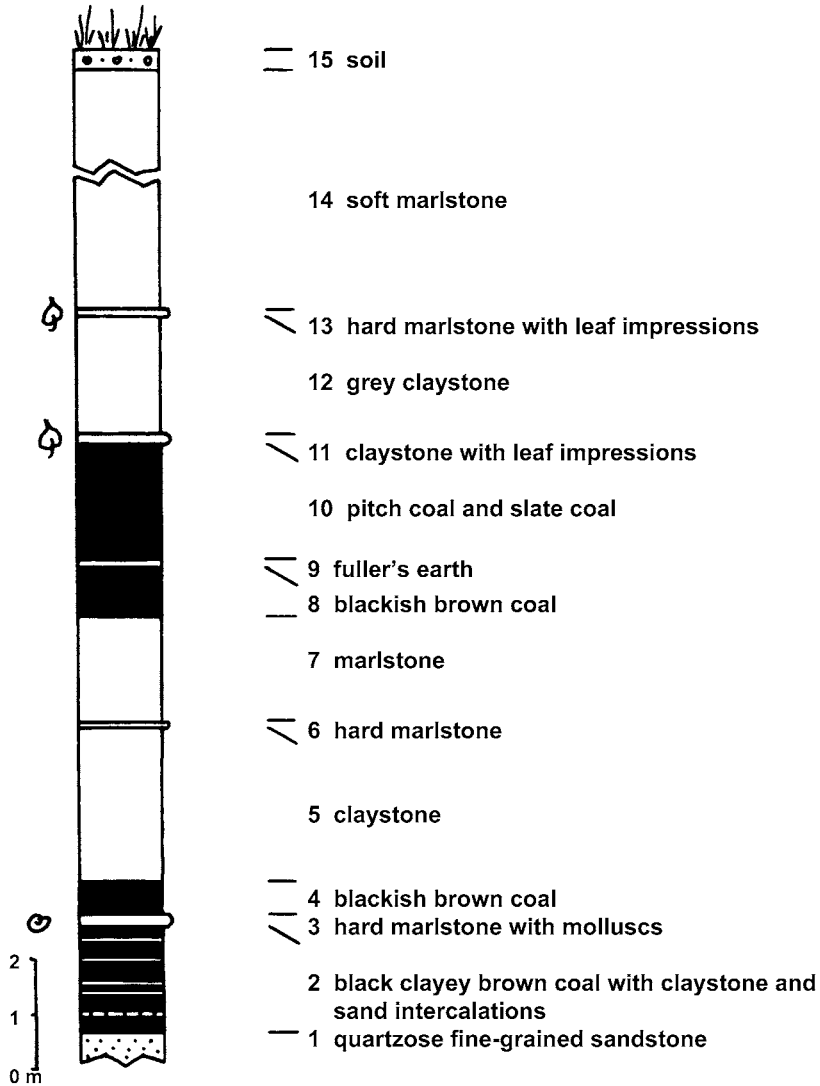


Fig. 3: Geological section of Parschlug at the gallery of the mine in 1843 (according to UNGER 1848: 7, adapted and translated into English).

1- underlying quartzose fine-grained sandstone; 2 - ca. 1.9 m ("1 Klafter") black, not pure clayey coal with 2.5-5 cm thick inter-beds of sand in the lower part and dark grey claystone high-pure coal 5-7.5 cm thick only; 3 - ca. 21 cm ("8 Zoll") dark brown hard rock with fragments of molluscs; 4 - up to ca. 65 cm ("2 Fuss") pure coal; 5 - ca. 2.8 m ("1.5 Klafter") claystone; 6 - a thin inter-bed of hard rock; 7 - ca. 1.9 m ("1 Klafter") marlstone; 8 - ca. 0.9 m ("3 Fuss") black brown coal; 9 - a thin inter-bed of fuller's earth; 10 - ca. 2.1 m ("7 Fuss") almost pure pitch coal and slate coal; 11 - ? thickness - coal and marl transition above the coal seam into dark brown fine-grained mica claystone with leaf impressions, easily weathered out; 12 - ca. 2.1 m ("7 Fuss") soft grey claystone; 13 - ca. 13 cm ("5 Zoll") harder broken up claystone to ironstone with best preserved plant impressions; 14 - more than 10 m ("mehrere Klafter") yellowish marlstone to marl with transition into the following; 15 - earthwork.

## Systematics

Pteridophyta

Osmundaceae

*Osmunda* L.

### ***Osmunda parschlugiana* (UNGER) ANDREÁNSZKY**

Plate 1, Figures 1, 2

1847 *Pteris parschlugiana* UNGER, p. 122, pl. 36, fig. 6 (LMJ 76520, holotype).

Holotype: LMJ 76520, figured by UNGER (1847: 122, pl. 36, fig. 6) - refigured on pl. 1, fig. 1.

Additional material: NHMW 1878/6/6795.

Detached pinnules, almost parallel-sided, 8-11 mm wide and more than 40 mm long, finely crenulate, semicordate. Secondary veins simple or forked, parallel, dense, originating under the angle of 45-55°. The attachment to the rhachis is damaged, contrary to UNGER's figure. Actually we doubt that the axis below the pinnule is in fact the rhachis.

The holotype pinnule corresponds exactly to the numerous specimens described in detail from the Early Miocene Most Formation by BŮŽEK (1971). The semicordate base in combination with fine marginal crenulations distinguishes this fern from similar pinnules of *Blechnum dentatum* (see KVAČEK & HURNÍK 2000: 6). The affinities to extant species of *Osmunda* must remain open pending a detailed study of co-occurring spores. These can be specific for different species (TRYON & LUGARDON 1990), while leaf morphological features of the *Osmunda regalis*-type are partly not distinctive enough to help in this respect.

Thelypteridaceae

*Pronephrium* K. PRESL

### ***Pronephrium stiriacum* (UNGER) KNOBLOCH & Z. KVAČEK**

Plate 1, Figure 3

Material: IBUG: Ett. coll. 111 (level III)

This poorly preserved fern fragment shows the goniopterid venation and shares other morphological features, as shape and size, with other records of this species (cf. e.g. KVAČEK & HURNÍK 2000).

Pteridaceae

*Adiantum* L.

### ***Adiantum renatum* UNGER**

Plate 1, Figure 5

1847 *Adiantum renatum* UNGER, p. 122, pro parte, pl. 37, fig. 1.

1850a *Adiantites renatus* (UNGER) UNGER, p. 106.

Material: IBUG: Ett. coll. 344 (level II)

A small fan-shaped leaf with flabellate venation, about 10 mm long including a short petiole.

Judging from the published illustration of the missing holotype in UNGER (1847), we suspect this poorly preserved specimen to be conspecific. A similar fern occurs also at the Randeck Maar (GREGOR 1986).

Salviniaceae

*Salvinia* SÉGUIER

***Salvinia* cf. *mildeana* GOEPPERT**

Plate 1, Figure 4

Material: IBUG: Ett. coll. 112 + 113 (part + counterpart, level II).

Isolated floating leaves, elliptical, ca. 10 x 15 mm, showing a primary vein giving off straight secondaries under the angle of 90-45° and oblique cross veins forming oblique quadrangular meshes. Leaf surface typically tuberculate.

The relatively small size of the specimen led us to compare the material from Parschlug with *S. mildeana*, which is typified by similar specimens from the Late Miocene site Sośnica. According to the recent revision (COLLINSON et al. 2001), not only size differences exist between this species and its probable ancestor, *S. reussii* (Late Oligocene to Early Miocene). At its type locality *S. mildeana* is accompanied by megaspores of the *S. intermedia*-type, while *S. reussii* is accompanied by those of the *S. cerebrata*-type. No megaspores have been found at Parschlug and the size of floating leaves alone is an insufficiently reliable diagnostic character in view of the fact that the material from Parschlug is limited to a single specimen and its counter-impression.

We found several specimens at IBUG identified as *Salvinia microphylla* ETTINGSHAUSEN, which are partly dubious plant remains (IBUG Ett. coll. 114) or wing-cases of beetles (IBUG Ett. coll. 115 et 116 level III).

Gymnospermae

Pinaceae

***Pinus* L.**

***Pinus* sp. div.**

Plate 1, Figures 6-13

- 1850a *Pinites balsamodes* UNGER, p. 357.
- 1852 *Pinites balsamodes* UNGER – UNGER, p. 95, pl. 35, fig. 7 (LMJ 76496, syntype), fig. 8.
- 1850a *Pinites centrotos* UNGER, p. 362.
- 1852 *Pinites centrotos* UNGER – UNGER, p. 98, pl. 37, fig. 1 (LMJ 76486, syntype), figs. 2, 3, 4 (LMJ 76500, syntype).
- 1850a *Pinites furcatus* UNGER, p. 363.
- 1852 *Pinites furcatus* UNGER – UNGER, p. 99, pl. 37, figs. 7-9.
- 1850a *Pinites goethanus* UNGER, p. 361.
- 1852 *Pinites goethanus* UNGER – UNGER, p. 96, pl. 35, fig. 18 (LMJ 76491, syntype), figs. 19-22.
- 1850a *Pinites hepios* UNGER, p. 362.
- 1852 *Pinites hepios* UNGER – UNGER, p. 97, pl. 35, figs. 6-8, 9 (LMJ 76501, syntype).
- 1850a *Pinites leuce* UNGER, p. 358.

- 1852 *Pinites leuce* UNGER – UNGER, p. 95, pl. 35, figs. 9-16.  
 1850a *Pinites oceanines* UNGER, p. 357.  
 1852 *Pinites oceanines* UNGER – UNGER, p. 94, pl. 35, figs. 1-4.  
 1852 *Pinites taedaeformis* UNGER, p. 97, pl. 36, fig. 4.  
 1878a *Pinus hepios* (UNGER) HEER - ETTINGSHAUSEN, p. 74, pl. 7, figs. 12, 13.  
 1878a *Pinus laricio* POIR. - ETTINGSHAUSEN, p. 75, pl. 7, 5, 6.  
 1878a *Pinus palaeo-strobis* (ETTINGSHAUSEN) ETTINGSHAUSEN, p. 74, pl. 1 figs. 1 b (NHMW 1878/6/9689), 2 b (NHMW 1878/6/9690), 3, 4, 7, 11, 12, 15, 16 (NHMW 1878/6/9687).  
 1878a *Pinus post-taedaeformis* ETTINGSHAUSEN, p. 77, pl. 4, figs. 3-5.  
 1878a *Pinus prae-cembra* ETTINGSHAUSEN, p. 77, pl. 3, figs. 2, 3.  
 1878a *Pinus prae-pumilio* ETTINGSHAUSEN, p. 75, pl. 9, figs. 5, 7, 8, pl. 10, fig. 1 a, 15 b (NHMW 1878/6/9765, syntype), 14 b (NHMW 1878/6/9762, syntype).  
 1878a *Pinus prae-silvestris* ETTINGSHAUSEN, p. 75, 76, pl. 1 figs. 5 (NHMW 1878/6/9744, syntype), 6 (NHMW 1878/6/9745, syntype), pl. 7, figs. 20 (NHMW 1878/6/9746, syntype), pl. 10, fig. 9 (NHMW 1878/6/9743, syntype).  
 1878a *Pinus prae-taedaeformis* ETTINGSHAUSEN, p. 77, pl. 2, fig. 3 (NHMW 1878/6/9779, syntype).  
 1878a *Pinus rigios* UNGER - ETTINGSHAUSEN, p. 79, pl. 4, fig. 6 (NHMW 1878/6/9797).

Additional material: GBA 2002/01/26; IBUG Ett. coll.195; NHMW 1878/6/2479, 9706, 9780.

The material, which comprises various kinds of dispersed male cones, seed cone scales, seeds and foliage, but not complete seed cones, does not seem to be identifiable to the species level. We refrain from establishing various morpho-taxa and we restrict ourselves to reproducing different morpho-types of these organs and do not attempt to differentiate them in detail. In our opinion, the number of natural species is certainly lower than the binomina listed in the synonymy. The single cone scale studied shows only poorly preserved details of the umbo. MAI (1986, 1994) has not recognised any entity listed above in his survey of Tertiary pines of Europe.

? *Cathaya* W.Y. CHUN & K.Z. KUANG

? *Cathaya* sp.

Plate 1, Figures 20-23

Material: IBUG: Ett. coll. 317, 318, 335, 343, 6977 ( level II); NHMW 1878/6/9684.

Several small cone scales rounded-rhomboidal, about 8-9 mm wide and ca. 10 mm long, obviously slightly convex before fossilisation, with hairy periphery and striate surface. One detached flat needle (2 x 60 mm in size) with rounded apex and slightly enlarged base.

The shape of the cone scales matches well with those of a disintegrated seed cone of *Cathaya*. The bract has not been preserved in any of the specimens studied. The extant species endemic to China exceeds in size of cone scales the fossils, which are smaller, like the specimens from the Upper Miocene of Santa Barbara (MAI 1994). ETTINGSHAUSEN (in his catalogue, IBUG) suspected these remains to be allied to the Pinaceae, designating them as *Pinus ciliata*. The needle (IBUG Ett. coll. 343) may belong to the same plant.

Cupressaceae sensu lato

*Glyptostrobus* ENDL.

***Glyptostrobus europaeus* (BRONGNIART) UNGER**

Plate 1, Figures 14-16

- 1845 *Juniperites baccifera* UNGER, p. 80, pl. 21, figs.1 (NHMW 2001B0017/0001, syntype), 2.  
 1847 *Widdringtonites ungeri* ENDLICHER - UNGER, p. 7 (271), pro parte.  
 1847 *Taxodites oeningensis* ENDLICHER - UNGER, p. 15 (279), pro parte.  
 1850a *Widdringtonites ungeri* ENDLICHER - UNGER, p. 342.  
 1850a *Taxodites dubius* STERNBERG - UNGER, p. 351, pro parte.  
 1850a *Taxodites oeningensis* ENDLICHER - UNGER, p. 351, pro parte.  
 1852 *Glyptostrobus oeningensis* A. BRAUN - UNGER, p. 20.  
 1852 *Taxodites dubius* STERNBERG - UNGER, p. 20, pro parte.  
 1968 *Widdringtonia baccifera* (UNGER) KNOBLOCH, p. 126.

Additional material: IBUG Ett. coll. 162 (level II), seed cones, 190a twigs det. by ETTINGSHAUSEN as *Taxodium distichum miocenicum*; NHMW 1878/6/2658a.

Twigs with helically disposed and appressed scale leaves are rather common, contrary to the characteristic seed cones, which are rare probably due to decay through pyritisation. Rare are twigs with taxodioid foliage (of young shoots), which were determined by ETTINGSHAUSEN (in IBUG) as *Taxodium distichum miocenicum*.

Besides seed cones, pollen cones attached terminally on the twigs also occur. The latter were misinterpreted as juniper-like seed cones (UNGER 1845, as *Juniperites baccifera*).

? *Cupressus* L.

? *Cupressus* sp.

Plate 1, Figures 17-19

Material: GBA 2002/01/23-25; NHMW 1878/6/2554 b, 1845/0039/0003.

Delicate twigs, straight, 1-1.5 mm thick and widely branched under an angle of about 45°, densely covered by almost isomorphic, decussately disposed scale leaves, broadly trigonal-deltoidal, blunt, with an indistinct gland on the facial leaves.

These specimens discovered in the collections at GBA and NHMW in Vienna were all incorrectly determined by UNGER and ETTINGSHAUSEN as *Widdringtonia ungeri* or *Juniperites baccifera*, respectively, which are synonyms of *Glyptostrobus europaeus*. Similar foliage accompanies *Cupressus* seed cones at the Early Miocene site of Kymi and Late Miocene of Vegora (KVAČEK et al. 2002b).

Angiospermae

Lauraceae

*Daphnogene* UNGER

***Daphnogene polymorpha* (A. BRAUN) ETTINGSHAUSEN**

Plate 2, Figure 8

- 1847 *Ceanothus subrotundus* A. BRAUN – UNGER, p. 144, pl. 49, fig. 7 (LMJ 76530).

Additional material: GBA 2002/01/116; NHMW 2001B0017/0002.

Cinnamomoid leaves are extremely rare at Parschlug, being represented mostly by broader forms typical of Miocene populations. The designation of foliage is maintained under this morpho-taxon for pragmatic reasons, although the associated fruits at Kreuzau are apparently allied to a camphor tree (PINGEN et al. 1994).

## Berberidaceae

*Berberis* L.***Berberis teutonica* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 2, Figures 9, 10

1850a *Clethra teutonica* UNGER, Gen. spec. pl. foss., p. 439 - basionym.1866 *Crataegus teutonica* (UNGER) UNGER, p. 60, pl. 19, figs. 24, 25.Neotype designated here: 1878/6/2153 det. by ETTINGSHAUSEN as *Celastrus* sp. nov. - figured on pl. 2, fig. 9.Additional material: NHMW 1878/6/2442 + 9372 det. by ETTINGSHAUSEN as *Quercus myrsinaefolia* and *Quercus mediterranea*, respectively.

Obovate subsessile leaves inconspicuously widely toothed, differing from similar *Berberis berberidifolia* (HEER) PALAMAREV & PETKOVA by a shorter petiole and denser secondaries, sharing irregular pinnate semicraspedodromous venation, which forms several rows of loops along the margin.

The figures published by UNGER (1866) show two incomplete leaves of different size. Both differ slightly from the neotype by the narrowly and shortly decurrent base and denser pinnately semicraspedodromous venation. They do correspond with the neotype in their complicated looping along the margin and finely toothed margins. Another available specimen (pl. 2, fig. 10) has a rounded apex, whereas in the neotype and in one of the missing syntypes (UNGER 1866: pl. 19, fig. 25) the apex is bluntly acute. Leaf size varies in length from 35 to probably more than 50 mm and in width from 15 to about 35 mm.

Only few specimens are available to circumscribe this newly recognised barberry of the European Neogene. The type of venation and marginal teeth are traits leading to the proposed alliance with *Berberis*. The syntypes are unfortunately missing and thus the protologue was the only basis for the new typification. Extant barberries having similar foliage are confined mostly to East Asia (e.g. *B. pruinosa* FRANCH., *B. centiflora* DIELS). Similar fossil leaf impressions occur elsewhere in the European Neogene, e.g. in the Middle Miocene flora of South Bohemia (KNOBLOCH & KVAČEK 1996, as cf. ? *Berberis* sp.).

***Berberis* (?) *ambigua* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 2, Figure 11

1847 *Ilex ambigua* UNGER, Chlor. prot., p. 149, pl. 50, fig. 14 (LMJ 76519, holotype) – basionym.1850a *Ilex ambigua* UNGER – UNGER, p. 461.

Holotype: LMJ 76519 – figured by UNGER (1847: 149, pl. 50, fig. 14), refigured in pl. 2, fig. 11.

The spiny margin and the obovate shape of the only available specimen suggest *Berberis*. The secondary and higher order venation is not preserved to confirm this assumption. *B. teutonica* described above differs in a broader leaf lamina and less conspicuous marginal teeth (like in *B. berberidifolia*).

Several extant species from China have similar leaves with thorny teeth. The scarcity and poor preservation of the available specimens prevent us from characterizing this obviously independent fossil species more precisely. Further leaf impressions of this species were described from Kymi, Greece (UNGER 1867 – as *Ilex ambigua*). *Prinsepia serra* described below differs in non-spiny marginal teeth.



? *Mahonia* NUTT.

***Mahonia* (?) *aspera* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 13, Figures 1-8

- 1847 *Quercus aspera* UNGER, Chlor. prot., p. 108, pl. 30 figs. 1 (LMJ 76532 right, syntype), 2 (LMJ 76529 top right, lectotype), fig. 3, pl. 31, figs. 1, 3 - basionym.  
 1847 *Ilex sphenophylla* UNGER, p. 148, pl. 50, fig. 9 (LMJ 76515 lower left, holotype).  
 1850a *Quercus aspera* UNGER – UNGER, p. 400.  
 1850a *Ilex sphenophylla* UNGER - UNGER, p. 461 ("*phenophylla*").  
 1850a *Ilex cyclophylla* UNGER, p. 461.  
 ? 1850a *Styrax boreale* UNGER, p. 436.  
 1864 *Ilex sphenophylla* UNGER – UNGER, p. 12, pl. 3, figs. 3 (LMJ 76571), 4 (LMJ 76538), 5, 6.  
 1864 *Ilex neogena* UNGER, p. 13, pl. 3, figs. 9, 10, 11? (LMJ 76572).  
 1864 *Ilex cyclophylla* UNGER – UNGER, p. 13, pl. 3, figs. 7 (LMJ 76537), 8 (LMJ 76579).  
 ? 1866 *Styrax boreale* UNGER - UNGER, p. 33, pl. 11, figs. 11-13.

Lectotype designated here: LMJ 76529, figured by UNGER (1847: pl. 30, fig. 2 top right) – refigured in pl. 13, fig. 3.

Additional material: GBA 2002/01/42-46, 79 b, 80-92a, 93; NHMW 1878/6/2081, 2758, 9140, 9474, 9489, 9492, 9498, 9917.

These leaflets are typical due to their basal acrodromous venation, which went unnoticed by UNGER, and an irregularly spiny margin. They are further characterized by short petiolules and sometimes slightly asymmetric bases. In our concept this distinct morpho-species comprises both spiny and entire-margined leaflets.

The true generic affinity remains unclear. The leaf margin, venation, and the sometimes slightly asymmetric base recall leaflets of *Mahonia*, e.g. *M. nervosa* (PURSH) NUTT. from western North America. *Quercus* and *Ilex* differ in their venation (no basal acrodromous veins). A very similar leaf from the Lower Pannonian of the Valea Crișului (Romania) was recently described by GIVULESCU (1998) as *Mahonia* sp.

We hesitate to definitively include *Styrax boreale* because these specimens are rather large, partly recall legumes and the specimens themselves are missing.

Cercidiphyllaceae

*Cercidiphyllum* SIEB. & ZUCC.

***Cercidiphyllum crenatum* (UNGER) R. BROWN**

Plate 2, Figure 7

Material: NHMW 1878/6/6510.

In all the Parschlug material studied, we discovered only one specimen. The incomplete leaf is roundish, typically crenulate, with the palmate venation. It fits well within the variation known from other records of this species.

Altingiaceae

*Liquidambar* L.

***Liquidambar europaea* A. BRAUN**  
Plate 2, Figures 1-5

- 1847 *Acer parschlugianum* UNGER, p. 132, pl. 43, fig. 5 (LMJ 76517, holotype).  
 1847 *Liquidambar europaeum* A. BRAUN - UNGER, p. 120, pl. 35, figs. 1 (LMJ 76523), 2 (LMJ 76867), 3 top (LMJ 76516), 4, 5.  
 1850a *Liquidambar protensum* UNGER, p. 415.  
 1851a *Liquidambar europaeum* A. BRAUN - ETTINGSHAUSEN, p. 15, pl. 2, figs. 20, 22.  
 1852 *Liquidambar protensum* UNGER - UNGER, p. 116, pl. 43, fig. 27 (LMJ 76508, holotype).  
 1850a *Liquidambar acerifolium* UNGER, p. 415.  
 1852 *Liquidambar acerifolium* UNGER - UNGER, p. 116, pl. 43, fig. 28 (LMJ 76492, holotype).  
 1878b *Liquidambar europaeum* A. BRAUN - ETTINGSHAUSEN, p. 86, pl. 2, figs. 3 (NHMW 1878/6/2406), 4, pl. 3, fig. 7 (NHMW 1878/6/2453 bearing *Xylomites liquidambaris* ETTINGSHAUSEN), 4.

Additional material: numerous specimens, e.g. GBA 2002/01/79a, 94a; NHMW 1878/6/9052, 9542, 9546, 7738.

Remains of this fossil representative of sweet-gum tree are common at Parschlug, mainly as foliage. The typical leaf form varies from trilobate to quinquelobate, the latter rarely with additional lobes on the margin ("*protensum*" form). Contrary to the opinion of UNGER we believe that only one natural species with a wider variation in foliage occurred at Parschlug. The studies undertaken so far on the leaf cuticles indicate a close relationship of most Neogene leaf records of Europe to extant *L. styraciflua* of North America. Not having better preserved material at hand, we share this opinion, although *L. orientalis* is not distinguishable based solely on gross morphology. According to the nomenclatural rules, the ending of the epithet must be corrected to "*europaea*" to agree with the gender of the genus (feminine).

***Liquidambar* sp. – fructus**  
Plate 2, Figure 6

- 1847 *Liquidambar europaeum* A. BRAUN - UNGER, p. 120, pl. 35, fig. 3 bottom (LMJ 76516).

Additional material: GBA 2002/01/96; NHMW 1878/6/9538.

Contrary to the leaves, the fruiting heads are rather rare (see Material and Methods). The surface and details of the fruits are poorly preserved and do not show necessary details to decide the specific affinities (*Liquidambar magniloculata* CZECZOTT & SKIRGIELLO versus *L. wutzleri* GREGOR).

Platanaceae

*Platanus* L.

***Platanus leucophylla* (UNGER) KNOBLOCH**  
Plate 3, Figure 10, Plate 4, Figure 17

- 1850a *Populus gigas* UNGER, p. 417.  
 1852 *Populus gigas* UNGER - UNGER, p. 117, pl. 44, fig. 1.  
 1866 *Acer productum* A. BRAUN - UNGER, p. 46, pro parte, pl. 15, fig. 1.

Material: IBUG Ett. coll. 1140 (level II), NHMW 1878/6/7713.

Although the figured specimens listed in the synonymy were not found in the collections, several others can be safely identified as this plane tree with pedate-palmately lobed foliage common during middle-late Neogene times in Europe. They differ from the extant *P. orientalis* of southern Europe and the Near East in having broader lobes and match in this respect another extant species of Europe, the London Plane (*P. hispanica*) of uncertain origin.

Betulaceae

*Betula* L.

***Betula* cf. *dryadum* BRONGNIART**

Plate 3, Figure 1

1847 *Betula dryadum* BRONGNIART - UNGER, p. 117.

1852 *Betula dryadum* BRONGNIART - UNGER, p. 33, pl. 16, fig. 10 (LMJ 76497).

Additional material: IBUG Ett. coll. 725.

Winged fruitlets of birch are very rare and in principle correspond to the basic type assigned usually to *Betula dryadum*. Due to poor preservation, any more precise identification is out of the question.

***Betula* vel *Alnus* sp.**

Plate 3, Figures 3, 4

1847 *Fagus deucalionis* UNGER, p. 101, pro parte.

1850a *Fagus deucalionis* UNGER – UNGER, p. 405, pro parte.

1852 *Fagus deucalionis* UNGER – UNGER, p. 38, pro parte, pl. 18, fig. 24 (LMJ 76489).

Additional material: NHMW 1878/6/2490, 6499, 2001B0017/0004.

Betulaceous foliage is not easily distinguishable to the genus level. Several leaf impressions of this kind were encountered in the Parschlug assemblage. Those that were better and more completely preserved are similar in the shape of the lamina and the marginal teeth to *Alnus adscendens* (GOEPPERT) ZASTAWNIAK & WALTHER (1998). In our opinion, this entity may also include birch foliage. This leaf type is extremely rare at Parschlug and in our case may belong either to a birch or an alder. Although UNGER identified this type of foliage as *Fagus deucalionis*, the latter was based on fruits (UNGER 1847) and cannot be used in this context. The leaf from Parschlug attributed by UNGER (1852) to *F. deucalionis* definitely belongs to the Betulaceae.

*Alnus* Mill.

***Alnus julianiformis* (STERNB.) Z. KVAČEK & HOLÝ**

Plate 3 Figure 6

Material: IBUG Ett. coll. 284 (II).

Only a single leaf fragment can be attributed – based on morphological traits (shape, marginal indistinct teeth, and craspedodromous venation) – to this species of alder,

widely distributed in Europe during the Miocene. It is one of the more thermophilic summergreen elements, corresponding best to the extant *A. trabeculosa* – *A. formosana* group of SE Asia.

***Alnus gaudinii* (HEER) KNOBLOCH & Z. KVAČEK**

Plate 3 Figure 5

Material: NHMW 1878/6/7508 + 9412 (part + counterpart) det. by ETTINGSHAUSEN as *Castanea atavia* and *Quercus mediterranea*.

Lamina elliptic, 70 mm long (incomplete), 27 mm wide, base missing, apex acute, leaf margin finely double serrate, teeth slender and sharp; venation (semi)craspedodromous, midvein slender, straight, secondaries slender, densely spaced (6-10 mm), almost straight and parallel, occasionally forking, one branch entering the first order tooth, others either running marginally or entering second order teeth; tertiary veins percurrent, densely spaced, slightly oblique.

This leaf resembles *Alnus gaudinii*, particularly those forms with relatively sharp teeth. Similar leaf forms occur in the Miocene to Pliocene in Europe (e.g. at Berga, MAI & WALTHER 1988).

Fagaceae

*Fagus* L.

***Fagus* sp. - leaf**

Plate 3, Figures 7-9

1882 *Fagus feroniae* UNGER - ETTINGSHAUSEN, p. 99, pl. 17, fig. 2 (NHMW 1878/6/2491, counterpart 2492).

Additional material: IBUG Ett. coll. 986, 989.

Beech leaves are rare in the Parschlug assemblage. The limited number of complete specimens prohibits statistically evaluating the number of secondaries. The margin shows prominent teeth with craspedodromous endings of the secondaries, a feature of Oligocene *F. saxonica*, but this feature is developed also in the subsequent beech maximum of Europe starting with the latest Early Miocene. These leaf forms have been usually assigned to *F. menzelii*, *F. kraeuselii* or *F. silesiaca*. DENK (2002) plans to lump all local populations of this beech in Central and West Europe into a single variable species. All Tertiary fruits from Europe have been recently united in a single morpho-species *Fagus deucalionis* (DENK & MELLER 2001). It would be unwise to solve taxonomical problems of fossil beech foliage on the basis of the limited Parschlug material.

***Fagus* sp. - cupule**

1847 *Fagus deucalionis* UNGER, p. 101, pro parte.

1850a *Fagus deucalionis* UNGER - UNGER, p. 405, pro parte.

1852 *Fagus deucalionis* UNGER - UNGER, p. 38, pro parte, pl. 18, fig. 25 (LMJ 62667).

The specimen is poorly preserved due to pyritisation.

***Fagus vel Alnus* sp.**  
Plate 3 Figure 2

Material: NHMW 1878/6/9137.

We hesitate to assign this leaf unambiguously to *Fagus* because the leaf margin bears occasional secondary teeth between the main teeth above the secondary veins. Secondary teeth are extremely rare in foliage of extant beeches, e.g. *Fagus pashanica* YANG (KVAČEK & WALTHER 1991). They occasionally occur even in fossil *Fagus silesiaca* WALTHER & ZASTAWNIAK (1991: Fig. 1:6).

*Quercus* L.

***Quercus drymeja* UNGER**  
Plate 4, Figures 1-7

- 1847 *Quercus drymeja* UNGER, p. 113, pl. 32, figs. 1 right (LMJ 76524 A, lectotype), 2, (non 3 = *Myrica lignitum*), 4.  
 1850a *Quercus drymeja* UNGER - UNGER, p. 400.  
 1850a *Juglans hydrophila* UNGER, p. 469.  
 1850b *Juglans hydrophila* UNGER - UNGER, p. 196, pro parte, pl. 53, figs. 7 (LMJ 76549), ? 8, 9 (LMJ 76541).  
 ? 1850a *Quercus urophylla* UNGER, p. 403.  
 ? 1852 *Quercus mediterranea* UNGER - UNGER, p. 35, pl. 18, fig. 4.  
 ? 1852 *Quercus urophylla* UNGER - UNGER, p. 36, pl. 18, fig. 11.  
 1878b *Quercus drymeja* UNGER - ETTINGSHAUSEN, p. 87, pl. 3, fig. 10 (NHMW 1878/6/6557) bearing *Xylomites drymejae* ETTINGSHAUSEN.

Lectotype designated here: LMJ 76524 A, figured by UNGER (1847: 113, pl. 32, fig. 1 right) – refigured in pl. 4, fig. 1.

Additional material: GBA 2002/01/40, 105, 108, 110, 113; NHMW 1878/6/2447, 9388, 9399.

*Quercus drymeja* is one of the most common sclerophyllous oaks of the Mediterranean area. It is distinguished from similar leaf forms from the Boreal Province (e.g. KNOBLOCH & KVAČEK 1996, as *Q. cf. drymeja*) by a slender lamina with regular spiny teeth. A recent study of cuticle structure on the material from Vegora (KVAČEK et al. 2002 b) showed that the abaxial leaf side of *Q. drymeja* bears occasional solitary, massive trichome bases typical of many sclerophyllous oaks, but certainly not of *Quercus ilex*, which has typically a densely hairy abaxial leaf surface. That is why this extant oak cannot serve as a living analogue for *Q. drymeja*, as has been traditionally maintained. On the other hand, the differences from the epidermal structure of *Q. mediterranea* are negligible. As is apparent in both the Parschlug and Vegora assemblages, transitions between these two species occur with regard to morphology of the leaf lamina. At Parschlug there are leaf forms similar to *Myrica lignitum* (narrow cuneate base) and to *Quercus zoroastri* (coarser toothed leaf margin and more rounded leaf base). The species can be easily distinguished in leaf assemblages whose cuticle structure is preserved. The nearest living relative of *Q. drymeja* should be sought among sclerophyllous oaks, most probably outside Europe.

***Quercus mediterranea* UNGER**  
Plate 4, Figures 8-16

- 1847 *Quercus mediterranea* UNGER, p.114, pl. 32, figs. 1 top left (LMJ 76524B, lectotype), 5 ?, 6 ?, 7, 8 ?, 9 (NHMW 1845/0034/4, syntype).  
 1850a *Quercus mediterranea* UNGER – UNGER, p. 400.  
 1850a *Quercus cyclophylla* UNGER, p. 400.  
 1850a *Prunus theodisca* UNGER, p. 484.  
 1852 *Quercus mediterranea* UNGER - UNGER, p. 35, pl. 18, figs. 1 (LMJ 76507), 2, 3, 5, 6.  
 1852 *Quercus cyclophylla* UNGER - UNGER, p. 37, pl. 18, fig. 15.  
 1866 *Prunus theodisca* UNGER - UNGER, p. 61, pl. 18, fig. 31.  
 1878b *Quercus mediterranea* UNGER – ETTINGSHAUSEN, p. 83, pl. 1 fig. 6, 7 ?, 8 ? (bearing *Sphaeria mediterranea* ETTINGSHAUSEN).

Lectotype: because the specimen selected by ILJINSKAYA (in TAKHTAJAN 1982: 102) is missing, a new lectotype is designated here: LMJ 76524 B, UNGER 1847, pl. 32, fig. 1 top left – refigured in pl. 4, fig. 8.

Additional material: GBA 1864/01/5, 2002/01/19, 106, 107; IBUG Ett. coll. 908, 912, 914, 934, 943 + 944 (part + counterpart), 949 + 950 (part + counterpart); NHMW 1878/6/7532, 9374, 9381.

This sclerophyllous oak was widely distributed during the Neogene in southern Europe and adjacent areas. Its limits towards the previous *Q. drymeja*, having slender leaves, are somewhat arbitrary because of highly variable foliage (KVAČEK et al. 2002 b). This variation is well expressed at Parschlug, which is the type locality of this species and where this species was described under several binomina (see synonymy). The cuticle structure obtained from various Late Miocene sites of Greece suggests affinities to the group of extant *Q. coccifera* (KVAČEK & WALTHER 1989: fig. 5a, b).

***Quercus zoroastri* UNGER**  
Plate 5, Figures 1-4

- 1850a *Quercus zoroastri* UNGER, p. 401, pro parte.  
 1850b *Juglans hydrophila* UNGER, p. 196, pro parte, pl. 53, fig. 6 (LMJ 76866).  
 1852 *Quercus zoroastri* UNGER - UNGER, p. 36, pro parte, pl. 18, figs. 7, 8.

Neotype designated here: NHMW 1878/6/2401 – figured in pl. 5, fig. 1.

Additional material: GBA 2002/01/42; IBUG Ett. coll. 932, NHMW 1878/6/6478, 9377.

Leaves broad elliptic to ovate, long petiolate, coriaceous, cuneate to rounded at the base, coarsely simple toothed except the entire base, venation craspedodromous, secondaries straight to slightly bent, dense, never forked, entering regular, ± closely spaced, apically directed teeth. Tertiary veins inconspicuous.

In our opinion this is also a sclerophyllous oak; it differs in the long petiole from *Q. mediterranea* and is characterised by the shape of lamina, which is broad elliptic to ovate (contrary to *Q. drymeja* and *Q. kubinyii*), and by the shape of teeth, which resembles some forms of *Q. kubinyii*. The occurrence of occasional secondary teeth between primary teeth above the secondary veins is a feature characteristic of this species and suggestive of the morphology of *Prinsepia* (see *P. serra* below). The base of the leaf is usually symmetric, contrary to UNGER's description (1852: 36), which incorrectly includes a leaflet of *Sapindus pythii* (UNGER 1852: pl. 18, fig. 8). Some leaf forms of *Q. sosnowskyi* KOLAKOVSKII may be similar in tooth form and lamina shape, but there are

also pronounced differences between the two species - *Q. sosnowskyi* has very typical, distinct percurrent tertiary venation and often forked secondaries. No very similar living relative of *Q. zoroastri* has been recovered.

## Theaceae

### ? *Gordonia* ELLIS

#### cf. ? *Gordonia oberdorfensis* KOVAR-EDER

Plate 5, Figures 5-8

Material: NHMW 1878/6/2004 + 2005 (part + counterpart), 2006 + 2007 (part + counterpart) determined by ETTINGSHAUSEN as *Ficus troglodytarum* UNGER, 1878/6/2009, 20025 + 2026 (part + counterpart), 2038 as *Diospyros* sp. nov. in sched., 2021 + 2022 as *Daphne* sp. nov. in sched.; probably NHMW 1878/6/2701.

These elongate and rather large leaves with entire margin have a very thick and straight midvein. The secondaries are very dense, originating at very steep angles; they initially run aside the midvein and then diverge towards the leaf margin. The secondaries run an irregular course, sometimes fork and the branches of neighbouring secondaries join each other.

Although we lack information about the epidermal structure of the leaves from Parschlug, the venation pattern is very similar to that of ? *Gordonia oberdorfensis* (KOVAR-EDER & MELLER 2001: 79) and extant *Gordonia axillaris* (KVAČEK & WALTHER 1984a: pl. 25, fig. 3 – as *Polyspora axillaris*). These leaves derive from level I with the exception of the specimen NHMW 1878/6/2701, which is from level III.

### *Ternstroemites* BERRY emend. HICKEY

#### *Ternstroemites pereger* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.

Plate 6, Figures 1-7

- 1850a *Carpinus oblonga* UNGER, p. 409, pro parte.
- 1850a *Amygdalus pereger* UNGER, Gen. spec. pl. foss., p. 483, pro parte, basionym.
- 1850a *Crataegus orionis* UNGER, p. 481.
- 1850b *Amygdalus pereger* UNGER - UNGER, p. 184, pro parte, pl. 55, figs. 11, 13, 14.
- 1852 *Carpinus oblonga* UNGER - UNGER, p. 10, pro parte, pl. 20 fig. 16.
- 1866 *Crataegus oreonis* UNGER - UNGER, p. 59, pl. 18, fig. 15 (LMJ 76593).

Neotype designated here: NHMW 1878/6/8169 det. by ETTINGSHAUSEN as *Fraxinus intermedius* ETTINGSHAUSEN - figured on pl. 6, fig. 1.

Additional material: GBA 2002/01/39 (part + counterpart), 41, 111, 112, 114, NHMW 1853/26/473 det. as *Ceratopetalum parschlugianum* ETTINGSHAUSEN, 1878/6/7451 + 9516 (part + counterpart) det. by ETTINGSHAUSEN as *Carpinus oblonga* and *Quercus serra*, 1878/6/7452 det. by ETTINGSHAUSEN as *Carpinus oblonga* UNGER, 1878/6/8171 det. by ETTINGSHAUSEN as *Fraxinus intermedia*.

Leaves lanceolate to elongate, long petiolate, leaf margin crenulate, except at the very base, with more or less distinct apical glands; secondary veins semicraspedodromous.

The morpho-genus *Ternstroemites* BERRY as emended by HICKEY (1977: 141) comprises foliage of the Theaceae, which are characterised by having simple glandular teeth on

the margin. Although we are not well informed about the detailed venation of the studied specimens due to coriaceous texture of the leaves, the species as emended above fits well into this group of leaf forms. Unfortunately, we are unable to corroborate this assignment with the epidermal structure, and it is therefore difficult to make comparisons with the previously described Theaceae leaves of the European Tertiary, which are mostly based on both gross morphology and epidermal anatomy (e.g. KVAČEK & WALTHER 1984b).

## Myricaceae

### *Myrica* L.

#### ***Myrica lignitum* (UNGER) SAPORTA**

Plate 7, Figures 1-6, 8, 9

- 1847 *Quercus lignitum* UNGER, p. 113, pl. 31, figs. 5-7.  
 1850a *Quercus lignitum* UNGER - UNGER, p. 402.  
 1850a *Comptonia laciniata* UNGER, p. 394.  
 1850a *Prinos hyperboreus* UNGER, p. 462.  
 1850b *Comptonia laciniata* UNGER, p. 161, pl. 29 fig. 2.  
 1851b *Dryandroides lignitum* (UNGER) ETTINGSHAUSEN, p. 741, pl. 34, fig.5 (GBA 1851/04/10).  
 1852 *Quercus lignitum* UNGER, p. 34, pro parte, pl. 17, figs. 1 and 2 (LMJ 76504), 3, 4 (LMJ 76503), 5, 6 (LMJ 76510 right), 7 (LMJ 76485).  
 1852 *Quercus commutata* UNGER, p. 35, pl. 17, figs. 8, 9, 10 (LMJ 76510 left).  
 1864 *Prinos hyperboreus* UNGER - UNGER, p. 14, pl. 3, fig. 37.  
 1878b *Myrica lignitum* (UNGER) SAPORTA - ETTINGSHAUSEN, p. 82, pl. 1 figs. 1, 2 (bearing *Phyllerium lignitum* ETTINGSHAUSEN).  
 1880 *Myrica lignitum* (UNGER) SAPORTA - ETTINGSHAUSEN, pl. 12, figs. 1-17 (fig.1 - NHMW 1878/6/9260, fig. 5 - NHMW 1878/6/7376, fig. 10 - NHMW 1878/6/9270, fig. 12 - NHMW 1879).  
 1888 *Myrica lignitum* (UNGER) SAPORTA - ETTINGSHAUSEN & STANDFEST, pl. 1, figs. 2, 3 (694), 5 (477), 6 (482), 7, 8 (488), 9 (489), 10, 11 (492), 12 (500), 13 (509), 15 (517), 16 (524), 17 (531), 18, 19 (559), pl. 2, figs. 20 (568), 21 (581), 23 (591), 24 (598), 25 (605), 26 (608), 27 (612), 28 (615), 29 (617), 32 (620), 34 (631, 632), 36 (647), 37 (653), 38 (661+662), 39 (666), 40 (718), 41 [non 33 (630), 35 (633)] (all specimen nos in brackets ex IBUG Ett. coll.).  
 1976 *Myrica lignitum* (UNGER) SAPORTA - KNOBLOCH & KVAČEK, p. 20-21, pl. 8, figs. 1-3.  
 1982 *Myrica lignitum* (UNGER) SAPORTA - KOVAR, p. 80, pl. 12 figs. 1-8 (coll. file nos see there).

Lectotype designated here: LMJ 76503, figured by UNGER (1852: pl. 17, fig. 4) - refigured on pl. 7, fig. 6.

Additional material: GBA 1847/03/11, 2002/01/1, 92b; IBUG Ett. coll. 1083 (II), 1084 (III); NHMW 1878/6/2324, 2339c, 2367, 2426, 2563, 7382, 8841, 9309, 9312.

This species was revised at an earlier date by the first author (KOVAR 1982), who circumscribed *M. lignitum* including cuticular anatomy and the variation in its leaf morphology. Leaf anatomical features have been obtained from a number of other Miocene sites in Europe (see KNOBLOCH & KVAČEK 1976), making this quite variable species now well recognisable. In addition, leaf forms identified as *Comptonia laciniata* UNG. (an additional specimen in NHMW 1878/6/7382) represent, in our opinion, extreme morphological variations of *M. lignitum* at Parschlug.



***Myrica oehningensis* (A. BRAUN) HEER**  
Plate 7, Figure 7

1850a *Comptonia oeningensis* A. BRAUN - UNGER, p. 394.

1850b *Comptonia oeningensis* A. BRAUN - UNGER, p. 161, pl. 29, fig. 3 (LMJ 76546).

Leaves designated under this species recall *Comptonia* and so were identified by UNGER (1850a, b) and ETTINGSHAUSEN (1851a – as *Comptonia vindobonensis*). Their lamina, however, differs from that of the extant *Comptonia peregrina* by much more irregular dissection of the margin tending from deeply lobed to coarsely crenate-toothed. At Parschlug, such a leaf form is exceptional, but elsewhere, e.g. in Bavaria (RIEDERLE & GREGOR 1997, as *Comptonia oehningensis* and *Myrica ungeri* vel *Comptonia oeningensis*) is very typical and common (see tab. 2). The taxonomic position of such leaf remains is to be solved on the basis of cuticular anatomy.

***Myrica* sp. - fructus**

1888 *Myrica lignitum* (UNGER) SAPORTA – ETTINGSHAUSEN & STANDFEST, pl. 1, figs. 1 a-c.

This single specimen described and figured by ETTINGSHAUSEN & STANDFEST (1888) is missing. It was possibly lost due to pyritisation.

Juglandaceae

*Engelhardia* LESCH.

***Engelhardia orsbergensis* (WESSEL & WEBER) JÄHNICHEN, MAI & WALTHER**  
Plate 6, Figures 10-12

Material: GBA 2002/01/22, 100; IBUG Ett. coll. 723, 841; NHMW 1878/6/2053a, 2816, 8951 det. by ETTINGSHAUSEN as *Hakea parschlugiana*, 9123.

Parschlug is a new site for this species (known also as *Palaeocarya orsbergensis* (WESSEL & WEBER) JÄHNICHEN, FRIEDRICH & TAKÁČ), which was widely distributed in the Tertiary of Europe. The leaflet morphology and its association with the fruits described below make this record unequivocal.

***Engelhardia macroptera* (BRONGNIART) UNGER**  
Plate 6, Figures 8, 9

1850b *Carpinus producta* UNGER, p. 164, pl. 32, fig. 6 (LMJ 76540 - UNGER erroneously mentioned the locality of Socka instead of Parschlug).

Additional material: NHMW 1878/6/2697, 2698 (part + counterpart), NHMW 1879/610.

Involucra of this species are rare at Parschlug. They do not differ from the standard form typified by the specimens from Armissan, France (JÄHNICHEN et al. 1977); they share triveined lobes of the involucre and occasionally bear an impression of the fruit. Also, as at other occurrences in Europe, the fruits are associated with the leaflets and with the compound leaves as mentioned above.

## Tiliaceae

*Tilia* L.***Tilia longebracteata* ANDRAE**

Plate 6, Figures 13-15

1869 *Tilia lignitum* ETTINGSHAUSEN - p. 15, pro parte, pl. 42, fig. 6 (IBUG Ett. coll. 1541).Additional material: IBUG Ett. coll. 1663, fructus (det. by ETTINGSHAUSEN as *Celastrus europaeus*), Ett. coll. 2049, fructus (det. by ETTINGSHAUSEN as *Prunus paradisiaca*); GBA 2002/01/31, fructus.

The few impressions of detached, globose, slightly angular fruits found at Parschlug recall those of linden. They are in our opinion not identifiable to the species level because of poor preservation. They are not attached to the bract described from Parschlug in the flora of Bilina by ETTINGSHAUSEN (1869), but may belong to the same plant. This isolated bract shows a fragment of the peduncle, which is attached at one point. Hence the bract is not adnate, as incorrectly drawn by ETTINGSHAUSEN. This type of bract is known to occur in several Tertiary species of linden in the Northern Hemisphere (type B sensu MANCHESTER 1994). The above designation is employed here as a morpho-species. Its holotype from Daia, Sarmatian (ANDRAE 1861: pl. 1, fig. 2), seems to represent the same kind of bract, devoid of fruits. No leaves of *Tilia* co-occur at Parschlug (impressions identified by ETTINGSHAUSEN as *Tilia milleri* – IBUG Ett. coll. 1542-1544 are clearly betulaceous fragments).

*Craigia* W.W. SMITH & EVANS***Craigia brononii* (UNGER) Z. KVAČEK, BŮŽEK & MANCHESTER**

Plate 6, Figures 16, 17

1847 *Ulmus brononii* UNGER, p. 100, pro parte.1850a *Ulmus brononii* UNGER - UNGER, p. 410, pro parte.Material: GBA 2002/01/35; IBUG Ett. coll. 1167, 2804a det. by ETTINGSHAUSEN as *Ulmus brononii*; NHMW 1878/6/7581, 1878/6/7582, 1878/6/9676, 1878/6/9677.

A few detached valves found at Parschlug are of the same kind as from other European sites. Such fruit remains have been assigned to several genera, recently to *Craigia*, an extant endemite of China (KVAČEK et al. 1991, 2002a).

## Ulmaceae

The various ulmaceous leaves found at Parschlug include transitional forms where we are unable to decide between *Cedrelospermum*, *Zelkova*, and *Ulmus plurinervia*, e.g. LMJ 76488, pl. 8, fig. 12. In the following text we document our views on the character of foliage in the respective species and we figure the most typical forms.

*Ulmus* L.***Ulmus plurinervia* UNGER**

Plate 6, Figures 18-22

- 1847 *Ulmus plurinervia* UNGER, p. 95, pl. 25, figs. 1-4.  
 1850a *Ulmus plurinervia* UNGER - UNGER, p. 411.  
 1851a *Planera ungeri* ETTINGSHAUSEN, p. 14, pro parte, pl. 2, figs. 11, 12.

Neotype designated here: NHMW 1878/6/9667 - figured on pl. 6, fig. 19.

Additional material: GBA 2002/01/101-104; IBUG Ett. coll. nos. 1031-1034 (twigs), 994, 1108, 1114, 1116; NHMW 1878/6/2650, 7592, 9082, 9155, 9154 + 9665 (part + counterpart).

This elm species based on leaves from Parschlug was established by UNGER (1847) and later generally employed for small, more or less asymmetrical leaves with simple teeth. Only ILJINSKAYA (in TAKHTAJAN 1982: 16) doubted its affinity to *Ulmus*, suggesting that most of the figured syntypes were more likely foliage of *Zelkova* or *Hemiptelea*. As stated above, the limits of *U. plurinervia* are indeed partly uncertain towards both *Zelkova* and *Cedrelospermum*. However, the selected collection shown in pl. 6 is typical and almost indistinguishable from *U. braunii* HEER s.s. (Oehningen), except for the double serrate margin in most specimens of the latter. Without repeating the endless discussions about European Tertiary elms, we merely intend to clearly delimit *U. plurinervia* for further studies. The fruits described below are other organs of the same plant, adding fruit characters of this elm, which is typical of mesic assemblages of the European Neogene (e.g. Erdőbénye).

***Ulmus parschlugiana* KOVAR-EDER & Z. KVAČEK sp. nov.**

Plate 6, Figures 23-26

- 1843 *Ulmus zelkovaefolia* UNGER, pro parte, pl. 24, fig. 7 left, fig. 8.  
 1845 *Ulmus zelkovaefolia* UNGER, pro parte, pl. 26, fig. 8.  
 1847 *Ulmus zelkovaefolia* UNGER, p.95 pro parte.  
 1850a *Ulmus zelkovaefolia* UNGER - UNGER, p. 411, pro parte.

Holotype designated here: IBUG Ett. coll. 1100 – figured on pl. 6, fig. 23.

Paratypes designated here: NHMW 1878/6/ 9651, 9658 - figured on pl. 6, figs. 24, 26.

Additional material: GBA 2002/01/95; IBUG Ett. coll. 1102-1104; NHMW 1878/6/2118, 9081, 9651.

Elm samaras in bundles, stalked (stalk about 5 mm long), with persistent perianth, winged, broadly oval, typically 8-10 mm long and 6-9 mm wide, with an elliptic endocarp (ca. 2 x 3.5 mm in size) surrounded in the centre by moderately wide wings (the rim of the same width or slightly wider than the endocarp body) that broadly extend into a pair of styles. Wings with strong marginal vein and a prominent axial vein laterally deflected from the stipe towards the endocarp (pl. 6, fig. 26).

As the leaves of *Ulmus plurinervia* are quite common and belong to the only elm species at Parschlug, we suspect that these fruits belong to the plant that produced *U. plurinervia* foliage. ETTINGSHAUSEN (1851a) was the first to arrive at this conclusion. Because the fruits occur detached from the leaves, they deserve in our opinion a separate binomen. Similar fruits were merged with *Ulmus pyramidalis* by BŮŽEK (1971) because, in the Early Miocene Most Formation of North Bohemia, they regularly accompany leaves indistinguishable from *U. pyramidalis*. At Schrotzburg two kinds of fruits occur – one indistinguishable from our *U. parschlugiana* (HANTKE 1954: pl. 6, fig. 18) and the other (HANTKE 1954: pl. 6, fig. 17) of the *Chaetoptelea*-type (sensu MANCHESTER 1989). At Sošnica, the type locality of *U. pyramidalis* and *U. carpinoides*,

three kinds of fruits occur, one of the *Chaetoptelea*-type (GOEPPERT 1855: pl. 14, figs. 15-18) and two others of different size with broader wings (GOEPPERT 1855: pl. 14, figs. 18-20 and 21). In the latter cases, the fruits have very short stipes so that the perianth adheres directly to the fruit base, in contrast to *U. parschlugiana*. Fruits similar to *U. parschlugiana* are produced for example by extant *U. americana* (cf. MANCHESTER 1989: fig. 12.1 c). A more extensive study of the discussed material is necessary to clarify the taxonomy of the whole group.

*Cedrelospermum* SAPORTA emend. MANCHESTER

***Cedrelospermum ulmifolium* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov. - foliage**  
Plate 8, Figures 1-5

- 1850a *Comptonia ulmifolia* UNGER, Gen. spec. pl. foss., p. 394 - basionym.  
 1850a *Rhus triphylla* UNGER, p. 474.  
 1850b *Comptonia ulmifolia* UNGER - UNGER, p. 194, pl. 29 figs. 4, 5 (LMJ 76536, lectotype).  
 1851a *Planera ungeri* ETTINGSHAUSEN, p. 14, pro parte, pl. 2, figs. 15, 17, ? 18.  
 ? 1850a *Prunus euri* UNGER, p. 485.  
 1860 *Rhus triphylla* UNGER - UNGER, p. 44, pl. 20, fig. 13.  
 ? 1866 *Prunus euri* UNGER - UNGER, p. 61, pl. 18 fig. 30.

Lectotype designated here: LMJ 76536, figured by UNGER (1850b: 194, pl. 29, fig. 5) – refigured on pl. 8, fig. 5.

Additional material: GBA 2002/01/38; IBUG Ett. coll. 135, 1079, 1085, 1087, 1088, etc. NHMW 1878/6/2053b, 7634, 9572, 9573, 9575, 9619, 9622, 9630 (det. by ETTINGSHAUSEN *Planera ungeri* in sched.), 1878/6/7520 (det. by ETTINGSHAUSEN *Quercus lonchitis* in sched.).

The variability of this species is similar to that encountered particularly in the Middle Miocene localities of Europe (e.g. Randeck Maar, RÜFFLE 1963, as *Tremophyllum tennerrimum*). Contrary to similar leaves of *Ulmus plurinervia* and *Zelkova zelkovifolia*, the asymmetrical, slender forms with a narrow, elongate upper part towards the apex are typical of this species. Transitional forms occur to both mentioned taxa. Larger leaves of *Cedrelospermum* are particularly difficult to differentiate from *Ulmus*. *Ulmus parvifolia* A. BR. sensu UNGER (1852: 43, pl. 20, fig. 22 - LMJ 76488) may be either *Cedrelospermum* or *Ulmus plurinervia*. ETTINGSHAUSEN (1851a), who was unaware of the existence of *Cedrelospermum* at Parschlug, established his *Planera ungeri* in a broad sense to include foliage of *Zelkova* and *Cedrelospermum* into a single, unnatural entity. HABLY & THIÉBAUT (2002) established *C. flichei* (SAPORTA) HABLY & THIÉBAUT for the Palaeogene and Miocene morphotypes of foliage. In our opinion, those from Magyaregregy coincide with *C. ulmifolium* in all respects including wider angles of the base (and the absence of intersecondaries - ? due to poor preservation). In view of the slight size difference of associated fruits from the type locality in the Palaeogene of southern France (see below) also these leaves warrant a separate taxon.

***Cedrelospermum stiriacum* (ETTINGSHAUSEN) KOVAR-EDER & Z. KVAČEK**  
**comb. nov. - fructus**  
Plate 8, Figure 6

- 1888 *Embothrium stiriacum* ETTINGSHAUSEN, Denkschr. k. Akad. Wiss. math.-nat. Cl. 54, p. 316, pl. 4, fig. 32 (lectotype, NHMW 1878/6/3583) - basionym.

Lectotype designated here: NHMW 1878/6/3583, figured by ETTINGSHAUSEN 1888: pl. 4, fig. 32 (Moskenberg).

Additional material: IBUG Ett. coll. 1359, 1360+1361 (part + counterpart), 1362 det. by ETTINGSHAUSEN as *Embothrium megalopterum* ETTINGSHAUSEN in sched., 1364, 2899 as *Embothrium stiriacum*; NHMW 1878/6/8045, 8046 det. by ETTINGSHAUSEN as *Embothrium giganteum* ETTINGSHAUSEN in sched.

Samaras with a single wing innervated by about 6 sub-parallel veins and asymmetricaly positioned cleft of two persistent styles, 5–8 mm wide and typically 14–17 (– 23) mm long, seed part oblique to the wing, mostly beak-like narrowed on the base.

Fruits of *Cedrelospermum* have been encountered at Parschlug for the first time. They conform in morphology and wing venation to the populations from the Oligocene to Middle Miocene of Europe (HABLY & THIÉBAUT 2002) but notably match in a bigger mean size and a narrower base of the seed part the population from Magyregregy. THIÉBAUT (personal communication) is going to separate the latter into a new species *C. hablyae*. The binomen suggested here has the priority. Records from Leoben (ETTINGSHAUSEN 1888), Schöneegg (ETTINGSHAUSEN 1890) and the Randeck Maar (RÜFFLE 1963) belong to the same species. Because this plant has not yet been found as twigs with attached fruits (contrary to other species of the genus), the associated leaves must be given a separate binomen (see above).

### *Zelkova* SPACH

#### ***Zelkova zelkovifolia* (UNGER) BŮŽEK & KOTLABA** Plate 8, Figures 8–11

- 1843 *Ulmus zelkovaefolia* UNGER, pl. 24 figs. 7 (right), 9–13.  
 1845 *Ulmus zelkovaefolia* UNGER, pl. 26, fig. 7 (NHMW 1987/57, lectotype).  
 1847 *Ulmus zelkovaefolia* UNGER, p. 94 (here valid diagnosis).  
 1850a *Ulmus zelkovaefolia* UNGER - UNGER, p. 411, pro parte.  
 1850a *Ulmus praelonga* UNGER, p. 411.  
 1851a *Planera ungeri* ETTINGSHAUSEN, p. 14, pro parte, pl. 2 figs. 7, 13, 16.  
 1852 *Zelkova ungeri* KOVATS - UNGER, p. 42, pl. 20, fig. 19.  
 1852 *Ulmus praelonga* UNGER - UNGER, p. 43, pl. 20, fig. 20 (LMJ 76487, holotype).

Lectotype designated here: NHMW 1987/57, figured by UNGER (1845: pl. 26, fig. 7) - refigured on pl. 8, fig. 9; previous lectotypification by ILJINSKAYA (in TAKHTAJAN 1982: p. 18) is invalid because the selected specimen is missing and a mere illustration is not accepted by the current nomenclatural rules for the typification.

Additional material: GBA 2002/01/18; NHMW 1878/6/9590, 9642.

Parschlug is the type locality of this common member of Tertiary floras of Eurasia. Besides coarsely simple-toothed large leaves of sterile twigs (pl. 8, figs. 10, 11), smaller forms also co-occur, the latter mostly attached to twigs, sometimes still bearing the fruits. This dimorphy, known also in extant *Zelkova*, led some authors to accept another independent species, *Z. praelonga*, (e.g. BERGER 1953). Some leaf records described as *Zelkova ungeri* from the Bavaria Molasse (e.g. RIEDERLE & GREGOR 1997) and Oehningen (HANTKE 1954) do not belong to *Zelkova* but represent probably leaflets of the Vitaceae (*Parthenocissus*).

## Celtidaceae

*Celtis* L.***Celtis japeti* UNGER**

Plate 8, Figure 7

1850a *Celtis japeti* UNGER, p. 412.1852 *Celtis japeti* UNGER - UNGER, p. 44, pl. 20, figs. 25-26.

Neotype designated here: NHMW 1878/6/7654 – figured on pl. 8, fig. 7.

Additional material: NHMW 1878/6/7691.

Because neither of the two type specimens is available, the lectotypification done by KUTUZKINA (in TAKHATAJAN 1982) is currently unacceptable. Of two topotypical specimens, which were discovered in the collections, the one with better preserved venation is selected here to serve as the neotype. We doubt that the population from Parschlug can be definitively distinguished from the records of Erdőbénye (*Celtis trachytica* ETTINGSH.) and Sošnica (*C. begonioides* GOEPP.), but more numerous collections of these entities are necessary to compare their variation. If merged (e.g. by KRISHTOFOVICH & BAYKOVSKAYA 1965), *C. japeti* has priority over *C. trachytica*.

## Salicaceae

*Populus* L.***Populus populina* (BRONGNIART) KNOBLOCH**

Plate 8, Figure 18, Plate 14, Figure 1

1850a *Populus latior* A. BRAUN - UNGER, p. 416.1850a *Populus aeoli* UNGER, p. 416.1852 *Populus latior* A. BRAUN - UNGER, p. 45, pl. 21, figs. 3 (LMJ 76509), 4 (LMJ 76505), 5.1852 *Populus aeoli* UNGER - UNGER, p. 45, pl. 21, fig. 2 (LMJ 76506, holotype).

Additional material: GBA 2002/01/29, 78.

The few specimens studied from Parschlug fit well within the morphological variation of this poplar, which was widely spread during the Neogene of Europe. Because only one species of *Populus* has been demonstrated at Parschlug, the fruits described below probably belong to the same plant.

***Populus* sp. - fructus**

Plate 8, Figures 19-21

1850a *Celastrus europaeus* UNGER, p. 459, pro parte.1866 *Macreightia germanica* HEER - UNGER, p. 26, pl. 8, figs. 12 bottom, 13.

Additional material: GBA 2002/01/32, 34, 115; IBUG Ett. coll. 1665, 1666, 1693; NHMW 1878/6/9896, 2387.

Capsules open, shortly stalked, trivalvate, partly incompletely preserved, valves elliptical, 3-5 mm wide and 5 – 10 mm long, clearly convex, flattened by fossilisation, slightly rugulate on the outer surface.

UNGER (1850a: 459) initially combined some leaves and the above-described capsules under *Celastrus europaeus*, but later (UNGER 1864: 10, 1866: 26) decided to separate the fruits and determined them as *Macreightia germanica* HEER (calyx). We, however, have no doubts that these remains are fruits (partly opened capsules) belonging to *Populus populina*. Although we did not find the original specimens, we discovered topotypical material. The trivalvate capsules figured by HEER (1859: pl. 103, figs. 1,2) as *Macreightia germanica* definitely correspond to the remains from Parschlug and also co-occur in Oehningen with numerous leaves of *P. populina* (as *P. latior* HEER). Similar remains have been attributed to *Populus* in the Bavarian Neogene (GREGOR 1982: pl. 6, figs. 12-17). In our opinion these detached fruits express no diagnostic features that permit identification to the species level. Very similar capsules also co-occur with the leaves of the *P. zaddachii* HEER – type in North Bohemia within fluvial facies of the Most Formation, Late Oligocene to Early Miocene (personal observation Z. KVAČEK).

## Buxaceae

### *Buxus* L.

#### ***Buxus* cf. *egeriana* Z. KVAČEK, BŮŽEK & HOLÝ**

Plate 8, Figures 15 (?), 16, 17 (?)

? 1850a *Quercus myrtilloides* p. 404, pro parte.

? 1852 *Quercus myrtilloides* UNGER - UNGER, p. 38, pro parte, pl. 18, fig. 17 (LMJ 76502).

Material: GBA 2002/01/14, LMJ 76524C (reverse side).

The leaves assigned to this entity have a dense, complicated venation found in *Buxus*. They exceed in size *Buxus pliocenica* SAPORTA & MARION, which commonly occurred during the Late Neogene in Europe, but do not attain the length of typical, much more slender leaves of *B. egeriana* (type locality Habartov, Sokolov Basin, Ottnangian – KVAČEK et al. 1982). The elliptical shape of the above-listed specimens recalls more the bigger leaves of *B. pliocenica* but differ partly by a long petiole. Some other leaf impressions identified as *Myrsine formosana* (BERGER 1955) and *Buxus pliocenica* (BERGER & ZABUSCH 1953) may represent the same type of foliage from the Middle Miocene from Lavanttal and the Vienna Basin. None of these impressions has been studied anatomically.

## Rosaceae

### *Rosa* L.

#### **cf. *Rosa* sp.**

Plate 8, Figure 14

1850a *Spiraea zephyri* p. 482.

1866 *Spiraea zephyri* UNGER - UNGER, p. 60, pl. 18, figs. 22, 23.

1866 *Pyrus mini* UNGER, p. 58, pl. 18, fig. 20.

Material: IBUG Ett. coll. 1059 (level III).

Although none of the type specimens of *Spiraea zephyri* and *Pyrus mini* survived, we suspect that these illustrations represent leaflets of a rose. One terminal leaflet of the same kind is housed at IBUG and is illustrated here. It certainly cannot serve as a basis to sufficiently circumscribe a fossil species.

*Prinsepia* ROYLE

***Prinsepia serra* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 13, Figures 9-17

- 1847 *Quercus serra* UNGER, Chlor. prot. p. 109, pro parte, pl. 30, fig. ? 4 left (LMJ 76527, syn-type), fig. 5 (LMJ 76528, lectotype), fig. 6 - basionym.  
 1850a *Quercus serra* UNGER - UNGER, p. 400, pro parte.  
 1852 *Ulmus quercifolia* UNGER, p. 43, pl. 20, fig. 24 (non UNGER 1847).  
 1852 *Quercus serra* UNGER - UNGER, p. 38, pl. 18, fig. 16 (LMJ 76495).  
 1878b *Quercus serra* UNGER – ETTINGSHAUSEN, p. 86, pl. 4, fig. 4 (NHMW 1878/6/6554, bearing *Xylomites quercus serrae* ETTINGSHAUSEN)

Lectotype designated here: LMJ 76528, figured by UNGER (1847: pl. 30, fig. 5) - refigured on pl. 13, fig. 9.

Epitype designated here: LMJ 76495, figured by UNGER (1852: pl. 18, fig. 16) - refigured on pl. 13, fig. 10.

Additional material: GBA 2002/01/15-17, 75-78, 79b.

NHMW 1878/6/2095, 2096, 2341a, 2423a, 2505, 2778, 2818, 7538 + 9528 (part + counterpart), 7539 + 9671 (part + counterpart det. by ETTINGSHAUSEN as *Quercus serra* and *Ulmus plurinervia*), 9502, 9505, 9509, 9511, 9514, 9517, 9519, 9521, 9525, 9527.

Contrary to the original description the petioles measure at least 18 mm. The leaf base is sometimes asymmetric, the margin is densely, sharply, but irregularly toothed almost along the whole leaf length. The secondary veins are thin and densely spaced and interspaced with thin intersecondaries, semicraspedodromous. Especially near the leaf margin the higher order venation has a rather irregular pattern (exmedially ramified sensu ASH et al. 1999).

Occasionally, when the marginal teeth are less elongated and less sharply pointed (pl. 13, fig. 17), these leaves resemble *Ternstroemites pereger*. In the latter, however, the teeth are more or less distinctly glandular and therefore apically rounded.

We suspected a rosaceous affinity of these leaves and ultimately compared them with those of *Prinsepia* on E. ZASTAWNIAK's suggestion. Indeed, the fossil leaves match particularly the large-leafed *P. sinensis* (OLIV.) OLIV. (subgen. *Plagiospermum*), notably in venation. We also cannot rule out a possibility that some of the entire-margined leaves from Parschlug with a similar dense venation pattern (e.g. "*Quercus*" *daphnes* shown on pl. 12, figs. 12 and 13) may belong to the same plant, because *Prinsepia* develops at the same time entire and toothed leaves. Fruits of *Prinsepia* have been recovered in the Miocene – Early Pliocene deposits of Central Europe and compared also to deciduous subgen. *Plagiospermum* (MAI 1984 b), which includes thorny shrubs distributed from Himalayas to E Asia.



**? *Prinsepia* sp.**  
Plate 8, Figure 13

Material: NHMW 1878/6/9747.

One spiny twig fragment, the spines broadened at the base, curved, apex sharp. This twig fragment possibly belongs to the leaves described above.

**Fabaceae**

Among the many remains attributed by UNGER to Leguminosae, only few can be characterized as independent entities. It is impossible to definitively combine the fruits and foliage into a single species except in the case of *Podocarpium*. Therefore, the next suite of morpho-taxa deals with these two organs independently. In principle we apply a similar approach as HABLY (1992) except that we prefer to assign epithets to the morphogenus *Leguminosites* BOWERBANK as emended by SCHIMPER (1874), i.e. including both fruits, seeds and foliage, over *Leguminocarpon* GOEPPERT (= *Leguminocarpos* GOEPPERT). We partly preserve the binomina given to foliage by UNGER because there is no possibility to check the affinity by cuticular studies. Some of UNGER's species of alleged legume foliage fall into the category of "Angiosperms incertae sedis" (p. 84 f.).

*Leguminosites* BOWERBANK emend. SCHIMPER

***Leguminosites hesperidum* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**  
Plate 9, Figures 2-4

- 1850a *Robinia hesperidum* UNGER, Gen. spec. pl. foss., p. 245, pro parte - basionym.  
 1850a *Acacia parschlugiana* UNGER, p. 494, pro parte.  
 1864 *Robinia hesperidum* UNGER - UNGER, p. 21, pro parte, pl. 4, figs. 11, 12, 13 (GBA 1864/01/21, lectotype).  
 1864 *Acacia parschlugiana* UNGER - UNGER, p. 35, pro parte, pl. 11, fig. 19 (LMJ 77653).

Lectotype designated here: GBA 1864/01/21, figured by UNGER (1864: pl. 4, fig. 13) - refigured on pl. 9, fig. 4.

Additional material: NHMW 1878/6/8783, 9109.

Pods 10 mm wide and less than 100 mm long, slightly to distinctly contracted between the seeds (up to 6-8 per pod), irregularly densely or widely spaced, even within one pod, rounded to flattened where neighbouring seeds meet, seeds max. 9 mm in diameter.

*L. hesperidum* corresponds with *Leguminocarpon* type I sensu HABLY (1992: 173). These fruits are rather widely distributed at certain time intervals, e.g. in Hungary and at Oehningen (HEER 1859, pl. 140, fig. 11). We refrained from applying the binomen *Acacia parschlugiana* for these pods because we reserve it for the compound leaves that have been described together with the pods although never found attached to each other (see below). UNGER (1864: 21) hesitated between *Robinia* and *Acacia* in the assignment of these fruits.

***Leguminosites dionysi* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 9, Figure 5

1850a *Cytisus dionysi* UNGER, Gen. spec. pl. foss., p. 486 - basionym.1864 *Cytisus dionysi* UNGER - UNGER, p. p. 19, pl. 4, fig. 1 (LMJ 76577, lectotype).

Lectotype designated here LMJ 76577, figured by UNGER (1864: 19, pl. 4, fig. 1) - refigured on pl. 9, fig. 5.

A short slender pod with several (?) seeds. No further material is available.

***Leguminosites palaeogaeus* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 9, Figure 1

1850a *Mimosites palaeogaea* UNGER, Gen. spec. pl. foss., p. 494 - basionym.1864 *Mimosa palaeogaea* (UNGER) UNGER, p. 34, pl. 11, fig. 12.

Neotype designated here: NHMW 2001B0017/3 - figured on pl. 9, fig. 1.

Long-stalked pods with several seeds, margins parallel-sided (without contractions).

*L. palaeogaeus* corresponds with *Leguminocarpon* type VI sensu HABLY (1992: 182, pl. 3, fig. 3) from Magyaregregy.***Leguminosites parschlugianus* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 9, Figures 6-7

1850a *Bauhinia parschlugiana* UNGER, Gen. spec. pl. foss., p. 493 - basionym.1864 *Bauhinia parschlugiana* UNGER - UNGER, p. 31, pl. 11, fig. 3.

Neotype designated here: NHMW 1878/6/9895 - figured on pl. 9, fig. 7.

Material: GBA 2002/01/59, 60, 61; NHMW 1878/6/2820, 2821, 8889, 8890.

Pods with two (occasionally three) seeds, sometimes slightly contracted.

*L. parschlugiana* corresponds with *Leguminocarpon* type IV sensu HABLY (1992: pl. 4, figs. 1-6) and *L. mecsekense* (ANDREÁNSZKY) HABLY. Similar fruits have been compared with *Dalbergia* (ANDREÁNSZKY 1955) and with *Cladrastis* (HERENDEEN 1992 c). This type of pods occurs also in Bavaria (e.g. RIEDERLE & GREGOR 1997: pl. 3, fig. 2).*Podocarpium* A. BRAUN***Podocarpium podocarpum* (A. BRAUN) HERENDEEN**

Plate 9, Figures 8-11

? 1851a *Cassia ambigua* UNGER - ETTINGSHAUSEN, p. 27, pl. 5, figs. 12, 13.

Material: fruits: GBA 2002/01/27; IBUG Ett. coll. 2245 (II); NHMW 1878/6/8876 (part) + 8877 (counterpart), 9894; leaflets: GBA 2002/01/28, 62-68; NHMW 1878/6/8349, 8878, 8884.

Pods of this completely known plant (HERENDEEN 1992 a, b, LIU et al. 2001) are so characteristic that the record at Parschlug is unequivocal. Several leaflets with a characteristic, more prominent basal vein on one side also co-occur. In Europe, the maximal distribution of *P. podocarpum* falls into Early-Middle Miocene. This legume mostly inhabited gallery forests under subtropical and warm-temperate climates.

*Phaseolites* UNGER***Phaseolites securidacus* UNGER**

Plate 9, Figures 13, 14

1850a *Phaseolites securidacus* UNGER, p. 488.1864 *Phaseolites securidacus* UNGER - UNGER, p. 24, pl. 5, figs. 9 (LMJ 76569, lectotype), 10.

Lectotype designated here: LMJ 76569, figured in UNGER (1864: pl. 5, fig. 9) – refigured on pl. 9, fig. 14.

Additional material: NHMW 1878/6/2517 (part) + 2518 (counterpart) det. by ETTINGSHAUSEN as *Chrysophyllum parschlugianum* ETTINGSHAUSEN in sched.; GBA 2002/01/12.

Leaflets broadly elliptic, bluntly acuminate, cuneate, sessile. Secondaries numerous, dense, eucamptodromous, distinctly impressed.

Leaflets of this kind are common among various representatives of the Papilionoideae.

gen. indet.

***"Acacia" parschlugiana* UNGER**

Plate 9, Figure 12

1850a *Acacia parschlugiana* UNGER, p. 494 pro parte.1852 *Comptonia laciniata* UNGER, p. 33, pl. 16, fig. 8.1864 *Acacia parschlugiana* UNGER - UNGER, p. 35, pro parte, pl. 11, fig. 20.

Neotype designated here: NHMW 1878/6/9117 - figured on pl. 9, fig. 12.

Additional material: GBA 2002/01/69-72, 94b; NHMW 1878/6/9859.

Complete, partly disintegrated leaves of this legume probably belong to the Mimosoideae. The fragmentary evidence afforded by this type of foliage prevents us from assigning it to a particular extant genus. The specimen determined by UNGER (1852: 33, pl. 16, fig. 8) as *Comptonia laciniata* is not available. However, in contrast to UNGER, who believed this fossil to be catkins, we think it constitutes a fragment of *"Acacia" parschlugiana*. Similar compound leaves also occur at the Randeck Maar (RÜFFLE 1963).

***"Juglans" parschlugiana* UNGER**

Plate 9, Figures 15, 16

1850a *Juglans acuminata* A. BRAUN - p. 468, pro parte (non Oehningen = *J. acuminata* A. BRAUN ex UNGER = *Cedrela acuminata* (A. BR.) ILJINSKAYA).1860 *Juglans parschlugiana* UNGER, p. 37, pro parte, pl. 19, figs. 1, 2 (LMJ 76559, lectotype), 3, 4 (LMJ 76560, syntype), 5, 6, (non 7).

Lectotype designated here: LMJ 76559, figured by UNGER (1860: pl. 10, fig. 2) – refigured on pl. 8, fig. 15.

Additional material: NHMW 1878/6/9119 det. ETTINGSHAUSEN as *Ficus tenuinervis*; 1878/6/2569 det. as *Juglans parschlugiana* UNGER; GBA 2002/01/2.

Because of the smaller leaflet size and the rather coriaceous texture of *Juglans parschlugiana*, we doubt its relationship to the Juglandaceae. Legumes are in our opinion a more appropriate group within which to search for affinities. The fruit, which UNGER (1860: pl. 19, fig. 7) combined with this species, must be excluded because it is an indeterminate fragment.

## Rhamnaceae

*Paliurus* MILL.***Paliurus tiliifolius* (UNGER) BŮŽEK**

## Plate 11, Figure 1

- 1847 *Paliurus favonii* UNGER, p. 147, pro parte, pl. 50, figs. 7, 8 (non 6 left).  
 ? 1847 *Ceanothus europaeus* UNGER, p. 144, pl. 49, fig. 8.  
 1850a *Paliurus favonii* UNGER - UNGER, p. 463, pro parte.  
 ? 1850a *Ceanothus europaeus* UNGER - UNGER, p. 466.  
 1850a *Ziziphus tremula* UNGER, p. 463.  
 1850a *Bauhinia parschlugiana* UNGER, p. 493, pro parte.  
 ? 1850a *Ziziphus protolotus* UNGER, p. 463.  
 1864 *Ziziphus tremula* UNGER - UNGER, p. 16, pl. 3 fig. 39 (LMJ 76566).  
 1864 *Ziziphus renata* UNGER, p. 16, pl. 3, figs. 40, 41.  
 ? 1864 *Ziziphus protolotus* UNGER - UNGER, p. 17, pl. 3, fig. 43.

Additional material: GBA 2002/01/36; NHMW 1878/6/8581 + 8582 (part + counterpart), 8584.

Leaves of this species, which are regularly found in association with the *Paliurus* fruits (e.g. in the Lower Miocene of North Bohemia – BŮŽEK 1971), are usually bigger and finely serrate: those from Parschlug partly differ, due to local environmental conditions, in their smaller size and sub-entire margins. Judging from the figure of *Ziziphus protolotus* UNGER (1864), this leaf impression is also an atypical specimen of much smaller size due to ecological conditions. Similar entire leaves of "*Quercus*" *aspera* differ in having basal secondaries that do not run that far towards the apex. The type locality of this species is Bílina-Břešťany (UNGER 1847). Because the typification was omitted in the revision by HABLY et al. (2001), we designate here as the lectotype the specimen no. BP 64.306.1 (Natural History Museum Budapest) figured by UNGER (1847) on pl. 49, fig. 2, and refigured by ETTINGSHAUSEN (1869) on pl. 50, fig. 17 and by HABLY et al. (2001) on pl. 85, fig. 1.

***Paliurus favonii* UNGER**

## Plate 11, Figures 2, 3, 7

- 1847 *Paliurus favonii* UNGER, p. 147, pro parte, pl. 50, fig. 6 left (LMJ 76518, lectotype) (non 7, 8 = *Paliurus tiliaefolius* (A. BR.) BŮŽEK).  
 1850a *Paliurus favonii* UNGER - UNGER, p. 463, pro parte.

Lectotype designated here: LMJ 76518, figured by UNGER (1847: pl. 50, fig. 6 left) - refigured on pl. 11, fig. 7.

Epitype designated here: NHMW 1878/6/8583 - figured on pl. 11, fig. 3.

Additional material: IBUG Ett.coll. 1841, 1842.

Parschlug is the type locality of this species, which was widely distributed in Europe during the Tertiary. Due to pyritisation the specimens from Parschlug usually do not show the characteristic trilocular pattern. In all other respects they match the other records of this kind in Europe. Contrary to the treatment of UNGER (1847) and the recommendation of BŮŽEK (1971: 74), we separate fruits and leaves into two species because they have never been found attached.

*Berchemia* DC.***Berchemia multinervis* (A. BRAUN) HEER**

Plate 11, Figures 4, 5

Material: NHMW 1878/6/2078, 9107, 9108.

Two leaves morphologically corresponding to the type material from Oehningen (HEER 1859: 77, pl. 128, figs. 9-18).

The true generic affiliation remains uncertain because the corresponding leaf morphology occurs in different genera among the Rhamnaceae (BŮŽEK 1971: 74). The only leaves available all derive from ETTINGSHAUSEN's level I.

**Sapindaceae**

Contrary to the other species, the specimen lists of *Acer* species are rather complete due to the monographic studies of *Acer* by STRÖBITZER-HERMANN (2003).

*Acer* L.***Acer tricuspdatum* BRONN**

Plate 10, Figures 10-12

1847 *Acer trilobatum* ALEX. BRAUN – UNGER, p. 130, pro parte, pl. 41, fig. 6.1847 *Acer productum* ALEX. BRAUN – UNGER, p. 131, pro parte, pl. 42, fig. 8 (LMJ 76526).1850a *Acer trilobatum* ALEX. BRAUN – UNGER, p. 450, pro parte.1850a *Acer productum* ALEX. BRAUN – UNGER, p. 451, pro parte.

Additional material: GBA 2002/01/52-54, 55 (part + counterpart); IBUG Ett. coll. 1552-1554, 2809; LMJ 77889, 77892 + 77900A (part + counterpart); NHMW 1845/39/16 + 17 (part + counterpart), 1878/6/2112, 2647A + 2648A (part + counterpart), 8421.

This species is rather rare at Parschlug. Leaf forms called "forma *tricuspdatum*" and "forma *productum*" occur there along with leaves of intermediate morphology. Leaves having the characteristic morphology of "*Acer pyrenaicum*" RÉROLLE, which are common in the Late Miocene and Early Pliocene floras (e.g. KVAČEK et al. 2002 b), are absent at Parschlug.

***Acer pseudomonspessulanum* UNGER emend. STRÖBITZER-HERMANN**

Plate 10, Figures 7-9

- 1847 *Acer pseudomonspessulanum* UNGER, p. 132, pro parte, pl. 43, fig. 2 (LMJ 76522, lectotype).  
 ? 1847 *Acer pseudocampstre* UNGER, p. 133, pro parte, pl. 43, fig. 6.  
 1850a *Acer pseudomonspessulanum* UNGER – UNGER, p. 449, pro parte.  
 ? 1850a *Acer pseudocampstre* UNGER – UNGER, p. 450, pro parte.  
 1878b *Acer decipiens* A. BRAUN – ETTINGSHAUSEN, p. 89, pro parte, pl. 5, fig. 5 (with *Rhytisma aceris* ETTINGSHAUSEN; NHMW 1878/6/6295).  
 1972 *Acer decipiens* AL. BRAUN 1851 sensu novo – WALTHER, p. 121, pro parte, pl. 2, figs. 6 (MMG Parsch. 144/2), 8, pl. 54, fig. 7 (MMG Parsch. 144/2).

Lectotype designated here: LMJ 76522, figured by UNGER (1847: pl. 43, fig. 2) - refigured on pl. 10, fig. 8.

Additional material: GBA 2002/01/56, 57? (vel *Acer integrilobum*), 58; IBUG Ett. coll. 1559? (vel *Acer integrilobum*), one specimen without number; LMJ 77896, 77897? (vel *Acer integrilobum*), 77899, 77903; NHMW 1878/6/2068, 2399? (vel *Acer integrilobum*), 3248 (counterpart to 6295), 9156, 9311.

Leaves small, palmate, 3-lobed, base usually rounded, lobes deeply incised, rather narrow, nearly of the same length, narrowing continuously towards the acute or obtuse apex, margin entire or sometimes with single small teeth.

From the two leaves assigned by UNGER (1847) to *Acer pseudomonspessulanum*, only that on pl. 43, fig. 2 is accepted as the lectotype. The leaf on pl. 43, fig. 1 belongs to *Acer integrilobum*. Against UNGER's opinion, *Acer pseudomonspessulanum* is not the most common species at Parschlug; this distinction goes to *A. integrilobum*.

### *Acer integrilobum* WEBER sensu WALTHER

#### Plate 10, Figures 1-6

- 1847 *Acer pseudomonspessulanum* UNGER, p. 132, pro parte, pl. 43, fig. 1 (LMJ 76531) {non fig. 2 = *Acer pseudomonspessulanum* UNGER emend. STRÖBITZER-HERMANN]  
 1850a *Acer pseudomonspessulanum* UNGER – UNGER, p. 449, pro parte.  
 1878b *Acer decipiens* A. BRAUN – ETTINGSHAUSEN, p. 85, 88, 89, pro parte, pl. 2, figs. 1, 2 (bearing *Hysterium parschlugianum* ETTINGSHAUSEN), pl. 4, fig. 11 (bearing *Xylomites aceris decipientis* ETTINGSHAUSEN), pl. 5, fig. 1 (bearing *Rhytisma aceris* ETTINGSHAUSEN; NHMW 1878/6/6594).

Within the natural variation of this species, two morphological groups can be distinguished among the studied specimens:

#### Group A (Plate 10, Figures 1-4)

Additional material: GBA 2002/01/47 (part + counterpart), 49-51, 57? (vel *Acer pseudomonspessulanum*); IBUG Ett. coll. 83 + 84 (part + counterpart), 1559? (vel *Acer pseudomonspessulanum*), 1565 + 1566 (part + counterpart), 1567 + Nr. 195 (part + counterpart), 1568, 2813 + Nr. 190 (part + counterpart); LMJ 77888, 77894, 77897? (vel *Acer pseudomonspessulanum*); NHMW 1878/6/2327, 2399? (vel *Acer pseudomonspessulanum*), 2533 + 2534 (part + counterpart), 2585, 6596, 8440? + 8441? (part + counterpart), 8444, 8702.

Leaves palmate, 3-lobed; base usually rounded, sometimes obtuse or very rarely cordate (similar to certain leaves of *Acer pseudomonspessulanum*), the basal part of the central-lobe is quite broad, it narrows abruptly at the upper third and has a characteristic acuminate apex; the side-lobes are nearly as long as the central-lobe, their apex is acuminate or acute; sinus between the lobes usually rounded and wide; entire margin, very seldom single, small teeth.

#### Group B (Plate 10, Figures 5-6)

Additional material: GBA 2002/01/48; IBUG Ett. coll. 1259, 1560, 1561 (counterpart to NHMW 1878/6/8445); LMJ 77895, 77898; NHMW 1878/6/2411 + 9157 (part + counterpart), 2412, 2451 (counterpart to 6594), 2544 + 9251 (part + counterpart), 2545, 8445 (counterpart to IBUG Ett. coll. 1561).

Leaves smaller than in group A, palmate, 3-lobed; base usually rounded, very rarely obtuse; central lobe much longer and broader than the very small side lobes; apex of the

lobes acute or attenuate, the tip sometimes rounded; sinus between the lobes rounded and wide; margin entire, sometimes one or two pairs of small teeth on the central lobe and/or on the basal side of the side lobes.

A few leaves show an intermediate position between groups A and B and are therefore difficult to group.

***Acer* sp. div. - fructus**

Plate 10, Figures 13-16

1847 *Acer pseudomonspessulanum* UNGER, p. 132, pro parte, pl. 43, figs. 3 (LMJ 76514), 4.

1847 *Acer pseudocampestre* UNGER, p. 133, pro parte, pl. 43, figs. 8, 9.

1850a *Acer pseudomonspessulanum* UNGER - UNGER, p. 449, pro parte.

1850a *Acer pseudocampestre* UNGER - UNGER, p. 450, pro parte.

Binomina that were originally applied to leaves cannot be used for detached fruits in the same way, contrary to the opinion of, e.g. UNGER (1847), BŮŽEK (1971), TANAI & OZAKI (1977), or TANAI (1983). Classification on the species level of these winged fruits, which are preserved as impressions only, is problematic because the combination with leaf taxa based on reliable feature complexes remains unsolved and the classification of fruits requires preservation of internal structures (cf. MAI 1983, 1984a).

Based on differences in nutlet shape and size, on the course of veins in the wings, and on the distance that the nutlets are enclosed by the wing on the ventral side, 3 different formal groups are distinguish within the material from Parschlug. A few fruits fit none of these groups. It remains to be determined whether the aforementioned features are really diagnostic for segregating natural species, since the observed variation in fruits of extant maple species is very large.

Form-group 1 (Plate 10, Figure 16):

Additional material: IBUG 187, Ett. coll. 1549 + 2873 (part + counterpart), 1550 + 1551 (part + counterpart); NHMW 1853/26/468, 1878/6/8419, 9099, 9242.

Nutlet quadrate or roundish, rarely oval, 6-10 mm long; 6-9 mm wide, wing 15-28.5 mm long, max. 6-12 mm wide, at the contact to the nutlet 3-7 mm wide, length-ratio wing : nutlet = 2.5-2.9; end of the wing cut or, towards the dorsal side, rounded, dorsal side straight, ventral side convex, a few veins initially run in a narrow zone parallel to the dorsal side and then approx. upright towards the ventral side, several times dichotomously ramified, interconnected by several cross-anastomoses, divergence-angle 28°-50°; wing nearly not enclosing the nutlet on the ventral side.

Form-group 2 (Plate 10, Figures 14, ?15):

Additional material: IBUG 104, 188, 189, Ett. coll. 1881, 1980, 2803?, 2902, one specimen without number; LMJ 77891, 77902 (part + counterpart); NHMW 1853/26/476, 1878/6/2582, 2708? + 2709? (part + counterpart), 8416, 8420 + 9243 (part + counterpart), 8551, 9097, 9100?, 9254, 9891.

Nutlet mostly oval, rarely approx. triangular; 7-12 mm long, 3.5-8 mm wide, wing 12-22 mm long, often incomplete, max. 4.5-10 mm wide, often incomplete, at the contact to the nutlet 3.5-5 mm wide, length-ratio wing : nutlet = 1.7-3; end of the wing round-

ed, dorsal side straight or slightly convex, ventral side more or less convex, several veins initially run parallel to the dorsal side and then approx. upright or  $<90^\circ$  towards the ventral side, several times dichotomously ramified; divergence-angle  $25^\circ$ - $58^\circ$ , wing enclosing about one third of the nutlet's ventral side.

Form-group 3 (Plate 10, Figure 13):

Additional material: IBUG Ett. coll. 1122 + 1564 (part + counterpart), one specimen without number (counterpart to NHMW 1878/6/8447); NHMW 1878/6/8447 (counterpart to IBUG without number), 9158, 9253.

Nutlet roundish, 4-4.5 mm long; 3.5 mm wide, wing 11.5-19 mm long, max. 7.5-8.5 mm wide, sometimes incomplete; at the contact to the nutlet 3-3.5 mm wide; length-ratio wing : nutlet = 2.9-4.8; end of wing rounded, dorsal side mostly straight or rarely somewhat convex, ventral side more or less convex, several veins initially run parallel to the dorsal side and then approx. upright or  $<90^\circ$  towards the ventral side, several times dichotomously ramified; divergence-angle (measurable only in one specimen)  $60^\circ$ ; wing nearly not enclosing the nutlet on the ventral side.

Specimens that do not fit in any of the groups: IBUG Ett. coll. 1557 + 1558 (part + counterpart); LMJ 76514.

#### Anacardiaceae

##### *Toxicodendron* MILL.

#### ***Toxicodendron herthae* (UNGER) Z. KVAČEK & WALTHER**

Plate 9, Figures 17-19

1850a *Rhus herthae* UNGER – UNGER, p. 473.

1850a *Juglans melaena* UNGER, p. 470.

1860 *Rhus herthae* UNGER – UNGER, p. 42, pl. 20, figs. 7, 8 (LMJ 76562, lectotype), 9 (LMJ 76551, syntype).

1860 *Juglans melaena* UNGER – UNGER, p. 38, pl. 19, figs. 8-10.

Lectotype designated here: LMJ 76562, figured by UNGER (1860: pl. 20, fig. 8) – refigured on pl. 9, fig. 17.

Additional material: NHMW 1878/6/2027 det. by ETTINGSHAUSEN as *Juglans parschlugiana*, 1878/6/9252 + 2543 (part + counterpart) det. as *Acer decipiens*.

The species concept for *Fagus herthae* (with the basionym of *Rhus herthae* UNGER 1849) that was proposed by ILJINSKAYA (1962 and 1964) is not based on the original diagnosis and material from Parschlug. It must be rejected along with the therein-selected type specimen. The nomenclature of this species has been discussed in detail by KVAČEK & WALTHER (1998: 27). The nearest living relative has not yet been established.

##### ? *Cotinus* MILL.

#### ***Cotinus* (?) *aizoon* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

Plate 11, Figures 6, 8-10

1847 *Rhamnus aizoon* UNGER, Chlor. prot., p. 146, pro parte, pl. 50, figs. 1 right, 2 - basionym.

1850a *Rhamnus aizoon* UNGER – UNGER, p. 464.



- 1850a *Celastrus cuneifolius* UNGER, p. 459.  
 1864 *Rhamnus aizoon* UNGER – UNGER, p. 17, pl. 3, figs. 44 (LMJ 76575, lectotype), 45, 46.  
 1864 *Pittosporum cuneifolium* (UNGER) UNGER, p. 6, pl. 1, figs. 14, 15.  
 1878b *Rhamnus aizoon* UNGER - ETTINGSHAUSEN, p. 86, pl. 3, fig. 9 (NHMW 1878/6/6553 bearing *Xylomites rhamni aizoonis* ETTINGSHAUSEN).

Lectotype designated here: LMJ 76575, figured by UNGER (1864: pl. 3, fig. 44) – refigured on pl. 11, fig. 8.  
 Additional material: GBA 2002/01/8, 11, 74, ? 75; LMJ 77607.

Broadly obovate leaves, petiolate, leaf apex emarginate and slightly mucronate, secondary veins camptodromous, relatively densely spaced.

SAPORTA (1865: 352 (208), pl. 12, fig. 6 (erronously 7 in the text)) described a similar leaf from the Oligocene of Armissan as *Rhus palaeocotinus* SAPORTA and mentioned that the leaf apex is not characteristic of the extant nearest relative *Rhus cotinus* L. (now *Cotinus coggygria* SCOP.). Due to poor preservation we are unable to discern the marginal vein that joins all secondaries in the foliage of extant *Cotinus*, which would help to corroborate the suggested affinity.

A similar but finely toothed and short, petiolate leaf was discovered under GBA 2002/01/73. This specimen weakens the probability that the entity as circumscribed above belongs to *Cotinus*.

The specimen figured by UNGER (1847: pl. 3, fig. 44) should be in the collection LMJ but is at present missing.

#### Simaroubaceae

#### *Ailanthus* DESF.

#### ***Ailanthus pythii* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

#### Plate 14, Figures 2-5

- 1850a *Sapindus pythii* UNGER, Gen. spec. pl. foss., p. 457 - basionym.  
 1850a *Juglans elaeoides* UNGER, p. 469, pro parte.  
 1850a *Quercus zoroastri* UNGER, p. 401, pro parte.  
 1850a *Rhus elaeodendroides* UNGER, p. 474.  
 1850b *Juglans elaeoides* UNGER – UNGER, p. 179, pro parte, pl. 53 fig. 3 (LMJ 76542 + 77652, part + counterpart).  
 1852 *Quercus zoroastri* UNGER – UNGER, p. 36, pro parte, pl. 18, fig. 9, (non 7 and 8).  
 1860 *Sapindus pythii* UNGER – UNGER, p. 33, pl. 14, figs. 6, 7, 8 (LMJ 76557, lectotype), 9-17.  
 1860 *Fraxinus primigenia* UNGER – UNGER, p. 22, pro parte, pl. 8, figs. 3, 8 ?.  
 1860 *Rhus elaeodendroides* UNGER – UNGER, p. 45, pro parte, pl. 21, figs. 4, 5, 11.  
 1878b *Sapindus pythii* UNGER – ETTINGSHAUSEN p. 85, pl. 3, fig. 5 (bearing *Sphaeria palaeo-sapindi* ETTINGSHAUSEN, NHMW 1878/6/6484).

Lectotype designated here: LMJ 76557, figured by UNGER (1860: pl. 14, fig. 8) - refigured in pl. 14, fig. 4

Additional material: NHMW 1878/6/2649 + 2650 (part + counterpart) determined by ETTINGSHAUSEN as *Pistacia lentiscus*, 1878/6/2031, 2525a, 2527, 2554 a.

GBA 2002/01/9,10.

Leaflets of the same morphology were described recently as *Ailanthus mecsekensis* HABLY (2001) from a fossiliferous layer at Magyaregregy with a mass occurrence of the *Ailanthus confucii* fruits. We believe that *A. mecsekensis* is conspecific with *A. pythii*.

The relationship to *Ailanthus* is also well documented by long petiolules, although fruits of the genus have been rarely documented at Parschlug. At Parschlug, *Fraxinus* fruits are also rarely preserved in association with the above leaflets and compound leaves, but the irregularly toothed to almost entire leaf margin and very long petiolules are certainly not typical for foliage of ash.

***Ailanthus confucii* UNGER**

Plate 11, Figure 11

Material: NHMW 1878/6/2121, 2606.

The specimens available are both incomplete fruits of *Ailanthus*. They correspond, as far as we can judge, to the populations from Erdőbénye and Magyaregregy (HABLY 2001).

Oleaceae

*Fraxinus* L.

***Fraxinus primigenia* UNGER**

Plate 11, Figures 12-15

1850a *Fraxinus primigenia* UNGER, p. 431, pro parte.

1860 *Fraxinus primigenia* UNGER - UNGER, p. 22, pro parte, pl. 8, fig. 1.

Neotype designated here NHMW 1878/6/8155 – figured on pl. 11, fig. 13.

Additional material: NHMW 1878/6/8156, 9889; IBUG Ett. coll. 1384, 1385 + 1386 (part + counterpart) det. by ETTINGSHAUSEN as *Fraxinus pachyptera*, 1387 as *Fraxinus praexcellior*.

Ash fruits are recorded at many sites of the European Tertiary, particularly in riparian assemblages, e.g. KOVAR-EDER & KRÄINER (1991). In our opinion, their morphology does not allow separation to the species level. The associated leaves have not yet been recognised among the leaf fossils of Parschlug. Ash leaflets or complete leaves have often been misinterpreted for the Juglandaceae (KVAČEK & HURNÍK 2000), mostly as *Juglans bilinica* UNG.

Apocynaceae

*Nerium* L.

***Nerium* sp.**

Plate 11, Figures 16-18

Material: NHMW 11878/6/7177, 8173, 8175.

Slender, coriaceous leaves, width 10-25 mm, incomplete length max. 70 mm, base cuneate decurrent; petiole stout, straight, leaf apex missing, margin entire at the base, in the upper parts slightly wavy, midvein stout, straight, secondaries very densely spaced, thin, of almost the same thickness, originating at wide angles, running parallel, looping each other near the margin.

Similar leaves are known from the European Neogene and are usually compared with or assigned to *Nerium oleander*, e.g. RIEDERLE & GREGOR (1997: pl. 11, figs. 1-5 – as aff. *Nerium* sp.) from Kirtberg, Bavaria, Upper Freshwater Molasse, Early-Middle Miocene, PALAMAREV & PETKOVA (1987: 141, pl. 36, fig. 6) from Rucinzi, Bulgaria, Sarmatian (Central Paratethys stage), Middle Miocene; GIVULESCU (1962: 165, fig. 180) - Valea Neagra, Pannonian, Late Miocene. BERGER (1952: 105) described foliage as *Nerium bilanicum* ETTINGSHAUSEN from Vösendorf (Vienna, Pannonian E, Late Miocene). The latter binomen is inappropriate because the type specimen of *N. bilanicum* derives from Kučlín (Late Eocene) and its venation does not correspond to that of *Nerium* (HABLY et al. 2001: pl. 23, fig. 6). The specimens from Vösendorf were not available for reinvestigation. Although the venation pattern seems to be very similar to that of *Nerium*, we are unable to decide whether an intramarginal vein, which would point towards the Lythraceae (*Decodon*, see KVAČEK & SAKALA 1999), exists.

Although sometimes resembling "*Quercus*" *daphnes* due to the coriaceous lamina and the dense secondary venation, *Nerium* can be distinguished by the narrow cuneate decurrent leaf base and the almost equally thick secondaries, whereas in "*Quercus*" *daphnes* the intersecondaries between the secondaries can be clearly distinguished.

In the ETTINGSHAUSEN collection IBUG, a cylindrical capsule narrow elongate and slightly bent in shape (Ett. coll. 1405) has been determined by ETTINGSHAUSEN as *Catalpa europaea* n. sp. It may belong to *Nerium* as well.

## Monocotyledoneae

### Smilacaceae

#### *Smilax* L.

#### ***Smilax sagittifera* HEER emend. HANTKE**

Plate 11, Figures 19, 20

1847 *Smilacites sagittata* UNGER, p. 129, pl. 40, fig. 4.

1850a *Smilacites sagittata* UNGER - UNGER, p. 317.

1851 *Smilax sagittata* (UNGER) A. BRAUN in STIZENBERGER, p. 75 (non *Smilax sagittata* HAMILTON).

Material: GBA 1847/03/20; IBUG Ett. coll. 400; NHMW 1878/6/7190 + 7191 (part + counterpart) det. by ETTINGSHAUSEN as *Smilax grandifolia*; IBUG Ett. coll. 399 as *Smilax* cf. *sagittifera*.

Most specimens from Parschlug match in lamina shape the morpho-species as circumscribed from Oehningen (HANTKE 1954). Although the cuticle was separated by a routine maceration from specimen NHMW 1878/6/ 7190 + 7191, diagnostic structures including the cell structure and stomata are not preserved. The specimen IBUG Ett.coll. 399 can be assigned to *Smilax* based on the venation pattern. However, the characteristic cordate base is not developed.

Although the type specimen is not available, we see no reason why ILJINSKAYA & SHTEFYRTSA (1971: 180) hesitated to assign *Smilacites sagittatus* UNGER (1847: pl. 40, fig. 4) directly to the genus *Smilax*.

### Monocotyledoneae gen. et sp. indet.

- 1850a *Cyperites tertarius* UNGER, p. 313.  
 1850a *Sparganium acheronticum* UNGER, p. 327.  
 1852 *Cyperites tertarius* UNGER - UNGER, p. 14, pl. 5, fig. 5 (LMJ 76511).  
 1852 *Sparganium acheronticum* UNGER - UNGER, p. 17, pl. 7, fig. 2.

Additional material: NHMW 1878/6/2675.

These monocotyledonous leaf fragments lack diagnostic features. The scarcity of monocotyledonous leaves at Parschlug is remarkable.

### Angiosperms incertae sedis

fam. et gen. indet.

#### **"*Celastrus*" europaea UNGER**

Plate 12, Figures 1, 2

- 1850a *Celastrus europaeus* UNGER, p. 459.  
 1864 *Celastrus europaeus* UNGER - UNGER, p. 10, pl. 2, figs. 10 (LMJ 76576, lectotype), 11 (LMJ 76581, syntype), 12 (LMJ 76563, syntype), 13.

Lectotype designated here: LMJ 76576, figured by UNGER (1864: pl. 2 fig. 10) - refigured on pl. 12 fig. 1.

Morphologically, these leaves correspond with *Dicotylophyllum deichmuelleri* Z. KVAČEK & WALTHER (1998: 14). As the epidermal structures are not preserved on the specimens from Parschlug, we refrain from merging them with this species from the Lower Oligocene of North Bohemia.

Smaller leaves of "*Celastrus*" *europaea* are even more reminiscent of narrower leaves of "*Evonymus*" *latoniae* UNGER mentioned below.

#### **"*Cornus*" ferox UNGER**

Plate 12, Figures 6, 7

- 1850a *Cornus ferox* UNGER, p. 441, pro parte.  
 1851a *Pterospermum ferox* ETTINGSHAUSEN, p. 22, pl. 4, fig. 4.  
 1864 *Hardenbergia orbis veteris* UNGER, p. 23, pl. 5, fig. 5.  
 1866 *Cornus ferox* UNGER - UNGER, p. 76, pl. 24, fig. 21.  
 1878b *Aristolochia parschlugiana* ETTINGSHAUSEN, p. 88, pl. 4, fig. 9 (NHMW 1878/6/6566 + 8109 part + counterpart, bearing *Xylomites aristolochiae*) (nomen).

Neotype designated here: NHMW 1878/6/6566 + 8109 (part + counterpart), figured by ETTINGSHAUSEN (1878 b: pl. 4, fig. 9) - refigured on pl. 12, fig. 6.

Although no exact affinities can currently be suggested, we reject the affinity to the Cornaceae because of the slightly cordate leaf base and the basal origin of the first pair of secondaries. *Aristolochia* is also rather unlikely. So-called *Aristolochia aesculapi* HEER has been transferred by BŮŽEK (1971) to *Diversiphyllum* (? Convolvulaceae).

**"*Evonymus*" *latoniae* UNGER**  
Plate 12, Figures 3-5

1850a *Evonymus latoniae* UNGER, p. 460.

1864 *Evonymus latoniae* UNGER - UNGER, p. 11, pl. 2, fig. 25 (LMJ 76574 + 76573, part + counterpart, lectotype).

Lectotype designated here: LMJ 76574 + 76573, (part + counterpart), figured by UNGER (1864: pl. 2, fig. 25) - refigured on pl. 12 fig. 3.

Additional material: NHMW 1878/6/2063 det. by ETTINGSHAUSEN as *Rhus elaeodendroides* UNGER, 1878/6/2742 as *Celastrus* sp. nov., 1878/6/9176 as *Celastrus europaeus* UNGER.

Marginal teeth glandular, regularly spaced, of almost equal size.

Superficially, these leaves resemble "*Celastrus*" *europaeus*, but they differ in the leaf margin as indicated above.

**"*Quercus*" *daphnes* UNGER**  
Plate 12, Figures 10-15

? 1847 *Quercus chlorophylla* UNGER, p. 111, pl. 31, fig. 1.

1847 *Quercus daphnes* UNGER, p. 112, pl. 31 figs. 2, 3 (LMJ 76525, lectotype).

1847 *Quercus elaena* UNGER, p. 112, pl. 31, fig. 4.

1850a *Quercus daphnes* UNGER - UNGER, p. 402.

? 1850a *Quercus chlorophylla* UNGER - UNGER, p. 402.

1850a *Quercus elaena* UNGER - UNGER, p. 402.

1850a *Achras lycobroma* UNGER, p. 435.

1850a *Rhododendron flos saturni* UNGER, p. 440.

1866 *Achras lycobroma* UNGER, p. 23, pro parte, pl. 8, fig. 1 (LMJ 76591).

1866 *Rhododendron flos saturni* UNGER - UNGER, p. 38, pl. 12 fig. 15 (LMJ 76590 counterpart).

? 1866 *Myrsine doryphora* UNGER - UNGER, p. 19, pl. 6, fig. 10.

1878b *Quercus daphnes* UNGER - ETTINGSHAUSEN, p. 86, pl. 3, fig. 8 (NHMW 1878/6/6549 + 9457 part + counterpart), pl. 4, fig. 5 (NHMW 1878/6/6550 bearing *Xylomites daphnes* ETTINGSHAUSEN).

Lectotype designated here: LMJ 76525, figured by UNGER (1847: pl. 31, fig. 3) – refigured on pl. 12, fig. 15.

Epitype designated here: LMJ 76590 - counterpart of the specimen figured by UNGER (1866: pl. 12, fig. 15) - refigured on pl. 12, fig. 11 a, b.

Additional material: GBA 1847/03/10, 2002/01/13; IBUG Ett. coll. 966; NHMW - all det. by ETTINGSHAUSEN - NHMW 1845/39, 1878/6/2375, 7557 as *Quercus chlorophylla* UNGER, NHMW 1878/6/2774, 9425, 9455, 9459 as *Quercus daphnes* UNGER, 1878/6/9460; 1878/6/8234 as *Sapotacites longepetiolatus* ETT., 1878/6/7850 as *Laurus palaeo-benzoin* ETTINGSHAUSEN.

Leaves with characteristically densely spaced secondaries and intersecondaries. The characteristic venation is poorly visible in the specimen of *Q. chlorophylla* (UNGER 1847: 111, pl. 31, fig. 1), which is not available.

Leaves with similar venation pattern can be found in different families such as Apocynaceae, Rosaceae, Myrsinaceae, and Sapotaceae but not in the Fagaceae.

*Antholithes* BRONGNIART***Antholithes stiriacus* KOVAR-EDER & Z. KVAČEK sp. nov.**

Plate 15, Figures 13-15

1850a *Celastrus elaeagnus* UNGER, p. 459, pro parte.1864 *Prinos hyperboreus* UNGER - UNGER, p. 14, pro parte, pl. 3, fig. 34 a, b.

Holotype designated here: NHMW 1878/6/9870 det. by ETTINGSHAUSEN as *Smilax grandifolia* – figured on pl. 15, fig. 15.

Additional material: IBUG Ett. coll. 415, 427, 432 det. by ETTINGSHAUSEN as *Asterocalyx stiriacus*.

Inflorescence (? partial) loosely botryoidal, flower short stalked, actinomorphic, octomeric, half-epigynous (?), calyx shortly synsepalous, cup-like, 3-5 mm long, free tips of sepals very narrow elliptic, blunt at the apex, about 1-2 mm long and 0.3-0.5 mm wide, corolla very shortly sympetalous (?) or choripetalous, 5-6 mm in diameter, petals nearly linear to narrowly obovate, about 2.5 mm long and 0.5 mm wide.

UNGER (1850a) assigned these flower remains to *Celastrus* and later changed his mind and associated them with *Prinos* (i.e. *Ilex*) *hyperboreus*, which he initially based on leaves only (UNGER 1850a: 462, 1864: 14). ETTINGSHAUSEN (in his catalogue IBUG) supposed these remains to belong to *Smilax*. He described as *Asterocalyx stiriacus* (ETTINGSHAUSEN 1888) a heterogenous entity based on leaves and flowers from Leoben-Münzenberg (type material is missing). The leaf figured there on pl. 3, fig. 4 is *Smilax*. The inflorescence and flower remains on figs. 1 to 3 belong to the species described above. ETTINGSHAUSEN (1890: 83) described the same type of flowers from Schöneegg and compared them with the Dioscoreaceae. None of the suggested groups are similar in the composition of flowers. The Celastraceae usually have 4- or 5-merous flowers, the Smilacaceae and Dioscoreaceae differ also in the flower diagram \* P 3+3 or P (3+3) A 3+3, as is often the case among monocotyledons. Of the dicotyledonous families that come into question, the Aquifoliaceae sometimes have more than 4-5-merous flowers. The Sapotaceae contain genera with small octomeric flowers, e.g. \* K (4)+(4) C (4)+(4) A 8+8+8 G (8) in *Madhuca* GMEL. (PENNINGTON 1991), which may correspond to *A. stiriacus*. *Antholithus* sp. from the Randeck Maar (GREGOR 1986: pl. 4, fig. 12) and Kirrberg near Balzhausen (RIEDERLE & GREGOR 1997: pl. 3, fig. 11, pl. 5, fig. 5) belongs to the same species. Also at Magyaregragy the same type of flowers is abundant (HABLY, personal communication). We lack evidence of pollen in situ, which would certainly help to decipher the affinities. The generic name *Asterocalyx* proposed by ETTINGSHAUSEN (1888) endangers the name in current use of the genus *Astrocalyx* MERRILL (Melastomataceae), being its early orthographic variant. In our opinion it should be proposed into the list of nomina rejicienda. We suggest to typify the genus *Asterocalyx* ETTINGSHAUSEN by the leaf (*A. stiriacus* ETTINGSHAUSEN 1888: pl. 3, fig. 4) and to include it into the synonymy of *Smilax*.

*Cypselites* HEER***Cypselites* sp.**

Plate 15, Figure 16

Material: IBUG Ett. coll. 1374.

Narrow elongated seed, 6 mm long, longitudinally striate, with a slender, 1-mm-long stalk. Coma not preserved.

Such seeds were previously described as fruits of Compositae (HEER 1859: 2). Later, REID & CHANDLER (1926) recognised in such remains the seeds of the Apocynaceae. The generic name *Cypselites* HEER has priority over *Apocynospermum* E.E.M. REID & CHANDLER.

*Saportaspermum* MEYER & MANCHESTER

***Saportaspermum* sp.**

Plate 15, Figures 6-8

1850a *Robinia hesperidum* p. 487, pro parte.

1864 *Robinia hesperidum* UNGER - UNGER, p. 21, pro parte, pl. 4, fig. 14.

Additional material: GBA 2002/01/30, 33, 97-98; IBUG Ett. coll. 1343, 1346, 1349 +1350 (part+counterpart) det. by ETTINGSHAUSEN as *Embothrium parschlugianum* ETTINGSHAUSEN, 1357 as *Embothrium post-sotzkianum* ETTINGSHAUSEN, 1358 as *Embothrium subboreale* ETTINGSHAUSEN.

NHMW 1878/6/2796, 2797, 8018, 8023 + 8024 (part + counterpart), 8025, 8028, 8029, 8033, 8034, 8035, 8036, 9904 det. by ETTINGSHAUSEN as *Embothrium parschlugianum* ETTINGSHAUSEN, 1878/6/8002 and 8003 as *Hakea parschlugiana* ETTINGSHAUSEN, 1878/6/8014, 8017 as *Embothrium affine* ETTINGSHAUSEN.

Winged seeds of this kind are widespread in Europe, starting from the Eocene. This morpho-genus was established in North America and typified by *Saportaspermum occidentale* MEYER & MANCHESTER (1997). The population from Parschlug is represented by numerous specimens and is morphologically more variable; it clearly belongs to another species. The same kind of seeds was described by ETTINGSHAUSEN (1890) from Schönegg (and Parschlug) as *Embothrium parschlugianum*. ETTINGSHAUSEN (1888) has referred to some other seeds of similar morphology and slightly different size and shape as *Embothrium sotzkianum*, *E. salicinum* and other binomina from the Leoben area. The whole set of these morpho-taxa requires a broader study within Europe to set limits between the species. The affinities of these enigmatic winged seeds remain doubtful.

? *Chaneya* WANG & MANCHESTER

? ***Chaneya* sp.**

Plate 12, Figures 8, 9

Material: IBUG Ett. coll. 2983, 2984, (both level II); NHMW 1878/6/8741, 8742.

Pentamerous calyces, partly incomplete, without fruits preserved, obviously epigynous. Sepals entire, sessile, only shortly fused, narrow elliptic, parallel-sided in some cases, 3-6 mm wide and 14 to 20 mm long. Venation reticulate, consisting of narrow elongate meshes between several closely spaced primaries.

In Europe, such fossils have usually been assigned to *Porana* (e.g. HEER 1859, ETTINGSHAUSEN 1888: pl. 9, fig. 19) and *Monotes* (WEYLAND 1937). A detailed study of more complete material from the Tertiary of Asia and North America (WANG & MANCHESTER 2000) revealed basic discrepancies between the morphology of the fossil fruits and the mentioned genera, which resulted in the erection of a new fossil genus

*Chaneya* WANG & MANCHESTER. These authors found notable similarities with certain members of the Simaroubaceae, namely *Picrasma* BL. (W. Himalayas to Japan and Fiji). The fossils described above may belong to *Chaneya*, but a more detail study of the European *Chaneya*-like fossils is required, including the type material of "*Porana*" from Oehningen (HEER 1859).

*Dicotylophyllum* SAPORTA

***Dicotylophyllum* sp. 1**

Plate 15, Figure 1

Material: NHMW 1878/6/2091.

A twig with three leaves, two of them basal fragments, the third 52 mm long and 17 mm wide, short-petiolate, base acute/cuneate, shape of lamina slender elliptic to slightly obovate, lamina basally entire-margined, in the upper part widely, simply, bluntly serrate, sinus acute; venation semicraspedodromous, poorly preserved, secondaries densely spaced, indistinct, originating at wide angles, looping near the leaf margin; loops connected with the teeth by veinlets. Affinities doubtful.

***Dicotylophyllum* sp. 2**

Plate 15, Figures 2, 3

1878b *Quercus serra* UNGER - ETTINGSHAUSEN, p. 86, pro parte, pl. 4, fig. 7 (NHMW 1878/6/6555).

Additional material: GBA 2002/01/109.

Narrow oblong, slender leaves (? leaflets), length 46 mm (complete specimen) and 60 mm (fragment), width 8 and 16 mm; base acute, slightly asymmetrical, probably sessile, apex attenuate; margin regularly, densely serrate, tooth apices rounded; midvein straight, secondaries poorly preserved, thin, relatively densely spaced, angles of origin 30- 40°.

Only two specimens have been discovered among all the investigated material. The morphology is reminiscent of *Sorbus* species with compound leaves, but the rounded teeth of the fossils are different. They are less comparable with *Prinsepia* foliage.

***Dicotylophyllum* sp. 3**

Plate 15, Figures 9, 10

Material: GBA 2002/01/20; NHMW 1878/6/8571.

Two obovate/spatulate leaves, shortly petiolate, base cuneate/decurrent, apex rounded, length 27 and 29 mm, width 11 and 13 mm, leaf margin basally entire, in the apical part shallowly crenulate; primary vein straight, secondaries indistinct, densely spaced, running rather steep across the lamina.

These leaves designated here as *Dicotylophyllum* sp. 3 recall *Celastrus noatica* UNGER (1864: 7, pl. 2, figs. 2, 3), but the shape of the lamina is more elliptical and the secondary veins are more distinct in the latter.



***Dicotylophyllum* sp. 4**  
Plate 15, Figure 11

Material: GBA 2002/01/21.

Leaf lamina sub-orbiculate, 90 mm long (but base and apex missing), 72 mm wide; venation acrodromous (whether basal or subbasal cannot be decided), simple craspedodromous, margin simply to occasionally double serrate, teeth acuminate, from the (sub)basal lateral main veins numerous veins originate at the basal part and run towards the margin, ending in the primary teeth, occasional secondary teeth present; tertiaries forked-percurrent.

This leaf cannot be assigned to *Platanus leucophylla* because the marginal teeth are not hooked, are relatively regularly spaced and the leaf is not trilobate. The teeth are reminiscent of *Davidia*, but the acrodromous venation is not characteristic of this genus. Also Vitaceae foliage comes into question. Similar large leaves, which clearly belong to *Celtis*, occur at Bílina (personal observation of Z. KVAČEK).

***Dicotylophyllum* sp. 5**  
Plate 15, Figure 12

Material: NHMW 1878/6/7507.

Upper part of an elongate lamina, 90 mm long, 33 mm wide, apex attenuate (although not complete), leaf margin simple serrate, apically crenate rather than serrate, teeth widely but relatively regularly spaced and small, sometimes sharp; venation (semi) craspedodromous, midvein straight, secondaries widely spaced (up to 13 mm), running relatively steep across the lamina (35-45°), sometimes forking at variable distances from the midrib, their branches either forming loops near the margin or sending veinlets into the teeth or directly entering the teeth.

It cannot be excluded that this fragment represents *Fraxinus* foliage. However, the true affinities are obscure.

***Dicotylophyllum* sp. 6**  
Plate 15, Figures 4, 5

Material: IBUG Ett. Coll. 1083, 1084.

Two apical fragments of elongate slender leaves, apex attenuate, margin regularly simply toothed, basal side of the teeth convex, apical side convex-concave, tooth apex acute or rounded; venation simple craspedodromous, secondaries originating at an angle of 45-55° from the midvein, tertiaries forked-percurrent.

In our opinion the similarity of these fragments to *Myrica lignitum* is only superficial and their true affinity remains obscure.

***Dicotylophyllum* sp. div.**

All those leaves which offer no distinct morphological characters to be safely recognized again elsewhere and still were given species names and described by UNGER, are united under this heading. In all these cases we were unable to discern useful morpho-types of foliage.

- 1850a *Amorpha stiriaca* UNGER, p. 486, pro parte.  
 1864 *Amorpha stiriaca* UNGER – UNGER, p. 20, pro parte, pl. 4, fig. 5 (leaf).  
 1850a *Andromeda glauca* UNGER, p. 438.  
 1866 *Andromeda glauca* UNGER – UNGER, p. 35, pl. 12, fig. 1.  
 1850a *Apocynophyllum lanceolatum* UNGER, p. 434.  
 1866 *Myrsine doryphora* UNGER, p. 19, pl. 6, fig. 10.  
 1850a *Azalea hyperborea* UNGER, p. 440.  
 1866 *Azalea hyperborea* UNGER – UNGER, p. 40, pl. 12, figs. 21 (LMJ 76583), 22.  
 1850a *Capparis ogygia* UNGER, p. 443.  
 1864 *Physolobium kennedyaefolium* UNGER, p. 22, pl. 5, fig. 1.  
 1850a *Cassia ambigua* UNGER, p. 492.  
 1864 *Cassia ambigua* UNGER – UNGER, p. 29, pl. 10, fig. 9.  
 1850a *Cassia memnonia* UNGER, p. 492.  
 1864 *Cassia memnonia* UNGER – UNGER, p. 29, pl. 10, figs. 4, 5.  
 1850a *Celastrus elaeagnus* UNGER, p. 459.  
 1864 *Celastrus elaeagnus* UNGER – UNGER, p. 10, pl. 2, figs 16-19.

The specimens shown in UNGER (1864: figs. 18, 19) may represent small leaves of *Myrica lignitum*.

- 1850a *Celastrus cassinefolius* UNGER, p. 459, pro parte.  
 1864 *Celastrus cassinefolius* UNGER, p. 7, pl. 2, fig. 1.  
 1850a *Celastrus cassinefolius* UNGER, p. 459, pro parte.  
 1864 *Celastrus noaticus* UNGER – UNGER, p. 7, pl. 2, figs. 2, 3 (LMJ 76539).  
 1850a *Cotoneaster andromedae* UNGER, p. 482.  
 1866 *Cotoneaster andromedae* UNGER – UNGER, p. 59, pl. 18, fig. 11 (LMJ 76586), 12 (LMJ 76585).  
 1866 *Cotoneaster pusillus* UNGER, p. 59, pl. 18, fig. 13.  
 1850a *Glycyrrhiza blandusiae* UNGER, p. 486, pro parte.  
 1864 *Glycyrrhiza blandusiae* UNGER – UNGER, p. 20, pro parte, pl. 4, figs. 8-10.  
 1864 *Ilex similaris* UNGER, p. 13, pl. 3, fig. 14.  
 1850a *Ledum limnophilum* UNGER, p. 441.  
 1866 *Ledum limnophilum* UNGER – UNGER, p. 40, pl. 12, figs. 25, 26.  
 1850a *Myrica deperdita* UNGER, p. 395.  
 1852 *Myrica deperdita* UNGER – UNGER, p. 32.  
 1850a *Myrtus miocenica* UNGER, p. 480.  
 1866 *Myrtus miocenica* UNGER, p. 57, pl. 18, fig. 6.  
 1850a *Nemopanthes angustifolius* UNGER, p. 462.  
 1864 *Nemopanthes angustifolius* UNGER – UNGER, p. 15, pl. 3, fig. 35 (LMJ 76567).  
 1850a *Phaseolites orbicularis* UNGER, p. 488.  
 1864 *Physolobium orbiculare* (UNGER) UNGER, p. 22, pl. 5, fig. 3.  
 1850a *Phaseolites physolobium* UNGER, p. 488.  
 1864 *Physolobium antiquum* UNGER, p. 21, pl. 5, fig. 4.  
 1850a *Phaseolites serratus* UNGER, p. 488.  
 1850a *Pistacia lentiscoides* UNGER, p. 473.  
 1860 *Pistacia lentiscoides* UNGER – UNGER, p. 46, pl. 21, fig. 14.  
 1847 *Ilex parschlugiana* UNGER, p. 148, pl. 50, fig. 8.

- 1850a *Ilex parschlugiana* UNGER – UNGER, p. 461.  
 1850a *Ilex stenophylla* UNGER, p. 461.  
 1864 *Ilex stenophylla* UNGER – UNGER, p. 14, pl. 3, figs. 15-19.

The specimens shown in UNGER (1864: figs. 15, 16) may constitute *Myrica lignitum*.

- 1850a *Prunus atlantica* UNGER, p. 484, pro parte.  
 1866 *Prunus atlantica* UNGER – UNGER, p. 61, pro parte, pl. 18, fig. 26.  
 1850a *Prunus paradisiaca* UNGER, p. 484, pro parte.  
 1866 *Prunus paradisiaca* UNGER – UNGER, p. 62, pro parte pl. 18, fig. 29 (leaf).  
 1850a *Pyrus euphemes* UNGER, p. 481.  
 1850b *Pyrus euphemes* UNGER – UNGER, p. 183, pl. 59, fig. 10 (LMJ 76548).  
 1850a *Pyrus minor* UNGER, p. 481.  
 1850b *Pyrus minor* UNGER – UNGER, p. 183, pl. 59, fig. 16 (LMJ 76547).  
 1850a *Pyrus theobroma* UNGER, p. 481.  
 1850b *Pyrus theobroma* UNGER – UNGER, p. 183, pl. 59, fig. 5 (LMJ 76550).  
 1852 *Quercus gmelini* A. BRAUN – UNGER, p. 36, pl. 18, fig. 10.  
 1847 *Quercus hamadryadum* UNGER, p. 110, pl. 30, fig. 8.  
 1850a *Quercus hamadryadum* UNGER – UNGER, p. 400.  
 1852 *Quercus myricaefolia* UNGER, p. 37, pl. 18, fig. 12.  
 1850a *Quercus myrtilloides* UNGER, p. 404, pro parte.  
 1852 *Quercus myrtilloides* UNGER – UNGER, p. 38, pro parte, pl. 18, fig. 18 (LMJ 76490), 19, 20.  
 1850a *Rhamnus aizoides* UNGER, p. 464.  
 1864 *Rhamnus aizoides* UNGER – UNGER, p. 17, pl. 3, fig. 47 (LMJ 76565).  
 1850a *Rhamnus degener* UNGER, p. 464.  
 1864 *Rhamnus degener* UNGER – UNGER, p. 18, pl. 3, fig. 49.  
 1850a *Rhamnus pygmaeus* UNGER, p. 465.  
 1864 *Rhamnus pygmaeus* UNGER – UNGER, p. 18, pl. 3, fig. 48.  
 1850a *Rhus cuneolata* UNGER, p. 474.  
 1860 *Rhus cuneolata* UNGER – UNGER, p. 44, pl. 20, fig. 12 (LMJ 76553).  
 1850a *Rhus elaeodendroides* UNGER, p. 474.  
 1860 *Rhus elaeodendroides* UNGER – UNGER, p. 45, pro parte, pl. 21, figs. 1-3, 6-8 (LMJ 76558), 9, 10 (LMJ 76556).

This taxon is a highly heterogeneous group.

- 1850a *Rhus napearum* UNGER, p. 474.  
 1860 *Rhus napearum* UNGER – UNGER, p. 43, pl. 20, fig. 11 (LMJ 76561).  
 1850a *Rhus retine* UNGER, p. 475.  
 1860 *Rhus retine* UNGER – UNGER, p. 43, pl. 20, fig. 10.

Although this leaf is reminiscent of Lauraceae we think the secondaries are too regular and too densely spaced.

- 1850a *Rhus zanthoxyloides* UNGER, p. 474.  
 1860 *Rhus zanthoxyloides* UNGER – UNGER, p. 45, pl. 21, fig. 13 (LMJ 76552).

This leaf may belong to *Myrica lignitum*.

- 1850a *Robinia hesperidum* UNGER, p. 487, pro parte.  
 1864 *Robinia hesperidum* UNGER – UNGER, p. 21, pro parte, pl. 4 figs. 15-17.

1850a *Sideroxylon hepios* UNGER, p. 434.

1866 *Sideroxylon hepios* UNGER – UNGER, p. 24, pl. 8, fig. 4 (LMJ 76587).

No venation is visible except the midvein.

1847 *Ulmus quercifolia* UNGER, p. 96, pl. 25, fig. 5.

1850a *Ulmus quercifolia* UNGER – UNGER, p. 411.

1850a *Vaccinium chamaedrys* UNGER, p. 439.

1866 *Vaccinium chamaedrys* UNGER, p. 36, pl. 12, fig. 1a.

1850a *Vaccinium empetrites* UNGER, p. 440.

1866 *Vaccinium empetrites* UNGER – UNGER, p. 37, pl. 12, figs. 2a (LMJ 76588), c.

1850a *Vaccinium icmadophilum* UNGER, p. 439.

1866 *Vaccinium icmadophilum* UNGER – UNGER, p. 37, pl. 12, fig. 5 a, b.

1850a *Vaccinium myrsinefolium* UNGER, p. 439.

1866 *Vaccinium myrsinefolium* UNGER – UNGER, p. 38, pl. 12, fig. 6 (LMJ 76589).

1850a *Vaccinium vitis japeti* UNGER, p. 439.

1866 *Vaccinium vitis japeti* UNGER – UNGER, p. 36, pl. 12, fig. 3 a-c.

Besides the leaf remains listed above, there is a greater number of dubious and indeterminate objects referred to by UNGER as remains of various generative organs, which are not treated in detail in the present account.

For the lists of taxa according to the previous publications (nomina nuda excluded) and current revisions see tables 4-11.

### Taphonomy

SACHSENHOFER et al. (2002) determined analogies in the development of the basins along the Norian depression: basal alluvial deltaic sediments are typically followed by one coal seam which is overlain by fine-grained, lacustric or sometimes even brackish sediments (as in the Fohnsdorf basin); this is often followed by subsequent coarsening upward, topped by fluvial gravels. The Parschlug flora was deposited in lacustric facies, in rather homogeneous pelitic sediments that developed above the coal seam. Besides water, wind has probably played an essential role in transporting the plant material into the lake sediments because the diversity of winged fruits and seeds is rather high: *Acer* sp. div., *Ailanthus confucii*, Betulaceae, *Cedrelospermum*, *Craigia brononii*, *Engelhardia macroptera*, *Fraxinus primigenia*, *Paliurus favonii*, *Pinus* sp., *Saportaspermum*, *Tilia longebracteata*, and *Cypselites*. Flower remains such as *Antholithes stiriacus* and ? *Chaneya* sp. or insect wings still preserved in pairs support this view. In this respect the flora of Parschlug resembles the Cypris Clay flora (BŮŽEK et al. 1996) and the flora from the Randeck Maar (RÜFFLE 1963). The differentiation of vegetation due to properties of the substrate (oligotrophic soils with sclerophyllous oaks and pine forests versus gallery forests on fertile soils) has largely vanished in this way from the fossil assemblages.

### Palaeoecology, sociology, and climate

In the assemblage of Parschlug (fig. 4), a few azonal elements are most common: *Glyptostrobis europaeus*, *Myrica lignitum*, and *Liquidambar europaea*. Others are

either not abundant such as *Acer tricuspidatum* and *Populus populina* or even rather rare such as *Alnus julianiformis* and *Cercidiphyllum*. Most taxa are clearly zonal. Among these, more or less humid mesophytic elements are of minor importance: *Fagus*, *Betula*, *Zelkova*, *Acer*, *Platanus leucophylla*, *Fraxinus*, *Tilia*, and *Berchemia*. Certain genera that today include species with chartaceous and rather large leaves (leaf size classes notophyllous/microphyllous) as well as species with coriaceous small leaves such as *Ulmus* and *Acer* are represented by the small-leaved species *U. plurinervia* and *A. pseudomonspessulanum*, respectively. Also, *Smilax* is represented by small-leaved forms of *S. sagittifera* and the Theaceae by the small-leaved *Ternstroemites pereger*. They suggest subhumid conditions, which is supported by several taxa with characteristic subhumid physiognomic appearance such as *Cedrelospermum*, *Berberis*, *Mahonia* (?), Leguminosae, *Paliurus*, *Cotinus* (?), and even by sclerophyllous plants such as *Quercus mediterranea*, *Q. zoroastri*, and *Q. drymeja*. Additionally, there are some taxa, partly of obscure systematic affinity, which recall subhumid conditions due to their coriaceous lamina (e.g., "*Quercus*" *daphnes*). Neither diverse nor abundant are taxa typical of humid subtropical forests, including the Lauraceae (only 3 leaves of *Daphnogene polymorpha*), Theaceae (cf. ? *Gordonia oberdorfensis*), and *Engelhardia*. *Ailanthus* may also belong to this group. Some taxa are difficult to evaluate in this respect, among them *Pinus* div. sp. or certain Leguminosae.

The reconstruction of the vegetation profile from the basin to the upland (fig. 5) is based on the autecology of single taxa, their abundance and the whole association. Aquatic plants are extremely rare, being confined to a few specimens of *Salvinia* and monocots. Therefore, we have no reason to assume the presence of extensive shallow water in the area where the plants were collected. (This probably represents the southwestern area of the Parschlug basin, where mining has focussed due to favourable geological conditions - see Geography and Geological Frame.) Oligotypic wetland gallery forests composed mainly of *Glyptostrobus europaeus*, *Myrica lignitum*, *Liquidambar europaea* and possibly also *Zelkova zelkovifolia* were developed along the shores of the lake. The mesophytic forests on drier substrates were species-diverse and probably not uniform, depending on the soil and exposition to the sun. We may expect small patches of humid mesophytic habitats with mixed-mesophytic forests (*Fagus*, *Betula*, *Engelhardia*, *Fraxinus*, *Ailanthus*, *Daphnogene*, and *Podocarpium podocarpum*). More extensive were probably subhumid forests composed of sclerophyllous oaks in the canopy and plants of similar physiognomic character in the shrub storey, including *Berberis*, *Mahonia* (?), possibly *Prinsepia*, *Cedrelospermum*, and *Paliurus*. Legumes may have been present in both. Pine stands were dispersed or mixed with oaks. Oak and pine forests probably grew preferentially on southern slopes and poor substrate, while humid mesophytic forests developed on northern expositions and deeper soils.

The climatic proxies are deduced from the taxonomic composition and the physiognomic character of the elements. Most important in this respect is the floristic spectrum, which we assign to zonal vegetation. The relatively high number of physiognomically evergreen sclerophyllous and small-leaved taxa suggests subtropical but relatively drier climatic conditions compared to the preceding humid, probably frostless subtropical/warm temperate conditions documented from the Lower Miocene of Oberdorf (Ottngangian; MELLER et al. 1999: 169) and the humid warm-temperate conditions documented from the Pannonian of the Molasse zone north of the Alps (KOVAR-EDER 1988: 63).



### Parschlug in the context of other floras from the Norian depression

The relatively low diversity and mostly low abundance of azonal components and the high diversity of probably zonal taxa clearly distinguish the Parschlug flora from all the others known along the Norian depression (Tamsweg, Leoben, Fohnsdorf - ETTINGSHAUSEN 1888, KNOBLOCH & KVAČEK 1982, STRÖBITZER 1999). Of the azonal taxa, *Glyptostrobus europaeus*, *Myrica lignitum*, and *Liquidambar europaea* are common in all the mentioned localities. *Acer tricuspidatum* is present at Parschlug but not very abundant. *Alnus julianiformis*, usually one of the most common azonal elements (e.g. Leoben), is documented in Parschlug by merely one specimen.

The probably zonal elements from Parschlug, e.g. *Cedrelospermum*, Leguminosae, Rosaceae, Berberidaceae, are largely absent at the other sites. Actually, physiognomically sclerophyllous taxa are both diverse and abundant there in contrast to the other floras of this region. The scarcity of Lauraceae at Parschlug also contrasts with the other sites, where *Daphnogene* is rather common and often associated with other Lauraceae (e.g. at Lintsching).

Among the Fagaceae, physiognomically sclerophyllous oaks (*Q. drymeja*, *Q. mediterranea*, *Q. zoroastri*) prevail at Parschlug but are almost absent in the other sites. *Quercus kubinyii* (KOVATS ex ETTINGSHAUSEN) CZECZOTT alias *Castanea atavia* UNGER is doubtful at Parschlug, but otherwise very abundant, e.g. at Leoben. In all the floras along the Norian depression, *Fagus* is rather rare if present at all. Beech obviously played a less important role in the vegetation here than later during the Late Miocene (KOVAR-EDER 1988).

Moreover, the Parschlug flora is unique in several aspects: Although its diversity is reduced from formerly about 180 to 60 taxa, it is by far the most species-diverse Neogene flora in Austria. Among the verified species, the higher number of probably endemic taxa is remarkable, e.g. *Prinsepia serra*, *Ternstroemites pereger*, and *Mahonia (?) aspera*. The presence and diversity of the Fabaceae (fruits and leaves) is remarkable, and none of the other floras from the Norian depression compares with that of Parschlug.

Fig. 4: Floral picture of Parschlug: (1) *Osmunda parschlugiana*, (2-4) *Pinus* sp. div., (5) *Glyptostrobus europaeus*, (6) ? *Cupressus* sp., (7) ? *Cathaya* sp., (8) *Liquidambar europaea*, (9) *Cercidiphyllum crenatum*, (10) *Daphnogene polymorpha*, (11, 12) *Berberis teutonica*, (13) *Betula* vel *Alnus* sp., (14) *Alnus gaudinii*, (15) *Fagus* sp., (16) *Quercus drymeja*, (17) *Quercus mediterranea* UNGER, (18) *Platanus leucophylla*, (19) *Quercus zoroastri* UNGER, (20) cf. *Gordonia oberdorfensis*, (21) *Ternstroemites pereger*, (22) *Engelhardia macroptera*, (23) *Engelhardia orsbergensis*, (24) *Tilia longebracteata*, (25) *Craigia brononii*, (26) *Ulmus plurinervia*, (27) *Ulmus parschlugiana*, (28) *Myrica lignitum*, (29) *Myrica oehningensis*, (30) *Cedrelospermum ulmifolium*, (31) *Celtis japeti*, (32) *Zelkova zelkovifolia*, (33) cf. *Rosa* sp., (34) *Buxus* cf. *egeriana*, (35) *Populus* sp., (36) *Leguminosites palaeogaea*, (37) *Leguminosites hesperidum*, (38) *Leguminosites parschlugianus*, (39, 40) *Podocarpium podocarpum*, (41) "*Acacia*" *parschlugiana*, (42) *Phaseolites securidacus*, (43) "*Juglans*" *parschlugiana*, (44) *Toxicodendron herthae*, (45) *Acer integrilobum*, (46) *Acer pseudomonspessulanum*, (47) *Acer tricuspidatum*, (48-50) *Acer* sp. div., (51) *Paliurus tiliifolius*, (52) *Paliurus favonii*, (53) *Berchemia multinervis*, (54) *Cotinus (?) aizoon*, (55) *Ailanthus confucii*, (56) *Fraxinus primigenia*, (57) *Nerium* sp., (58, 59) *Smilax sagittifera*, (60) "*Celastrus*" *europaea*, (61) "*Evonymus*" *latoniae*, (62) "*Cornus*" *ferox*, (63) ? *Chaneya* sp., (64) "*Quercus*" *daphnes*, (65) *Mahonia (?) aspera*, (66) *Prinsepia serra*, (67) *Populus populina*, (68) *Ailanthus pythii*, (69) *Dicotylophyllum* sp. 2, (70) *Saportaspermum* sp., (71) *Antholithes stiriacus*, (72) *Cypselites*, (73) *Cedrelospermum stiriacum*.

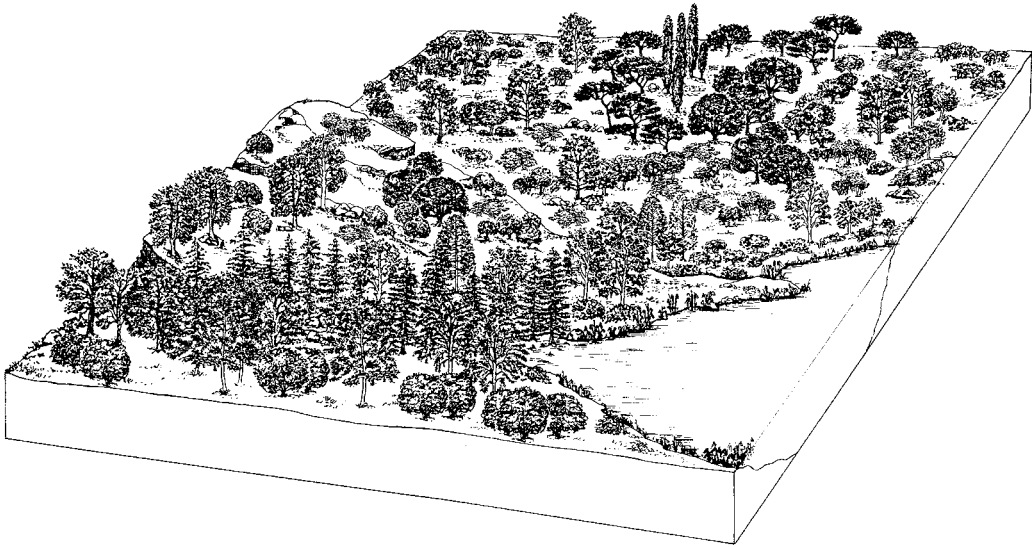


Fig. 5: Reconstructed vegetation of Parschlug. Gallery forest with *Glyptostrobus europaeus*, *Myrica lignitum*, *Liquidambar europaea*, and *Zelkova zelkovifolia* along a stream; small patches of humid mesophytic forests with *Fagus*, *Betula*, *Engelhardia*, *Fraxinus*, *Ailanthus*, *Daphnogene*, and *Podocarpium* on deeper soils and/or north-exposed slopes (foreground); on drier substrates and possibly south-exposed slopes subhumid (more open) forests with sclerophyllous oaks in the canopy and *Ulmus plurinervia*, *Berberis*, *Mahonia* (?), possibly *Prinsepia*, *Cedrelopermum*, and *Paliurus*; pine stands and ? *Cupressus* dispersed or mixed with oaks.

## The flora of Parschlug in the Central European context

### Southern Germany (Randeck Maar and Upper Freshwater Molasse)

The flora from the Randeck Maar (RÜFFLE 1963), which has been dated to MN 5 (HEIZMANN 1983), compares in many aspects quite well with Parschlug. From the Upper Freshwater Molasse (OSM) several macrofloras are correlated by mammals and/or regional geology to the late Early Miocene/Middle Miocene (MN 5/6), (tabs. 1, 2). The publications dealing with Burtenbach (SCHMID 1983), Entrischenbrunn (SCHMITT & BUTZMANN 1997), Gallenbach (SCHMID & GREGOR 1983), and Kirrberg (RIEDERLE & GREGOR 1997) need many taxonomic corrections (see tab. 2). For other sites, only lists of unfigured taxa have been published (Ursberg, RIEDERLE 1997). Systematic treatments of the macrofloras from Pfaffenzell and Eberstetten do not exist. This situation hinders a more detailed comparison than given below. Nonetheless, a comparison is possible because these floras have been recently studied in the collection of the Bayerische Staatssammlung by the first author.

The floras from the OSM are of relatively distal fluvial origin, while the Randeck Maar and Parschlug represent lacustric facies connected in the latter to lignite-forming facies.



Tab. 1: Macrofloras from southern Germany relevant for the comparison with Parschlug and their stratigraphic position. Abbreviation used: BSM = Bayerische Staatssammlung Munich.

locality	reference for macro flora	age	reference for age
Randeck Maar	RÜFFLE 1963	MN 5	HEIZMANN 1983
Burtenbach	SCHMID 1983, and pers. studies of the first author in the BSM	OSM, sedimentary cycle 3, correlated MN 5	BÖHME et al. 2002
Eberstetten	unpub., pers. studies of the first author in the BSM	OSM, sedimentary cycle 6, correlated MN 5	BÖHME et al. 2002
Entrischenbrunn	SCHMITT & BUTZMANN 1997	by regional geology around Ries impact, correlated MN5/6	pers. comm. BÖHME, HEISSIG 2002
Derching	SCHMIDT 1976, 1980, and pers. studies of the first author in the BSM	OSM, sedimentary cycle 8	pers. comm. BÖHME 2002
Gallenbach 1	SCHMID & GREGOR 1983, and pers. studies of the first author in the BSM	OSM, sedimentary cycle 8	BÖHME et al. 2002, and pers. comm. HEISSIG, 2002
Kirrberg	RIEDERLE & GREGOR 1997	upper MN 6 by mammals	pers. comm. BÖHME 2002
Pfaffenzell 1	unpub., pers. studies of the first author in the BSM	around 14.6 m.a., radio-metric date of a tuffite	pers. comm. HEISSIG and BÖHME 2002

In the OSM floras, the absence of conifers is remarkable. The Randeck Maar is poor in conifers as well. At Parschlug the abundance of *Glyptostrobus europaeus* is certainly linked to the nearby lignite-forming facies. Finally, conifers are neither diverse nor abundant there.

The floras of the OSM, the Randeck Maar, and Parschlug share the presence and sometimes abundance of *Podocarpium podocarpum* (leaves and fruits). Moreover, different legume pods do occur in Eberstetten, Pfaffenzell, Kirrberg, and the Randeck Maar, as they do in Parschlug. The Randeck Maar and Parschlug share the characteristic pinnate leaves of "*Acacia*" *parschlugiana* ("unbestimmbarer leguminosenartiger Blattrest", in RÜFFLE 1963: pl. 9, figs. 23, 24). In the Randeck Maar, Parschlug, and Pfaffenzell some entire-margined, obviously coriaceous leaves possibly represent Leguminosae. This rather rich and diverse representation of Leguminosae distinguishes these floras from those of the late Middle/Late Miocene floras from the Styrian, Vienna, and Molasse basins.

*Populus* is represented in all compared floras and sometimes even rather common, while at Parschlug, only *P. populina* has been recorded. *Populus balsamoides* is present in all south German localities, while *P. populina* is present only in few. In contrast, *Salix* records are relatively scarce and not abundant at the individual sites; the genus is completely absent at Parschlug. *Platanus leucophylla* is often associated in the OSM, as it is at Parschlug. Generally, maples are rare and not species-diverse compared to the record from the Late Miocene. Among the compared localities, Parschlug is the most species-diverse (3 maple species).

The OSM floras and Parschlug share the presence of probable endemites:

- *Prinsepia serra* from Parschlug is unknown so far from any other site.
- In the OSM, leaves that have been incorrectly determined as *Pterocarya castaneifolia* (GÖPPERT) MENZEL by RIEDERLE & GREGOR (1997) from Kirrberg and by SCHMID & GREGOR (1983) from Gallenbach and as *Salix* sp. by SCHMITT & BUTZMANN (1997, pl. 4, fig. 13) constitute a taxon of yet unknown affinity (? Rosaceae), but are present in most of the floras (except Burtenbach).
- The identification of *Zelkova ungeri* (ETTINGSHAUSEN) KOVATS from Kirrberg (RIEDERLE & GREGOR 1997) and also from Oehningen (HANTKE 1954: pl. 8, figs. 1-2) is taxonomically (as well as nomenclaturally) incorrect. These leaves clearly do not represent the genus *Zelkova*. They are of yet unknown affinity but may rather represent leaflets of the Vitaceae (*Parthenocissus*). From Gallenbach, SCHMID & GREGOR (1983) also list *Z. ungeri*. However, the material studied in the Bayerische Staatsammlung Munich yielded no *Zelkova*, besides the above-mentioned peculiar leaf type, which seems to be almost endemic to the OSM. In fact, *Zelkova zelkovifolia* (correct synonym of *Z. ungeri*) is rarely encountered in the discussed OSM floras, but is abundant in the Randeck Maar and Parschlug.

The flora from the Randeck Maar shares even more taxa with Parschlug. Noteworthy are *Adiantum renatum* (*Adiantum* sp., GREGOR 1986: pl. 1, fig. 4), *Cupressus*, *Cedrelospermum* (see tab. 2), *Craigia brononii* (*Pteleaecarpum europaeum* (BRONN) BŮŽEK & KNOBLOCH in GREGOR 1986), *Engelhardia*, *Acer integrilobum*, *Antholithes stiriacus* (*Antholithus* sp. sensu GREGOR 1986: pl. 4, fig. 12), *Celtis*, *Berchemia*, and *Ailanthus confucii*, of which the latter three are more abundant in the Randeck Maar. On the other hand, elements characteristic and abundant in Parschlug, such as *Mahonia* (?) *aspera*, *Quercus mediterranea*, and *Ulmus plurinervia*, have not been recorded in the Randeck Maar flora. However, the specimens figured as *Zelkova praelonga* BERGER (RÜFFLE 1963: pl. 4, fig. 3 and possibly fig. 4) may represent *U. plurinervia*. At the same time, some elements, e.g. *Sideroxylon salicites* (WEBER) WEYLAND and *Koelreuteria macroptera* (KOVATS) EDWARDS, are rather common in the Randeck Maar flora but absent at Parschlug.

### Cypris Shale flora, western Bohemia

The Early Miocene (Ottangian-Karpatian) flora of the Cypris Shale in western Bohemia belongs to the typical "Younger Mastixioid" plant assemblages, although the Mastixiaceae are infrequent (BŮŽEK et al. 1996). The flora is dominated by thermophilic ("Palaeotropic") elements of a humid subtropical climate – *Tetraclinis salicornioides*, diverse Lauraceae, Theaceae, Symplocaceae, *Trigonobalanopsis*, *Platanus neptuni*, *Engelhardia*. Deciduous ("Arctotertiary") elements are also present, but of low diversity. A limited number of taxa are shared with the flora of Parschlug: *Myrica lignitum*, *M. oehningensis*, *Acer integrilobum*, *Liquidambar*, *Podocarpium*, *Craigia*, *Tilia*, *Ulmus*, *Zelkova*, *Cedrelospermum*, *Fraxinus*, *Populus populina*, *Ailanthus*, and Betulaceae. The striking difference between the two assemblages is in the humid (Cypris) versus subhumid (Parschlug) aspects. A number of endemic plants of Parschlug are not known in western Bohemia. Instead of *P. leucophylla*, *Platanus neptuni* occurs in the Cypris Shale flora.

Tab. 2: Occurrences of selected taxa from the Parschlug plant assemblages compared with similar floras from southern Germany with notes and references:

- <sup>1</sup> RIEDERLE & GREGOR (1997), pl. 11, figs. 8-10, det. as *Ulmus pyramidalis*.
- <sup>2</sup> RIEDERLE & GREGOR (1997), pl. 3, fig. 9.
- <sup>3</sup> SCHMITT & BUTZMANN (1997), pl. 4, fig. 9, det. as *Ulmus pyramidalis*.
- <sup>4</sup> SCHMITT & BUTZMANN (1997), pl. 3, fig. 5 det. as cf. *Populus mutabilis*.
- <sup>5</sup> SCHMITT & BUTZMANN (1997) pl. 3, figs. 7, 8, pl. 4, fig. 2 det. as cf. *Myrica* sp.
- <sup>6</sup> SCHMITT & BUTZMANN (1997), det. as *Salix* sp.
- <sup>7</sup> SCHMID & GREGOR (1983), pl. 3, fig. 3.
- <sup>8</sup> None of the specimens figured by RIEDERLE & GREGOR (1997) belongs to *Zelkova*.
- <sup>9</sup> RÜFFLE (1963), pl. 9, figs. 23, 24 "unbestimmbarer leguminosenartiger Blattrest".
- <sup>10</sup> RÜFFLE (1963), pl. 5, figs. 16-26, pl. 20, figs. 4, 5 det. as *Tremophyllum tenerrimum*, pl. 12, figs. 1-17, pl. 25, fig. 6 det. as *Embothrites borealis*.
- <sup>11</sup> RÜFFLE (1963), pl. 1, fig. 14.

Abbreviations used: v = very, a = abundant, r = rare, pr = poor remains, n = non.

	<i>Glyptostrobus europaeus</i>	<i>Pinus</i>	<i>Cupressus</i>	<i>Platanus leucophylla</i>	<i>Quercus drymeja</i>	<i>Quercus mediterranea</i>	<i>Ulmus plurinervis</i>	<i>Cedrelospermum</i>	<i>Zelkova zelkoviifolia</i>	type " <i>Zelkova ungeri</i> " sensu RIEDERLE & GREGOR 1997 - non <i>Zelkova</i> but ? <i>Toxicodendron</i> or <i>Vitaceae</i>	<i>Comptonia oeningsis/ Myrica vindobonensis</i>	<i>Daphnogene</i>	<i>Leguminocarpon</i> div. (several seeds)	<i>Acacia parschlugiana</i>	<i>Podocarpium podocarpum</i>	<i>Populus balsamoides</i>	<i>Populus populina</i>	<i>Salix</i>	type " <i>Pterocarya castaneifolia</i> " sensu RIEDERLE & GREGOR 1997- non <i>Pterocarya</i> but ? <i>Rosaceae</i>	<i>Smilax</i>
Parschlug	X va	X	X (r)	X	X	X	X	X	X	-	-	X vr	X	X	X	-	X	-	-	X
Burtenbach	-	-	-	-	-	-	X	-	-	-	X	X	-	-	X	X	-	X	-	-
Derching	-	-	-	X	-	-	-	-	X (r)	X ?	-	X a	-	-	X	X	X	X	X	-
Eberstetten	-	-	-	X	-	X ?	-	-	X (r)	-	X ?	X	X	-	X	X	-	-	-	X
Entrischenbrunn	-	-	-	X	X <sup>5</sup>	-	X <sup>3</sup>	-	-	X <sup>4</sup>	-	X	-	-	X	X	-	X ?	X <sup>6</sup>	-
Gallenbach 1	-	-	-	X	-	-	-	-	-	X	-	X	-	-	X	X	X <sup>7</sup>	X	X	-
Kirrborg	-	-	-	-	-	n <sup>2</sup>	X <sup>1</sup>	-	- <sup>8</sup>	X a	X	X a	X	-	X	X	X	-	X	X
Pfaffenzell 1	-	-	-	X	-	-	-	X ?	-	X	X	X r	X	-	X	X	-	X	X	X
Randecker Maar	X pr	-	X ? <sup>11</sup>	-	-	-	-	X <sup>10</sup>	X	-	-	X	X	X <sup>9</sup>	X	X	-	-	-	-

Tab 3: Revised floral list of Parschlug (prefixed symbols of approximate abundance: **D** – dominant, **C** – common, **R** – rare or single).

- R - *Osmunda parschlugiana* (UNGER) ANDREÁNSZKY  
R - *Pronephrium stiriacum* (UNGER) KNOBLOCH et Z. KVAČEK  
R - *Adiantum renatum* UNGER  
R - *Salvinia* cf. *mildeana* GOEPPERT  
C - *Pinus* sp. div.  
R - ? *Cathaya* sp.  
**D** - *Glyptostrobus europaeus* (BRONGNIART) UNGER  
R - *Cupressus* sp.  
R - *Daphnogene polymorpha* (A. BRAUN) ETTINGSHAUSEN  
R - *Berberis teutonica* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Berberis* (?) *ambigua* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
C - *Mahonia* (?) *aspera* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Cercidiphyllum crenatum* (UNGER) R. BROWN  
**D** - *Liquidambar europaea* A. BRAUN  
R - *Liquidambar* sp. – fructus  
R - *Platanus leucophylla* (UNGER) KNOBLOCH  
R - *Betula* cf. *dryadum* BRONGNIART  
R - *Betula* vel *Alnus* sp.  
R - *Alnus julianiformis* (STERNB.) Z. KVAČEK et HOLÝ  
R - *Alnus gaudinii* (HEER) KNOBLOCH et Z. KVAČEK  
R - *Fagus* sp. - leaf  
R - *Fagus* sp. - cupule  
R - *Fagus* vel *Alnus* sp.  
C - *Quercus drymeja* UNGER  
C - *Quercus mediterranea* UNGER  
R - *Quercus zoroastri* UNGER  
R - cf. ? *Gordonia obergdorffensis* KOVAR-EDER  
R - *Ternstroemites pereger* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
**D** - *Myrica lignitum* (UNGER) SAPORTA  
R - *Myrica oehningensis* (A. BRAUN) HEER  
R - *Myrica* sp. - fructus  
R - *Engelhardia orsbergensis* (WESSEL et WEBER) JÄHNICHEN, MAI et WALTHER  
R - *Engelhardia macroptera* (BRONGNIART) UNGER  
R - *Tilia longibracteata* ANDRAE  
R - *Craigia bronnii* (UNGER) Z. KVAČEK, BŮŽEK et MANCHESTER  
C - *Ulmus plurinervia* UNGER  
R - *Ulmus parschlugiana* KOVAR-EDER et Z. KVAČEK sp. nov.  
R - *Cedrelospermum ulmifolium* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov. -foliage  
R - *Cedrelospermum stiriacum* (ETTINGSHAUSEN) KOVAR-EDER et Z. KVAČEK comb. nov. - fructus  
C - *Zelkova zelkovifolia* (UNGER) BŮŽEK et KOTLABA  
R - *Celtis japeti* UNGER  
R - *Populus populina* (BRONGNIART) KNOBLOCH  
R - *Populus* sp. – fructus  
R - *Buxus* cf. *egeriana* Z. KVAČEK, BŮŽEK et HOLÝ  
R - cf. *Rosa* sp.  
C - *Prinsepia serra* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - ? *Prinsepia* sp.  
R - *Leguminosites hesperidum* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Leguminosites dionysi* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Leguminosites palaeogaea* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Leguminosites parschlugianus* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Podocarpium podocarpum* (A. BRAUN) HERENDEEN  
R - *Phaseolites securidacus* UNGER  
R - "*Acacia*" *parschlugiana* UNGER  
R - "*Juglans*" *parschlugiana* UNGER  
R - *Paliurus tiliifolius* (UNGER) BŮŽEK  
R - *Paliurus favonii* UNGER  
R - *Berchemia multinervis* (A. BRAUN) HEER  
R - *Acer tricuspidatum* BRONN  
R - *Acer pseudomonspessulanum* UNGER emend. STRÖBITZER-HERMANN  
R - *Acer integrilobum* WEBER sensu WALTHER  
R - *Acer* sp. div. - fructus  
R - *Toxicodendron herthae* (UNGER) Z. KVAČEK et WALTHER  
R - *Cotinus* (?) *aizoon* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
C - *Ailanthus pythii* (UNGER) KOVAR-EDER et Z. KVAČEK comb. nov.  
R - *Ailanthus confucii* UNGER  
R - *Fraxinus primigenia* UNGER  
R - *Nerium* sp.  
R - *Smilax sagittifera* HEER emend. HANTKE  
R - Monocotyledoneae gen. et sp. indet.  
R - "*Celastrus*" *europaea* UNGER  
R - "*Cornus*" *ferox* UNGER  
R - "*Evonymus*" *latoniae* UNGER  
C - "*Quercus*" *daphnes* UNGER  
R - *Antholites stiriacus* KOVAR-EDER et Z. KVAČEK sp. nov.  
R - *Cypselites* sp.  
C - *Saportaspermum* sp.  
R - ? *Chaneya* sp.  
R - *Dicotylophyllum* sp. 1-6

### Miocene of Hungary

Among numerous Sarmatian floras of Hungary (ERDEI in press), those from the areas of the Tokaj Mountains (e.g. Erdőbénye and Tallya) are comparable with Parschlug due to their mesophytic character. Taken together, they share a higher number of common elements including *Fagus*, *Quercus mediterranea*, *Q. drymeja*, Betulaceae, Ulmaceae and Celtidaceae, *Engelhardia*, *Acer*, *Platanus leucophylla*, *Ailanthus*, and some Leguminosae including *Podocarpium*. Noteworthy is the same scarcity of the Lauraceae as in Parschlug. Contrary to Parschlug, younger elements typical of the Late Miocene and Pliocene are already present: *Ginkgo*, *Quercus pseudocastanea/pseudorobur* group, *Acer jurenaki/subcampestre*. Also lacking at Parschlug, but probably for palaeoclimatic reasons, are several "throughrunners", e.g. *Tetraclinis salicornioides*, *Parrotia*, *Liriodendron*, *Koelreuteria*, and *Pungiphyllum* - elements that are widespread in the late Palaeogene and Neogene of Europe. Nowhere in the Hungarian Sarmatian do we encounter leaf fossils typical of Parschlug, e.g. *Mahonia* (?) *aspera*, *Prinsepia serra*, and greater accumulations of *Myrica lignitum*.

Another group of similar floras, also with mesophytic features, is concentrated in southern Hungary in the Mecsek Mountains. The plant fossils there are bound to the facies of fish scale-rich shale and diatomite, such as at Magyaregregy (HABLY 1985). The dating is somewhat uncertain, but the sites are usually assigned to the latest Early and early Middle Miocene (HABLY 2001, 2002). These floras seem to share most characters, both in physiognomy and composition, although local differences also occur. Azonal wetland vegetation is composed of *Glyptostrobus*, and *Myrica lignitum*, while *Liquidambar* is lacking. Because the site is under study (HABLY in prep.), a more precise comparison is premature. We may only note a rich representation of Leguminosae, *Ailanthus*, and *Cedrelospermum*, and the occurrence of many elements in common with Parschlug, including *Fagus*, *Acer integrilobum* (as *mecsekense*), *A. pseudomonspessulanum* (as *decipiens*), *Myrica lignitum*, *Antholithes stiriacus*, *Engelhardia*, *Zelkova*, *Celtis*, *Craigia*, and *Populus populina*. Some other elements are differently represented at Magyaregregy – common Lauraceae, *Ziziphus paradisiaca* (HABLY 2002, personal communication).

In summary, the mentioned late Early/Middle Miocene floras of Hungary are well comparable with Parschlug both in composition and the aspects described above. The lack of typical endemites of Parschlug, however, suggests an even more subhumid climate of the Parschlug assemblage.

### Miocene of Greece

In the area of southern Europe, the flora of Kymi, Evia, Greece (UNGER 1867, KVAČEK in VELITZELOS, ed. 2002) shares common aspects and some elements with Parschlug. Both floras are dominated by sclerophyllous oaks, myricas (including *Myrica oehningensis*), Leguminosae, and *Glyptostrobus*. Noteworthy common accessory elements are *Cupressus*, *Tilia*, *Populus*, *Cedrelospermum*, *Saportaspermum*, *Mahonia* (?) *cyclophylla*, and *Berberis* (?) *ambigua*. The Kymi flora is older, middle Early Miocene in age, and distinct by a number of different plants – "*Encephalartos*" *goerceixianus*, *Calocedrus suleticensis*, *Tetraclinis*, *Berberis kymeana*, *Diospyros rugosa* and others.

Tab. 4: List of taxa from Parschlug published in UNGER (1841-47) with current revisions.

UNGER, 1841-7, *Chloris protogaea* – reference A

taxon	reference	collection/no.	revision	new illustration
<i>Acer parschlugianum</i>	p. 132, pl. XLIII, fig. 5	H; LMJ 76517	<i>Liquidambar europaea</i>	
<i>Acer productum</i>	p. 131, pl. XLII, fig. 8	LMJ 76526	<i>Acer tricuspidatum</i>	pl. 10, fig. 10
<i>Acer pseudocampestre</i>	p. 133, pl. XLIII, fig. 6 (folium)	S	? <i>Acer pseudo-monspessulanum</i>	
	pl. XLIII, fig. 8, 9 (fructus)		<i>Acer</i> sp.	
<i>Acer pseudo-monspessulanum</i>	p. 132, pl. XLIII, fig. 1	S; LMJ 76531	<i>Acer integrilobum</i>	pl. 10, fig. 3
	pl. XLIII, fig. 2	L; LMJ 76522	<i>A. pseudo-monspessulanum</i>	pl. 10, fig. 8
	pl. XLIII, fig. 3	S; LMJ 76514	<i>Saportaspermum</i> sp.	
	pl. XLIII, fig. 4	S; LMJ	? <i>Saportaspermum</i> sp.	
<i>Acer trilobatum</i>	p. 130, pl. XLI, fig. 6		<i>Acer tricuspidatum</i>	
<i>Adiantum renatum</i>	p. 122, pl. XXVII, fig. 1		<i>Adiantum renatum</i>	
	pl. XXVII, fig. 2		indet.	
<i>Betula dryadum</i>	p. 117		<i>Betula</i> cf. <i>dryadum</i>	
<i>Ceanothus europaeus</i>	p. 144, pl. XLIX, fig. 8		? <i>Paliurus tiliifolius</i>	
<i>Ceanothus subrotundus</i>	p. 144, pl. XLIX, fig. 7	LMJ 76530	<i>Daphnogene polymorpha</i>	
<i>Fagus deucalionis</i>	p. 101		<i>Betula</i> vel <i>Alnus</i> sp.	
<i>Ilex ambigua</i>	p. 149, pl. L, fig. 14	H; LMJ 76519	<i>Berberis</i> (?) <i>ambigua</i>	pl. 2, fig. 1
<i>Ilex parschlugiana</i>	p. 148, pl. L, fig. 8	H	<i>Dicotylophyllum</i> sp.	
<i>Ilex sphenophylla</i>	p. 148, pl. L, fig. 9	S; LMJ 76515	<i>Mahonia</i> (?) <i>aspera</i>	
<i>Ilex stenophylla</i>	p. 149, pl. L, figs. 10-13	S	<i>Dicotylophyllum</i> sp.	
<i>Juniperites baccifera</i>	p. 80, pl. XXI, fig. 1	S; NHMW 2001B0017/1	<i>Glyptostrobus europaeus</i>	pl. 1, fig. 14
	pl. XXI, fig. 2	S	<i>Glyptostrobus europaeus</i>	
<i>Liquidambar europaeum</i>	p. 120, pl. XXXV, fig. 1	LMJ 76523	<i>Liquidambar europaea</i>	
	pl. XXXV, fig. 2	LMJ 76867	<i>Liquidambar europaea</i>	
	pl. XXXV, fig. 3 (folium, infructescence)	LMJ 76516	<i>Liquidambar europaea</i> and <i>Liquidambar</i> sp.	
	pl. XXXV, figs. 4, 52		<i>Liquidambar europaea</i>	
<i>Paliurus favonii</i>	p. 147, pl. L, fig. 6 (fructus)	L; LMJ 76518	<i>Paliurus favonii</i>	pl. 11, fig. 7
	pl. L, figs. 7, 8 (folia)		<i>Paliurus tiliifolius</i>	
<i>Pteris parschlugiana</i>	p. 122, pl. XXXVI, fig. 6	H; LMJ 76520	<i>Osmunda parschlugiana</i>	pl. 1, fig. 1
<i>Quercus aspera</i>	p. 108, pl. XXX, fig. 1 right	S; LMJ 76532	<i>Mahonia</i> (?) <i>aspera</i>	pl. 13, fig. 4
	pl. XXX, fig. 1 upper left, fig. 2 bottom	S	<i>Mahonia</i> (?) <i>aspera</i>	

Tab. 4: continued

taxon	reference	collection/no.	revision	new illustration
	pl. XXX, fig. 1 bottom	S	<i>Mahonia (?) aspera</i>	
	pl. XXX, fig. 2 top	L; LMJ 76529	<i>Mahonia (?) aspera</i>	pl. 13, fig. 3
	pl. XXX, fig. 3	S	<i>Mahonia (?) aspera</i>	
<i>Quercus chlorophylla</i>	p. 111, pl. XXXI, fig. 1	H	? " <i>Quercus</i> " <i>daphnes</i>	
<i>Quercus daphnes</i>	p. 112, pl. XXXI, fig. 2	S	" <i>Quercus</i> " <i>daphnes</i>	
	pl. XXXI, fig. 3	L; LMJ 76525	" <i>Quercus</i> " <i>daphnes</i>	pl. 12, fig. 15
<i>Quercus drymeja</i>	p. 113, pl. XXXII, fig. 1	L; LMJ 76524	<i>Quercus drymeja</i>	pl. 4, fig. 1
	pl. XXXII, fig. 2	S	<i>Quercus drymeja</i>	
	pl. XXXII, fig. 3	S	<i>Myrica lignitum</i>	
	pl. XXXII, fig. 4	S	<i>Quercus drymeja</i>	
<i>Quercus elaena</i>	p. 112, pl. XXXI, fig. 4	H	" <i>Quercus</i> " <i>daphnes</i>	
<i>Quercus hamadryadum</i>	p. 110, pl. XXX, fig. 8	H	<i>Dicotylophyllum</i> sp.	
<i>Quercus lignitum</i>	p. 13, pl. XXXI, figs. 5-7	S	<i>Myrica lignitum</i>	
<i>Quercus mediterranea</i>	p. 114, pl. XXXII, fig. 1 top left	L; LMJ 76524	<i>Quercus mediterranea</i>	pl. 4, fig. 8
<i>Quercus mediterranea</i>	p. 114, pl. XXXII, fig. 7	S	<i>Quercus mediterranea</i>	
	pl. XXXII, figs. 5, 6, 8		? <i>Quercus mediterranea</i>	
	pl. XXXII, fig. 9	NHMW 1845/34/4	<i>Quercus mediterranea</i>	pl. 4, fig. 9
<i>Quercus serra</i>	p. 109, pl. XXX, fig. 4 left	L; LMJ 76528	<i>Prinsepia serra</i>	pl. 13, fig. 9
	pl. XXX, fig. 5	S; LMJ 76521	<i>Prinsepia serra</i>	
	pl. XXX, fig. 6	S		
	pl. XXX, fig. 7	S	<i>Dicotylophyllum</i> sp.	
<i>Rhamnus aizoon</i>	p. 146, pl. L, fig. 1 (folium)	S	<i>Cotinus (?) aizoon</i>	
	pl. L, fig. 2 folium	S	<i>Cotinus (?) aizoon</i>	
	pl. L, fig. 3 flos		indet.	
<i>Smilacites sagittata</i>	p. 129, pl. XL, fig. 4	H; LMJ 76512	<i>Smilax sagittifera</i>	
<i>Ulmus bronnii</i>	p. 100			
<i>Ulmus plurinervia</i>	p. 95, pl. XXV, figs. 1-4	S	<i>Ulmus plurinervia</i>	
<i>Ulmus quercifolia</i>	p. 96, pl. XXV, fig. 5	H	<i>Dicotylophyllum</i> sp.	
<i>Ulmus zelkovaefolia</i>	p. 94, pl. XXIV, fig. 7 upper right, figs. 9-12	S	<i>Zelkova zelkovifolia</i>	
	pl. XXIV, fig. 7 left bottom, fig. 8 (fructus)	S	<i>Ulmus parschlugiana</i>	
	pl. XXIV, fig. 13	S	<i>Zelkova zelkovifolia</i>	
	pl. XXVI, fig. 7	L; NHMW 1987/57	<i>Zelkova zelkovifolia</i>	pl. 8, fig. 9
	pl. XXVI, fig. 8	L; LMJ 76513	<i>Ulmus parschlugiana</i>	

Tab. 5: List of taxa from Parschlug published in UNGER (1850a) with current revisions. References A-F see tabs. 4, 6, 8-11

UNGER, 1850 a. Genera et species

taxon	UNGER's revision	in reference	figure	determination now
<i>Acacia parschlugiana</i>		E	pl. XI, fig. 19 (fructus)	<i>Leguminosites hesperidum</i>
		E	pl. XI, fig. 20 (folium)	" <i>Acacia</i> " <i>parschlugiana</i>
<i>Acer productum</i>		A	pl. XLII, fig. 8	<i>Acer tricuspdatum</i>
		F	pl. XV, fig. 1 (folium)	<i>Platanus leucophylla</i>
		F	pl. XV fig. 2 (fructus)	<i>Acer</i> sp.
<i>Acer pseudocampstre</i>		A	pl. XLIII, fig. 6	? <i>Acer pseudo-monspessulanum</i>
		F	pl. XV fig. 3 (fructus)	<i>Acer</i> sp.
		F	pl. XV fig. 4	<i>Acer</i> cf. <i>pseudo-monspessulanum</i>
		F	pl. XV fig. 5 (leaf fragment)	<i>Dicotylophyllum</i> sp.
<i>Acer pseudomonspessulanum</i>		A	pl. XLIII, fig. 1	<i>Acer integrilobum</i>
		A	pl. XLIII, fig. 2	<i>Acer pseudo-monspessulanum</i>
		A	pl. XLIII, fig. 3	<i>Acer</i> sp.
<i>Acer trilobatum</i>		A	pl. XLI, fig. 6	<i>Acer tricuspdatum</i>
<i>Achras lycobroma</i>		F	pl. VIII, fig. 1 (folium)	" <i>Quercus</i> " <i>daphnes</i>
		F	pl. VIII, fig. 2 (? fructus)	
<i>Adiantites renatus</i>	<i>Adiantum renatum</i>	A	pl. XXXVII, fig. 1	<i>Adiantum renatum</i>
<i>Amorpha stiriaca</i>		E	pl. IV, fig. 4 (? fructus)	<i>Dicotylophyllum</i> sp.
		E	pl. IV, fig. 5	<i>Mahonia</i> (?) <i>aspera</i>
<i>Amygdalus pereger</i>		B	pl. LV, figs. 11-14 (folia)	<i>Ternstroemites pereger</i>
		B	pl. LV, fig. 15 (fructus)	indet.
<i>Amygdalus quercula</i>				
<i>Andromeda glauca</i>		F	pl. XII, fig. 8	<i>Dicotylophyllum</i> sp.
<i>Azalea hyperborea</i>		F	pl. XII, fig. 21, 22	<i>Dicotylophyllum</i> sp.
<i>Bauhinia parschlugiana</i>		E	pl. XI, fig. 3 (fructus)	<i>Leguminosites parschlugianus</i>
<i>Bauhinia parschlugiana</i>	<i>Zizyphus renata</i>	E	pl. III, fig. 41 (folium)	? <i>Paliurus tiliifolius</i>
<i>Capparis ogygia</i>	<i>Physolobium kennedyaeifolium</i>	E	pl. V, fig. 1	<i>Dicotylophyllum</i> sp.
<i>Carpinus oblonga</i>		C	pl. XLIII, fig.16 (folium)	<i>Ternstroemites pereger</i>
		C	pl. XLIII, fig. 17 (fructus)	<i>Engelhardia macroptera</i>
<i>Cassia ambigua</i>		E	pl. X, fig. 9	<i>Dicotylophyllum</i> sp.
<i>Cassia hyperborea</i>				<i>Dicotylophyllum</i> sp.
<i>Cassia memnonia</i>		E	pl. X, figs. 4,5	<i>Dicotylophyllum</i> sp.
<i>Cassia petiolata</i>		B	pl. LXV, fig. 7	<i>Dicotylophyllum</i> sp.
<i>Ceanothus europaeus</i>		A	pl. XLIX fig. 8	? <i>Paliurus tiliifolius</i>



Tab. 5: continued

taxon	UNGER's revision	in refer- ence	figure	determination now
<i>Ceanothus subrotundus</i>		A	pl. XLIX, fig. 7	<i>Daphnogene polymorpha</i>
<i>Celastrus cassinefolius</i>	p.p. <i>Celastrus cassinefolius</i>	E	pl. II, fig. 1	<i>Dicotylophyllum</i> sp.
<i>Celastrus cassinefolius</i>	p.p. <i>Celastrus noaticus</i>	E	pl. II, figs. 2, 3	<i>Dicotylophyllum</i> sp.
<i>Celastrus cuneifolius</i>	<i>Pittosporum cuneifolium</i>	E	pl. I, figs. 14, 15	<i>Dicotylophyllum</i> sp.
<i>Celastrus elaeus</i>		E	pl. II, figs. 16-19 (folia)	<i>Dicotylophyllum</i> sp.
<i>Celastrus elaeus</i>	<i>Prinus hyperboreus</i>	E	pl. III, figs. 34, a, b (flores)	<i>Antholithes stiriacus</i>
<i>Celastrus europaeus</i>		E	pl. II, figs. 10-13	" <i>Celastrus</i> " <i>europaea</i>
	<i>Macreightia germanica</i>	F	pl. VIII, figs. 12, 13	<i>Populus</i> sp.
<i>Celtis japeti</i>		C	pl. XLIII, figs. 25, 26	<i>Celtis japeti</i>
<i>Clethra teutonica</i>	<i>Crataegus teutonica</i>	F	pl. XIX, figs. 24, 25	<i>Berberis teutonica</i>
<i>Comptonia laciniata</i>		B	pl. XXIX, fig. 2	<i>Myrica lignitum</i>
		C	pl. XXXIX, fig. 8	" <i>Acacia</i> " <i>parschlugiana</i>
<i>Comptonia oeningensis</i>		B	pl. XXIX, fig. 3	<i>Myrica lignitum</i>
<i>Comptonia ulmifolia</i>		B	pl. XXIX, figs. 4, 5	<i>Cedrelospermum ulmifolium</i>
<i>Cornus ferox</i>		F	pl. XXIV, fig. 21	" <i>Cornus</i> " <i>ferox</i>
<i>Cotoneaster andromedae</i>		F	pl. XVIII, figs. 11, 12	<i>Dicotylophyllum</i> sp.
<i>Crataegus orionis</i>		F	pl. XVIII, fig. 15	<i>Ternstroemites pereger</i>
<i>Cyperites tertiaris</i>		C	pl. XXVIII, fig. 5	Monocotyledonae indet.
<i>Cytisus dionysi</i>		E	pl. IV, fig. 1	<i>Leguminosites dionysi</i>
<i>Daphnogene cinnamomifolia</i>				
<i>Equisetites braunii</i>				
<i>Evonymus latoniae</i>		E	pl. II, fig. 25	" <i>Evonymus</i> " <i>latoniae</i>
<i>Fagus deucalionis</i>		C	pl. XLI, fig. 24 (folium)	<i>Betula</i> vel <i>Alnus</i> sp.
		C	pl. XLI, fig. 25 (fructus)	<i>Fagus</i> sp.
<i>Fraxinus primigenia</i>		D	pl. VIII fig. 1 (fructus)	<i>Fraxinus primigenia</i>
		D	pl. VIII, figs. 3, 8	<i>Ailanthus pythii</i>
		D	pl. VIII, figs. 4-7	<i>Dicotylophyllum</i> sp.
<i>Glyzyrrhiza blandusiae</i>		E	pl. IV, figs. 6, 7 (fructus)	
		E	pl. IV, figs. 8-10 (folia)	<i>Dicotylophyllum</i> sp.
<i>Ilex ambigua</i>		A	pl. L, fig. 8	<i>Berberis</i> (?) <i>ambigua</i>
<i>Ilex cyclophylla</i>		E	pl. III, fig. 7, 8	<i>Mahonia</i> (?) <i>aspera</i>
<i>Ilex parschlugiana</i>		A	pl. L, fig. 8	<i>Dicotylophyllum</i> sp.
<i>Ilex phenophylla</i>	<i>Ilex sphenophylla</i>	A	pl. L, fig. 9	<i>Mahonia</i> (?) <i>aspera</i>
	<i>Ilex sphenophylla</i>	E	pl. III, figs. 3-6	<i>Mahonia</i> (?) <i>aspera</i>
<i>Ilex stenophylla</i>		A	pl. L, figs. 10-13	<i>Dicotylophyllum</i> sp.
		E	pl. III, figs. 15-19	<i>Dicotylophyllum</i> sp.

Tab. 5: continued

taxon	UNGER's revision	in reference	figure	determination now
<i>Isoetites brauni</i>		C	pl. XXVII, fig. 18	indet.
<i>Juglans acuminata</i>	<i>Juglans parschlugiana</i> p.p.			" <i>Juglans</i> " <i>parschlugiana</i>
<i>Juglans elaeonoides</i>		B	pl. LIII, fig. 3 (folium)	<i>Ailanthus pythii</i>
<i>Juglans falcifolia</i>				
<i>Juglans hydrophila</i>		B	pl. LIII, fig. 6	<i>Quercus zoroastri</i>
		B	pl. LIII, figs. 7-9	<i>Quercus drymeja</i>
<i>Juglans melaena</i>		D	pl. XIX, figs. 8-10	<i>Toxicodendron herthae</i>
<i>Juglans quercina</i>				
<i>Ledum limnophilum</i>		F	pl. XII, figs. 24-26	<i>Dicotylophyllum</i> sp.
<i>Liquidambar acerifolium</i>		C	pl. XLIII, fig. 28	<i>Liquidambar europaea</i>
<i>Liquidambar europaeum</i>		A	pl. XXXV, figs. 1-5	<i>Liquidambar europaea</i> and <i>L.</i> sp. (fruit)
<i>Liquidambar protensum</i>		C	pl. XLIII, fig. 27	<i>Liquidambar europaea</i>
<i>Mimosites palaeogaea</i>	<i>Mimosa palaeogaea</i>	E	pl. XI, fig. 12 (fructus)	<i>Leguminosites palaeogaeus</i>
<i>Muscites schimperi</i>		C	pl. XXVII, fig. 1, 2	indet.
<i>Myrica deperdita</i>		C		
<i>Myrtus miocenica</i>		F	pl. XVIII, fig. 6	<i>Dicotylophyllum</i> sp.
<i>Nemopanthes angustifolius</i>	<i>Nemopanthes angustifolius</i>	E	pl. III, fig. 35	<i>Dicotylophyllum</i> sp.
<i>Olea mediterranea</i>				
<i>Paliurus favonii</i>		A	pl. L, fig. 6	<i>Paliurus favonii</i>
			pl. L, figs. 7, 8	<i>Paliurus tiliifolius</i>
<i>Phaseolites orbicularis</i>	<i>Physolobium orbiculare</i>	E	pl. V, fig. 3	<i>Dicotylophyllum</i> sp.
<i>Phaseolites physolobium</i>	<i>Physolobium antiquum</i>	E	pl. V, fig. 4	<i>Dicotylophyllum</i> sp.
<i>Phaseolites securidacus</i>		E	pl. V, figs. 9, 10	<i>Phaseolites securidacus</i>
<i>Phaseolites serratus</i>				
<i>Pinites balsamodes</i>		C	pl. XXXV, fig. 7 (scale)	<i>Pinus</i> sp.
		C	pl. XXXV, fig. 8 (folia)	<i>Pinus</i> sp.
<i>Pinites centrotos</i>		C	pl. XXXVII, figs. 1-3	<i>Pinus</i> sp.
		C	pl. XXXVII, fig. 4 (male cone)	<i>Pinus</i> sp.
<i>Pinites furcatus</i>		C	pl. XXXVII, fig. 7 (semen)	<i>Pinus</i> sp.
		C	pl. XXXVII, fig. 9 (folia)	<i>Pinus</i> sp.
<i>Pinites goethanus</i>		C	pl. XXXV, figs. 18-21 (semina)	<i>Pinus</i> sp.
		C	pl. XXXV, fig. 22 (folia)	<i>Pinus</i> sp.
<i>Pinites hepios</i>		C	pl. XXXV, figs. 6-8 (folia)	<i>Pinus</i> sp.
		C	pl. XXXV, fig. 9 (semen)	<i>Pinus</i> sp.

Tab. 5: continued

taxon	UNGER's revision	in refer- ence	figure	determination now
<i>Pinites leuce</i>		C	pl. XXXV, fig. 22 (semina)	<i>Pinus</i> sp.
		C	pl. XXXV, fig. 16 (folium)	<i>Pinus</i> sp.
<i>Pinites oceanines</i>		C	pl. XXXV, fig. 1 (semen)	Pinaceae
		C	pl. XXXV, figs. 2-4 (folia)	Coniferae
<i>Pistacia lentiscoides</i>		D	pl. XXI, fig. 14	<i>Dicotylophyllum</i> sp.
<i>Populus aeoli</i>		C	pl. XLIV, fig. 2	<i>Populus populina</i>
<i>Populus gigas</i>		C	pl. XIV, fig. 1	<i>Platanus leucophylla</i>
<i>Populus latior</i>		C	pl. XLIV, figs. 3-5	<i>Populus populina</i>
<i>Populus ovalifolia</i>				
<i>Prinos europaeus</i>				
<i>Prinos hyperboreus</i>		E	pl. III, fig. 37 (folium)	<i>Myrica lignitum</i>
			pl. III, figs. 34 (flores)	<i>Antholithes stiriacus</i>
<i>Prunus atlantica</i>		F	pl. XVIII, figs. 26 (folium), 27 (fructus)	<i>Dicotylophyllum</i> sp. and indet.
<i>Prunus euri</i>		F	pl. XVIII, fig. 30	? <i>Cedrelospermum ulmifolium</i>
<i>Prunus paradisiaca</i>		F	pl. XVIII, fig. 28 (? infructescence)	? <i>Myrica</i> infructescence
		F	pl. XVIII, fig. 29 (folium)	<i>Dicotylophyllum</i> sp.
<i>Prunus theodisca</i>		F	pl. XVIII, fig. 31	<i>Quercus mediterranea</i>
<i>Pteris parschlugiana</i>		A	pl. XXXVI, fig. 6	<i>Osmunda parschlugiana</i>
<i>Pyrus euphemes</i>		B	pl. LIX, fig. 10	<i>Dicotylophyllum</i> sp.
<i>Pyrus minor</i>				
<i>Pyrus theobroma</i>		B	pl. LIX, fig. 5	<i>Dicotylophyllum</i> sp.
<i>Quercus aspera</i>		A	pl. XXX, figs. 1 right, upper left, fig. 2 bottom	<i>Mahonia</i> (?) <i>aspera</i>
		A	pl. XXX, fig. 1 bottom, 2 top	<i>Mahonia</i> (?) <i>aspera</i>
<i>Quercus chlorophylla</i>		A	pl. XXXI, fig. 1	? " <i>Quercus</i> " <i>daphnes</i>
<i>Quercus cyclophylla</i>		C	pl. XLI, fig. 15	<i>Quercus mediterranea</i>
<i>Quercus daphnes</i>		A	pl. XXXI, figs. 2, 3	? " <i>Quercus</i> " <i>daphnes</i>
<i>Quercus drymeja</i>		A	pl. XXXII, figs. 1, 2	<i>Quercus drymeja</i>
		A	pl. XXXII, fig. 3	<i>Myrica lignitum</i>
		A	pl. XXXII, fig. 4	<i>Quercus drymeja</i>
<i>Quercus elaena</i>		A	pl. XXXI, fig. 4	" <i>Quercus</i> " <i>daphnes</i>
<i>Quercus hamadryadum</i>		A	pl. XXX, fig. 8	<i>Dicotylophyllum</i> sp.
<i>Quercus lignitum</i>		C	pl. XLI, figs. 1-7	<i>Myrica lignitum</i>
<i>Quercus mediterranea</i>		A	pl. XXXII figs. 1 top left, 7, 9	<i>Quercus mediterranea</i>
		A	pl. XXXII, figs. 5, 6, 8	? <i>Quercus mediterranea</i>
		C	pl. XLI, figs. 1-3, 5, 6	<i>Quercus mediterranea</i>
		C	pl. XLI, fig. 4	? <i>Quercus drymeja</i>

Tab. 5: continued

taxon	UNGER's revision	in refer- ence	figure	determination now
<i>Quercus myrtilloides</i>		C	pl. XLI, fig. 17	? <i>Buxus</i> cf. <i>egeriana</i>
		C	pl. XLI, figs. 18-20	<i>Dicotylophyllum</i> sp.
<i>Quercus serra</i>		A	pl. III, fig. 4 left, 5	" <i>Quercus</i> " <i>serra</i>
		A	pl. III, figs. 6, 7	<i>Dicotylophyllum</i> sp.
		C	pl. XLI, fig. 16	" <i>Quercus</i> " <i>serra</i>
<i>Quercus urophylla</i>		C	pl. XLI, fig. 11	? <i>Quercus drymeja</i>
<i>Quercus zoroastri</i>		C	pl. XLI, figs. 7, 8	<i>Quercus zoroastri</i>
		C	pl. XLI, fig. 9	<i>Ailanthus pythii</i>
<i>Rhamnus aizoides</i>		E	pl. III, fig. 47	<i>Dicotylophyllum</i> sp.
<i>Rhamnus aizoon</i>		A	pl. L, fig. 1, 2 (folia)	<i>Cotinus</i> (?) <i>aizoon</i>
		A	pl. L, fig. 3 (flos)	indet.
		E	pl. III, fig. 44	<i>Cotinus</i> (?) <i>aizoon</i>
		E	pl. III, fig. 45, 46	<i>Cotinus</i> (?) <i>aizoon</i>
<i>Rhamnus degener</i>		E	pl. III, fig. 49	<i>Dicotylophyllum</i> sp.
<i>Rhamnus pygmaeus</i>		E	pl. III, fig. 48	<i>Dicotylophyllum</i> sp.
<i>Rhododendron flos-saturni</i>		F	pl. XII, fig. 12, fig. 15	" <i>Quercus</i> " <i>daphnes</i>
<i>Rhus cuneolata</i>		D	pl. XX, fig. 12	<i>Dicotylophyllum</i> sp.
<i>Rhus elaeodendroides</i>		D	pl. XXI, figs. 1-3, 6-8	<i>Dicotylophyllum</i> sp.
		D	pl. XXI, fig. 7	<i>Quercus drymeja</i>
		D	pl. XXI, figs. 4, 5, 11	<i>Ailanthus pythii</i>
<i>Rhus herthae</i>		D	pl. XX, figs. 7-9	<i>Toxicodendron herthae</i>
<i>Rhus napaeorum</i>		D	pl. XX, fig. 11	<i>Dicotylophyllum</i> sp.
<i>Rhus nitida</i>				
<i>Rhus retine</i>		D	pl. XX, fig. 10	<i>Dicotylophyllum</i> sp.
<i>Rhus triphylla</i>		D	pl. XX, fig. 13	<i>Cedrelospermum ulmifolium</i>
<i>Rhus zanthoxyloides</i>		D	pl. XXI, fig. 13	<i>Dicotylophyllum</i> sp.
<i>Robinia hesperidum</i>		E	pl. IV, figs. 11-13 (fructus)	<i>Leguminosites hesperidum</i>
		E	pl. IV, fig. 14 (semina)	<i>Saportaspermum</i> sp.
		E	pl. IV, figs. 15-17 (folia)	<i>Dicotylophyllum</i> sp.
<i>Rosa penelopes</i>				
<i>Salix angustissima</i>				
<i>Sapindus pythii</i>		D	pl. XIV, figs. 6-17	<i>Ailanthus pythii</i>
<i>Sideroxylon hepios</i>		F	pl. VIII, fig. 4	<i>Dicotylophyllum</i> sp.
<i>Smilacites sagittata</i>		A	pl. XL, fig. 4	<i>Smilax sagittifera</i>
<i>Sparganium acheronticum</i>		C	pl. XXX, fig. 2	Monocotyledonae indet.
<i>Sphaerites disciformis</i>				
<i>Sphaerites punctiformis</i>				

Tab. 5: continued

taxon	UNGER's revision	in refer- ence	figure	determination now
<i>Spiraea zephyri</i>		F	pl. XVIII, figs. 22, 23	cf. <i>Rosa</i> sp.
<i>Styrax boreale</i>		F	pl. XI, fig. 11	<i>Mahonia</i> (?) <i>aspera</i>
		F	pl. XI, figs. 12, 13	? Leguminosae
<i>Taxodites dubius</i>				
<i>Taxodites oeningensis</i>				
<i>Ulmus bronnii</i>				
<i>Ulmus parvifolia</i>		C	pl. XLIII, fig. 22	<i>Cedrelospemum ulmifolium</i> vel <i>Ulmus plurinervia</i>
<i>Ulmus plurinervia</i>		A	pl. XXV, figs. 1-4	<i>Ulmus plurinervia</i>
<i>Ulmus praelonga</i>		C	pl. XLIII, fig. 20	<i>Zelkova zelkovifolia</i>
<i>Ulmus quercifolia</i>		A	pl. XXV, fig. 5	<i>Dicotylophyllum</i> sp.
		C	pl. XLIII, fig. 24	<i>Prinsepia serra</i>
<i>Ulmus zelkovaefolia</i>		A	pl. XXIV, fig. 7, upper right, figs. 9-12	<i>Zelkova zelkovifolia</i>
		A	pl. XXIV, fig. 7 left bottom, fig. 8 (fructus)	<i>Ulmus parschlugiana</i>
		A	pl. XXIV, fig. 13	<i>Zelkova zelkovifolia</i>
		A	pl. XXVI, fig. 7	<i>Zelkova zelkovifolia</i>
		A	pl. XXVI, fig. 8	<i>Ulmus parschlugiana</i>
<i>Vaccinium chamaedrys</i>		F	pl. XII, fig. 1 a	<i>Dicotylophyllum</i> sp.
<i>Vaccinium empetrites</i>		F	pl. XII, fig. 2 a, c	<i>Dicotylophyllum</i> sp.
<i>Vaccinium icmadophilum</i>		F	pl. XII, fig. 5 a, b	<i>Dicotylophyllum</i> sp.
<i>Vaccinium myrsinefolium</i>		F	pl. XII, fig. 6	<i>Dicotylophyllum</i> sp.
<i>Vaccinium vitis-japeti</i>		F	pl. XII, figs. 3 a-c	<i>Dicotylophyllum</i> sp.
<i>Widdringtonites ungeri</i>				
<i>Xylomites maculatus</i>				
<i>Xylomites tuberculatus</i>				
<i>Zanthoxylum fraxinoides</i>				
<i>Ziziphus protolotus</i>	<i>Zizyphus protolotus</i>	E	pl. III, fig. 43	? <i>Paliurus tiliifolius</i>
<i>Ziziphus tremula</i>	<i>Zizyphus tremula</i>	E	pl. III, fig. 39	<i>Paliurus tiliifolius</i>

Tab. 6: List of taxa from Parschlug published in UNGER (1850b) with current revisions.

UNGER, 1850 b. Socka (Sotzka) – reference B

taxon	reference	collection/No.	revision	new illustration
<i>Amygdalus pereger</i>	p. 184, pl. LV, figs. 11-14 (folia)	S	<i>Ternstroemites pereger</i>	
	pl. LV, fig. 15 (fructus)	S	indet.	
<i>Carpinus producta</i>	p. 164, pl. XXXII, fig. 6	LMJ 76540	<i>Engelhardia macroptera</i>	pl. 6, fig. 9
	pl. XXXII, fig. 4	LMJ 76545 possibly from Sotzka	<i>Engelhardia macroptera</i>	
<i>Cassia petiolata</i>	p. 189, pl. LXV, fig. 7	LMJ 76543 possibly from Sotzka	<i>Dicotylophyllum</i> sp.	
<i>Comptonia laciniata</i>	p. 161, pl. XXIX, fig. 2	H	<i>Myrica lignitum</i>	
<i>Comptonia oeningensis</i>	p. 161, pl. XXIX, fig. 3	LMJ 76546	<i>Myrica lignitum</i>	pl. 7, fig. 7
<i>Comptonia ulmifolia</i>	p. 162, pl. XXIX, fig. 4	S	<i>Cedrelospermum ulmifolium</i>	
	pl. XXIX, fig. 5	L; LMJ 76536	<i>Cedrelospermum ulmifolium</i>	pl. 8, fig. 5
<i>Juglans elaeagnoides</i>	p. 179, pl. LIII, fig. 3 (folium)	LMJ 76542, counter-impression 77652	<i>Ailanthus pythii</i>	
	pl. LIII, fig. 4 (fructus)	S	indet.	
<i>Juglans hydrophila</i>	p. 179, pl. LIII, figs. 8, 9	S	<i>Quercus drymeja</i>	
	pl. LIII, fig. 6	S; LMJ 76866	<i>Quercus zoroastri</i>	pl. 5, fig. 2
	pl. LIII, fig. 7	S; LMJ 76549	<i>Quercus drymeja</i>	pl. 4, fig. 2
<i>Pyrus euphemes</i>	p. 183, pl. LIX, fig. 10	LMJ 76548	<i>Dicotylophyllum</i> sp.	
<i>Pyrus minor</i>	p. 183, pl. LIX, fig. 16	LMJ 76547	<i>Dicotylophyllum</i> sp.	
<i>Pyrus theobroma</i>	p. 183, pl. LIX, fig. 5	LMJ 76550	<i>Dicotylophyllum</i> sp.	

Tab. 7: List of taxa from Parschlug published in ETTINGSHAUSEN (1851a) with current revisions.

ETTINGSHAUSEN 1851 a. Tertiär-Floren der österreichischen Monarchie

taxon	reference	collection/no.	revision	new illustration
<i>Cassia ambigua</i>	p. 27, pl. V figs. 12, 13	GBA ??	? <i>Podocarpium podocarpum</i>	
<i>Liquidambar europaeum</i>	p. 15, pl. II, figs. 20, 22	GBA ??	<i>Liquidambar europaea</i>	
<i>Planera ungeri</i>	p. 14, pl. II, figs. 7, 13, 16	S, GBA ??	<i>Zelkova zelkovifolia</i>	
	pl. II, figs. 15, 17	S, GBA ??	<i>Cedrelospermum ulmifolium</i>	
	pl. II, fig. 18	S, GBA ??	? <i>Cedrelospermum ulmifolium</i>	
	pl. II, figs. 11, 12	S, GBA ??	<i>Ulmus plurinervia</i>	
	pl. II, fig. 14	S, GBA ??	? <i>Ulmus plurinervia</i>	
<i>Pterospermum ferox</i>	p. 22, pl. IV, fig. 4	S, GBA	" <i>Cornus</i> " <i>ferox</i>	

Tab. 8: List of taxa from Parschlug published in UNGER (1852) and current revisions.

UNGER, 1852. Iconographia plantarum fossilium – reference C

taxon	reference	collection/no.	revision	new illustration
<i>Betula dryadum</i>	p. 105, pl. XXXIX, fig. 10 (fructus)	LMJ 76497	<i>Betula</i> sp.	
	pl. XXXIX, fig. 9 (folium)		Betulaceae, ? <i>Betula</i> vel <i>Alnus</i>	
	pl. XXXIX, fig. 11		indet.	
	pl. XXXIX, fig. 12		indet.	
<i>Carpinus microptera</i>	p. 113, pl. XLIII, fig. 18 (bract)	H	indet.	
<i>Carpinus oblonga</i>	p. 112, pl. XLIII, fig. 16		<i>Ternstroemites pereger</i>	
	p. 112, pl. XLIII, fig. 17 (fructus)		<i>Engelhardia macroptera</i>	
<i>Celtis japeti</i>	p. 116, pl. XLIII, figs. 25, 26		<i>Celtis japeti</i>	
<i>Comptonia laciniata</i>	p. 105, pl. XXXIX, fig. 8		" <i>Acacia</i> " <i>parschlugiana</i>	
<i>Cyperites tertiaris</i>	p. 86, pl. XXVIII, fig. 5	LMJ 76511	Monocotyledoneae indet.	
<i>Fagus deucalionis</i>	p. 110, pl. XLI, fig. 24 (folium)	LMJ 76492	<i>Betula</i> vel <i>Alnus</i> sp.	pl. 3, fig. 3
	pl., XLI, fig. 25 (fructus)	LMJ 62667	<i>Fagus</i> sp.	
<i>Glyptostrobus oeningensis</i>	p. 92, unfig.			
<i>Isoetites brauni</i>	p. 85, pl. XXVII, fig. 18		indet.	
<i>Liquidambar acerifolium</i>	p. 116, pl. XLIII, fig. 28	LMJ 76492	<i>Liquidambar europaea</i>	pl. 2, fig. 1
<i>Liquidambar protensum</i>	p. 116, pl. XLIII, fig. 27	LMJ 76508	<i>Liquidambar europaea</i>	pl. 2, fig. 4
<i>Muscites fontinaloides</i>	p. 82, pl. XXVII, figs. 3, 4			
<i>Muscites schimperi</i>	p. 82, pl. XXVII, figs. 1, 2	LMJ 76498	indet.	
<i>Myrica deperdita</i>	p. 104, sine fig.			
<i>Pinites balsamodes</i>	p. 95, pl. XXXV, fig. 7 (scale)	LMJ 76496	<i>Pinus</i> sp.	
	pl. XXXV, fig. 8		<i>Pinus</i> sp.	
<i>Pinites centrotos</i>	p. 98, pl. XXXVII, fig. 1	LMJ 76486	<i>Pinus</i> sp.	
	pl. XXXVII, figs. 2, 3		<i>Pinus</i> sp.	
	pl. XXXVII, fig. 4 (male cone)	LMJ 76500	<i>Pinus</i> sp.	pl. 1, fig. 4
<i>Pinites furcatus</i>	p. 99, pl. XXXVII, figs. 7, 8 (semen)		<i>Pinus</i> sp.	
	pl. XXXVII, fig. 9 (folia)		<i>Pinus</i> sp.	
<i>Pinites hepjos</i>	p. 97, pl. XXXV, figs. 6-8 (folia)		<i>Pinus</i> sp.	
	pl. XXXV, fig. 9 (semen)	LMJ 76501	<i>Pinus</i> sp.	pl. 1, fig. 12
<i>Pinites goethanus</i>	p. 96, pl. XXXV, fig. 18 (semen)	LMJ 76491	<i>Pinus</i> sp.	pl. 1, fig. 11
	pl. XXXV, figs. 19-21 (semina)		<i>Pinus</i> sp.	
	pl. XXXV, fig. 22 (folia)		<i>Pinus</i> sp.	
<i>Pinites leuce</i>	p. 95, pl. XXXV, figs. 9-15 (semina)		<i>Pinus</i> sp.	
	pl. XXXV, fig. 16 (folium)		<i>Pinus</i> sp.	
<i>Pinites oceanines</i>	p. 94, pl. XXXV, fig. 1 (semen)		Pinaceae ?	
	pl. XXXV, figs. 2-4 (folia)		Coniferae	

Tab. 8: continued

taxon	reference	collection/no.	revision	new illustration
<i>Pinites taedaiformis</i>	p. 97, pl. XXXVI, fig. 4	H	<i>Pinus</i> sp.	
<i>Populus aëoli</i>	p. 117, pl. XLIV, fig. 2	H; LMJ 76506	<i>Populus populina</i>	pl. 8, fig. 18
<i>Populus gigas</i>	p. 117, pl. XLIV, fig. 1		<i>Platanus leucophylla</i>	
<i>Populus latior</i>	p. 117, pl. XLIV, fig. 3	LMJ 76509	<i>Populus populina</i>	
	pl. XLIV, fig. 4	LMJ 76505	<i>Populus populina</i>	pl. 14, fig. 1
	pl. XLIV, fig. 5	LMJ 76484	<i>Populus populina</i>	
<i>Potamogeton castaliae</i>	p. 89, pl. XXX, fig. 1	LMJ 76499	indet.	
<i>Quercus commutata</i>	p. 107, pl. XL, figs. 8, 9	S	<i>Myrica lignitum</i>	
	pl. XL, fig. 10	S; LMJ 76510	<i>Myrica lignitum</i>	pl. 7, fig. 8
<i>Quercus cyclophylla</i>	p. 109, pl. XLI, fig. 15		<i>Quercus mediterranea</i>	
<i>Quercus gmelini</i>	p. 108, pl. XLI, fig. 10		<i>Dicotylophyllum</i> sp.	
<i>Quercus lignitum</i>	p. 106, pl. XL, fig. 1	LMJ 76504	<i>Myrica lignitum</i>	pl. 7, fig. 2
	p. 106, pl. XL, fig. 2	LMJ 76504	<i>Myrica lignitum</i>	
	pl. XL, fig. 4	LMJ 76503	<i>Myrica lignitum</i>	pl. 7, fig. 6
	pl. XL, figs. 3, 5		<i>Myrica lignitum</i>	
	pl. XL, fig. 6	LMJ 76510	<i>Myrica lignitum</i>	pl. 7, fig. 1
	pl. XL, fig. 7	LMJ 76485	<i>Myrica lignitum</i>	
	pl. XLI, figs. 21-23 (catkins)			
<i>Quercus mediterranea</i>	p. 107, pl. XLI, fig. 1	LMJ 76507	<i>Quercus mediterranea</i>	
	pl. XL figs. 2, 3, 5, 6		<i>Quercus mediterranea</i>	
	pl. XL, fig. 4		? <i>Quercus drymeja</i>	
<i>Quercus myricaefolia</i>	p. 109, pl. XLI, fig. 12	H	<i>Dicotylophyllum</i> sp.	
<i>Quercus myrtilloides</i>	p. 110, pl. XLI, fig. 17	LMJ 76502	? <i>Buxus</i> cf. <i>egeriana</i>	pl. 8, fig. 15
	pl. XLI, fig. 18	LMJ 76490	<i>Dicotylophyllum</i> sp.	
	pl. XLI, figs. 19, 20		<i>Dicotylophyllum</i> sp.	
<i>Quercus serra</i>	p. 110, pl. XLI, fig. 16	E; LMJ 76495	" <i>Quercus</i> " <i>serra</i>	pl. 13, fig. 10
<i>Quercus urophylla</i>	p. 108, pl. XLI, fig. 11		? <i>Quercus drymeja</i>	
<i>Quercus zoroastri</i>	p. 108, pl. XLI, figs. 7, 8		<i>Quercus zoroastri</i>	
	pl. XLI, fig. 9		<i>Ailanthus pythii</i>	
<i>Sparganium acheronticum</i>	p. 89, pl. XXX, fig. 2	? LMJ 76499 (right)	Monocotyledoneae	
<i>Taxodites dubius</i>	p. 92, sine fig.			
<i>Ulmus praelonga</i>	p. 115, pl. XLIII, fig. 20	H; LMJ 76487	<i>Zelkova zelkovifolia</i>	pl. 8, fig. 11
<i>Ulmus parvifolia</i>	p. 115, pl. XLIII fig. 22	LMJ 76488	<i>Cedrelospermum ulmifolium</i> vel <i>Ulmus plurinervia</i>	pl. 8, fig. 12
<i>Ulmus quercifolia</i>	p. 115, pl. XLIII fig. 24		<i>Prinsepia serra</i>	
<i>Zelkova ungeri</i>	p. 114, pl. XLIII, fig. 19		<i>Zelkova zelkovifolia</i>	



Tab. 9: List of taxa from Parschlug published in UNGER (1860) with current revisions.

UNGER, 1860. Sylloge plantarum fossilium 1 – reference D

taxon	reference	collection/no.	revision	new illustration
<i>Fraxinus primigenia</i>	p. 22, pl. VIII, fig. 1 (fructus)		<i>Fraxinus primigenia</i>	
	pl. VIII, figs. 3, 8		<i>Ailanthus pythii</i>	
	pl. VIII, figs. 4-7		<i>Dicotylophyllum</i> sp.	
<i>Juglans parschlugiana</i>	p. 37 pl. XIX, fig. 2	S; LMJ 76559	" <i>Juglans</i> " <i>parschlugiana</i>	pl. 9, fig. 2
	pl. XIX, fig. 4	S; LMJ 76560	" <i>Juglans</i> " <i>parschlugiana</i>	
	pl. XIX, figs. 1, 3, 5, 6		" <i>Juglans</i> " <i>parschlugiana</i>	
	pl. XIX, fig. 7 (? fructus)		indet.	
<i>Juglans melaena</i>	p. 38, pl. XIX figs. 8-10		<i>Toxicodendron herthae</i>	
<i>Pistacia lentiscoides</i>	p. 46, pl. XXI, fig. 14		<i>Dicotylophyllum</i> sp.	
<i>Rhus cuneolata</i>	p. 44, pl. XX, fig. 12	LMJ 76553	<i>Dicotylophyllum</i> sp.	
<i>Rhus elaeodendroides</i>	p. 45, pl. XXI, figs. 1-3, 6, 9		<i>Dicotylophyllum</i> sp.	
	p. 45, pl. XXI, figs. 4, 5, 11		<i>Ailanthus pythii</i>	
	pl. XXI, fig. 7		<i>Quercus drymeja</i>	
	pl. XXI, fig. 8	LMJ 76558	<i>Dicotylophyllum</i> sp.	
	pl. XXI, fig. 10	LMJ 76556	<i>Dicotylophyllum</i> sp.	
<i>Rhus herthae</i>	p. 42, pl. XX, fig. 7		<i>Toxicodendron herthae</i>	
	pl. XX, fig. 8	L; LMJ 76 562 A	<i>Toxicodendron herthae</i>	pl. 9, fig. 7
	pl. XX, fig. 9	S; LMJ 76551	<i>Toxicodendron herthae</i>	
<i>Rhus napearum</i>	p. 43, pl. XX, fig. 11	LMJ 76561	<i>Dicotylophyllum</i> sp.	
<i>Rhus retine</i>	p. 43 pl. XX, fig. 10		<i>Dicotylophyllum</i> sp.	
<i>Rhus triphylla</i>	p. 44, pl. XX, fig. 13	LMJ 76554	<i>Cedrelospermum ulmifolium</i>	
<i>Rhus zanthoxyloides</i>	p. 45, pl. XXI, fig. 13	LMJ 76552	<i>Dicotylophyllum</i> sp.	
<i>Sapindus pythii</i>	p. 33, pl. XIV, figs. 6, 7, 9-17	S	<i>Ailanthus pythii</i>	
	pl. XIV, fig. 8	L; LMJ 76557	<i>Ailanthus pythii</i>	pl. 14, fig. 4

Tab. 10: List of taxa from Parschlug published in UNGER (1864) with current revisions.

UNGER, 1864. Sylloge – reference E

taxon	reference	collection/no.	revision	new illustration
<i>Acacia parschlugiana</i>	p. 34, pl. XI, fig. 19 (fructus)	LMJ 77653	<i>Leguminosites hesperidum</i>	
	pl. XI, fig. 20 (folium compositum)		" <i>Acacia</i> " <i>parschlugiana</i>	
<i>Amorpha styriaca</i>	p. 20, pl. IV, fig. 4	LMJ 76568	<i>Dicotylophyllum</i> sp.	
	pl. IV, fig. 5		? <i>Mahonia</i> (?) <i>aspera</i>	
<i>Bauhinia parschlugiana</i>	p. 29, pl. XI, fig. 3 (fructus)		<i>Leguminosites parschlugianus</i>	
<i>Cassia ambigua</i>	p. 29, pl. X, fig. 9	LMJ 76570	<i>Dicotylophyllum</i> sp.	
<i>Cassia memnonia</i>	p. 29, pl. X, figs. 4, 5		<i>Dicotylophyllum</i> sp.	
<i>Celastrus cassinefolius</i>	p. 7, pl. II, fig. 1		<i>Dicotylophyllum</i> sp.	
<i>Celastrus elaenoides</i>	p. 10, pl. II, figs. 16-19		<i>Dicotylophyllum</i> sp.	
<i>Celastrus europaeus</i>	p. 10, pl. II, fig. 10	L; LMJ 76576	" <i>Celastrus</i> " <i>europaea</i>	pl. 12, fig. 1
	pl. II, fig. 11	S; LMJ 76581	" <i>Celastrus</i> " <i>europaea</i>	
	pl. II, fig. 12	S; LMJ 76563	" <i>Celastrus</i> " <i>europaea</i>	pl. 12, fig. 2
	pl. II, fig. 13		<i>Dicotylophyllum</i> sp.	
<i>Celastrus noaticus</i>	pl. II, fig. 2		<i>Dicotylophyllum</i> sp.	
	pl. II fig. 3	LMJ 76539	<i>Dicotylophyllum</i> sp.	
<i>Cytisus dionysi</i>	pl. IV, fig. 1	H; LMJ 76577	<i>Leguminosites dionysi</i>	pl. 9, fig. 5
<i>Evonymus latoniae</i>	p. 11, pl. II, fig. 25	L; LMJ 76574 (part), 76573 (counter part)	" <i>Evonymus</i> " <i>latoniae</i>	pl. 12, fig. 3
<i>Glyzyrrhiza blandusia</i>	p. 20, pl. IV figs. 6, 7 (fructus)			
	pl. IV, figs. 8-10 (folia)		<i>Dicotylophyllum</i> sp.	
<i>Hardenbergia orbis-veteris</i>	p. 23, pl. V, fig. 5		" <i>Cornus</i> " <i>ferox</i>	
<i>Ilex ambigua</i>	p. 14			
<i>Ilex cyclophylla</i>	p. 13, pl. III, fig. 7	LMJ 76537	<i>Mahonia</i> (?) <i>aspera</i>	
	pl. III fig. 8	LMJ 76579	<i>Mahonia</i> (?) <i>aspera</i>	pl. 13, fig. 3
<i>Ilex neogena</i>	p. 13, pl. III, fig. 9		<i>Mahonia</i> (?) <i>aspera</i>	
	pl. III, fig. 10	LMJ 76580	<i>Mahonia</i> (?) <i>aspera</i>	
	pl. III, fig. 11	LMJ 76572	<i>Mahonia</i> (?) <i>aspera</i>	
<i>Ilex simularis</i>	p. 13, pl. III, fig. 14		<i>Dicotylophyllum</i> sp.	
<i>Ilex sphenophylla</i>	p. 12, pl. III, fig. 3	LMJ 76571	<i>Mahonia</i> (?) <i>aspera</i>	pl. 13, fig. 1
	pl. III, fig. 4	LMJ 76538	<i>Mahonia</i> (?) <i>aspera</i>	
	pl. III, figs. 5, 6		<i>Mahonia</i> (?) <i>aspera</i>	
<i>Ilex stenophylla</i>	p. 14, pl. III, figs. 15-19		<i>Dicotylophyllum</i> sp.	

Tab. 10: continued

taxon	reference	collection/no.	revision	new illustration
<i>Mimosa palaeogaea</i>	p. 34, pl. XI, fig. 12 (fructus)		<i>Leguminosites palaeogaeus</i>	
<i>Nemopanthes angustifolius</i>	p. 15, pl. III, fig. 35	LMJ 76567	<i>Dicotylophyllum</i> sp.	
<i>Phaseolites securidacus</i>	p. 24, pl. V, fig. 9	L; LMJ 76569	<i>Phaseolites securidacus</i>	pl. 9, fig. 14
	pl. V, fig. 10		<i>Dicotylophyllum</i> sp.	
<i>Physolobium antiquum</i>	p. 21, pl. V, fig. 4		<i>Dicotylophyllum</i> sp.	
<i>Physolobium kennedyaefolium</i>	p. 22, pl. V, fig. 1		<i>Dicotylophyllum</i> sp.	
<i>Physolobium orbiculare</i>	p. 22, pl. V, fig. 3		<i>Dicotylophyllum</i> sp.	
<i>Pittosporum cuneifolium</i>	p. 6, pl. I, figs. 14, 15		<i>Cotinus</i> (?) <i>aizoon</i>	
<i>Prinus hyperboreus</i>	p. 14, pl. III, fig. 34 (flores),		<i>Antholithes styriacus</i>	
	pl. III, fig. 37 (folium)		<i>Myrica lignitum</i>	
<i>Rhamnus aizoides</i>	p. 17, pl. III, fig. 47	LMJ 76565	<i>Dicotylophyllum</i> sp.	
<i>Rhamnus aizoon</i>	p. 17, pl. III, fig. 44	L; LMJ 76575	<i>Cotinus</i> (?) <i>aizoon</i>	
	pl. III, figs. 45, 46		<i>Cotinus</i> (?) <i>aizoon</i>	
<i>Rhamnus degener</i>	p. 18, pl. III, fig. 49		<i>Dicotylophyllum</i> sp.	
<i>Rhamnus pygmaeus</i>	p. 18, pl. III, fig. 48		<i>Dicotylophyllum</i> sp.	
<i>Robinia hesperidum</i>	p. 21, pl. IV, fig. 12 (fructus)	LM 76868	<i>Leguminosites hesperidum</i>	
	pl. IV, fig. 11, 13 (fructus)	L; GBA 1864/01/21	<i>Leguminosites hesperidum</i>	pl. 9, fig. 4
	pl. IV, fig. 14		<i>Saportaspermum</i> sp.	
	pl. IV, figs. 15, 17		<i>Dicotylophyllum</i> sp.	
	pl. IV, fig. 16	LMJ 76578	<i>Dicotylophyllum</i> sp.	
<i>Zizyphus protolotus</i>	p. 17, pl. III, fig. 43		? <i>Paliurus tiliifolius</i>	
<i>Zizyphus renata</i>	p. 16, pl. III, fig. 40, 41		<i>Paliurus tiliifolius</i>	
<i>Zizyphus tremula</i>	p. 16. pl. III, fig. 39	LMJ 76566	<i>Paliurus tiliifolius</i>	

Tab. 11: List of taxa from Parschlug published in UNGER (1866) with current revisions.

UNGER, 1866. Sylloge – reference F

taxon	reference	collection/ no.	revision	new illustration
<i>Acer productum</i>	p. 46, pl. XV fig. 1		<i>Platanus leucophylla</i>	
	pl. XV, fig. 2 (fructus)		<i>Acer</i> sp.	
<i>Acer pseudo-campestre</i>	p. 46, pl. XV, fig. 3 (fructus)		<i>Acer</i> sp.	
	pl. XV, fig. 4 (folium)		<i>Acer</i> cf. <i>pseudomonspessulanum</i>	
	pl. XV, fig. 5 (folium)		<i>Dicotylophyllum</i> sp.	
<i>Achras lycobroma</i>	p. 23, pl. VIII, fig. 1 (folium)	LMJ 76591	" <i>Quercus</i> " <i>daphnes</i>	pl. 12, fig. 10
	pl. VIII, fig. 2			
<i>Andromeda glauca</i>	p. 35, pl. XII, fig. 8	LMJ 76592	<i>Dicotylophyllum</i> sp.	
<i>Azalea hyperborea</i>	p. 40, pl. XII, fig. 21	LMJ 76583	<i>Dicotylophyllum</i> sp.	
	pl. XII, fig. 22		<i>Dicotylophyllum</i> sp.	
<i>Cornus ferox</i>	p. 76, pl. XXIV, fig. 21		" <i>Cornus</i> " <i>ferox</i>	
<i>Cotoneaster andromedae</i>	p. 59, pl. XVIII, fig. 11	LMJ 76585	<i>Dicotylophyllum</i> sp.	
	pl. XVIII, fig. 12	LMJ 76586	<i>Dicotylophyllum</i> sp.	
<i>Cotoneaster pusillus</i>	p. 59, pl. XVIII, fig. 13		<i>Dicotylophyllum</i> sp.	
<i>Crataegus oreonis</i>	p. 59, pl. XVIII, fig. 15	LMJ 76593	<i>Ternstroemites pereger</i>	
<i>Crataegus teutonica</i>	p. 60, pl. XIX, figs. 24, 25		<i>Berberis teutonica</i>	
<i>Ledum limnophilum</i>	p. 40, pl. XII, figs. 24-26		<i>Dicotylophyllum</i> sp.	
<i>Macreightia germanica</i>	p. 26, pl. VIII, figs. 12, 13 (flores)		<i>Populus</i> sp.	
<i>Myrsine doryphora</i>	p. 19, pl. VI, fig. 10		? " <i>Quercus</i> " <i>daphnes</i>	
<i>Myrtus miocenica</i>	p. 57, pl. XVIII, fig. 6		<i>Dicotylophyllum</i> sp.	
<i>Prunus atlantica</i>	p. 61, pl. XVIII, fig. 26 (folium)		<i>Dicotylophyllum</i> sp.	
	pl. XVIII, fig. 27 (fructus)			
<i>Prunus euri</i>	p. 61, pl. XVIII, fig. 30		? <i>Cedrelospermum ulmifolium</i>	
<i>Prunus paradisiaca</i>	p. 62, pl. XVIII, fig. 28		? <i>Myrica</i> (infructescence)	
	pl. XVIII, fig. 29 (folium)		<i>Dicotylophyllum</i> sp.	
<i>Prunus theodisca</i>	p. 61, pl. XVIII, fig. 31		<i>Quercus mediterranea</i>	
<i>Pyrus mini</i>	p. 58, pl. XVIII, fig. 20		cf. <i>Rosa</i> sp.	
<i>Rhododendron flos-saturni</i>	p. 24, pl. 12, fig. 15	LMJ 76590 (counterpart)	" <i>Quercus</i> " <i>daphnes</i>	pl. 12, fig. 11
<i>Sideroxylon hepios</i>	p. 24, pl. VIII, fig. 4	LMJ 76587	<i>Dicotylophyllum</i> sp.	
<i>Spiraea zephyri</i>	p. 60, pl. XVIII, figs. 22, 23		cf. <i>Rosa</i> sp.	
<i>Styrax boreale</i>	p. 33, pl. XI, fig. 11		? <i>Mahonia</i> (?) <i>aspera</i>	
	pl. XI, figs. 12, 13		? Leguminosae	
<i>Symplocos parschlugiana</i>	p. 33, pl. XI, fig. 10			
<i>Vaccinium chamaedrys</i>	p. 36, pl. XII, fig. 1 a		<i>Dicotylophyllum</i> sp.	

Tab. 11: continued

taxon	reference	collection/ no.	revision	new illustration
<i>Vaccinium empetrites</i>	p. 37, pl. XII, fig. 2 a	LMJ 76588	<i>Dicotylophyllum</i> sp.	
	pl. XII, fig. 2 c		<i>Dicotylophyllum</i> sp.	
<i>Vaccinium icmadophyllum</i>	p. 37, pl. XII, fig. 5 a, b		<i>Dicotylophyllum</i> sp.	
<i>Vaccinium myrsinefolia</i>	p. 38, pl. XII, fig. 6	LMJ 76589	<i>Dicotylophyllum</i> sp.	
<i>Vaccinium vitis-japeti</i>	p. 36, pl. XII, figs. 3 a-c		<i>Dicotylophyllum</i> sp.	

### Age of the flora of Parschlug

The age of the coal-bearing deposits has long been the subject of discussion. A late Karpatian age (late Early Miocene) was supposed based on mammal remains described by MÖTTL (1970). However, these remains are not appropriate for such a precise dating (personal communication 2002 G. DAXNER-HÖCK). The newly characterized aspects of the assemblage from Parschlug offer some additional information: *Engelhardia* is more abundant in the Early Miocene and still occurs in the Badenian, e.g. at Weingraben, Wieliczka, but is a relict in the Early Pannonian (Rudabanya), and Early Pliocene (Gérce) in Central Europe. *Cedrelospermum* offers a similar picture - it survived only to the Sarmatian and we lack certain evidence from the Pannonian onwards. Unequivocal records of *Acer vindobonensis*, *Acer aegopodifolium*, and *Acer subcampestre* GÖPPERT are documented in Central Europe starting from the Sarmatian (rarely from the late Badenian). Also, roburoid oaks immigrated from the east and are documented largely starting from the Sarmatian. None of them occurs in the Parschlug flora. Of younger elements, only *Platanus leucophylla* is well documented at Parschlug. The first definite record is not older than the Badenian (*Platanus leucophylla* in Ukraine, Poland - KOVAR-EDER et al. 1994, 1996). Concluding from these considerations, we suspect a Karpatian/Early Badenian age (late Early – early Middle Miocene) for the flora of Parschlug.

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<i>Populus sp.</i> .....	70, 95, 96, 100, 101, 105, 116, 142	<i>Quercus serra</i> .....	63, 72, 88, 103, 108, 112, 152
<i>Populus zaddachii</i> .....	71	<i>Quercus sosnowskyi</i> .....	62, 63
<i>Porana</i> .....	87, 88	<i>Quercus urophylla</i> .....	61, 108, 112
<i>Potamogeton castaliae</i> .....	112	<i>Quercus zoroastri</i> .....	61, 62, 63, 81, 93, 95, 100, 106, 108, 110, 112, 136
<i>Prinos hyperboreus</i> .....	64, 86	<i>Rhamnus aizoides</i> .....	91, 108, 115
<i>Prinsepia serra</i> .....	45, 56, 62, 72, 95, 98, 100, 101, 103, 109, 112, 152	<i>Rhamnus aizoon</i> .....	80, 81, 103, 108, 115, 148
<i>Prinsepia sinensis</i> .....	72	<i>Rhamnus degener</i> .....	91, 108, 115
? <i>Prinsepia sp.</i> .....	73, 100, 142	<i>Rhamnus pygmaeus</i> .....	91, 108, 115



<i>Rhododendron flos-saturni</i> .....	85, 108, 116, 150	<i>Tilia</i> .....	93, 98, 101, 122
<i>Rhus cotinus</i> .....	81	<i>Tilia lignitum</i> .....	66, 138
<i>Rhus cuneolata</i> .....	91, 108, 113	<i>Tilia longebracteata</i> .....	66, 92, 95, 100, 138
<i>Rhus elaeodendroides</i> .....	81, 85, 91, 108, 113	<i>Tilia milleri</i> .....	66
<i>Rhus herthae</i> .....	80, 108, 113, 144	<i>Toxicodendron herthae</i> ....	80, 95, 100, 106, 108, 113, 144
<i>Rhus napearum</i> .....	91, 108, 113	<i>Tremophyllum tenerrimum</i> .....	68, 99
<i>Rhus palaeocotinus</i> .....	81	<i>Trigonobalanopsis</i> .....	98
<i>Rhus retine</i> .....	91, 108, 113	<i>Ulmus</i> .....	68, 93, 98
<i>Rhus triphylla</i> .....	68, 108, 113	<i>Ulmus americana</i> .....	68
<i>Rhus zanthoxyloides</i> .....	91, 108, 113	<i>Ulmus braunii</i> .....	67
<i>Rhytisma aceris</i> .....	77, 78	<i>Ulmus bronnii</i> .....	66, 103
<i>Robinia</i> .....	73	<i>Ulmus carpinoideis</i> .....	67
<i>Robinia hesperidum</i> .....	73, 87, 91, 108, 115, 144	<i>Ulmus parschlugiana</i> 45, 67, 68, 95, 100, 103, 109, 138	
cf. <i>Rosa</i> sp. ....	71, 95, 100, 109, 116, 142	<i>Ulmus parvifolia</i> .....	68, 109, 112, 142
<i>Salix</i> sp. ....	98, 99	<i>Ulmus plurinervia</i> .....	66, 67, 68, 72, 93, 95, 96, 98, 9 100, 103, 109, 110, 112, 138, 142
<i>Salvinia</i> .....	93, 118	<i>Ulmus praelonga</i> .....	69, 109, 112, 142
<i>Salvinia cerebrata</i> .....	53	<i>Ulmus pyramidalis</i> .....	67, 99
<i>Salvinia</i> cf. <i>mildeana</i> .....	53, 100, 128	<i>Ulmus quercifolia</i> .....	72, 92, 103, 109, 112
<i>Salvinia intermedia</i> .....	53	<i>Ulmus zelkovaefolia</i> .....	67, 69, 103, 109, 142
<i>Salvinia microphylla</i> .....	53	<i>Vaccinium chamaedrys</i> .....	92, 109, 116
<i>Salvinia reussii</i> .....	53	<i>Vaccinium empetrites</i> .....	92, 109, 117
<i>Sapindus pythii</i> .....	62, 81, 108, 113, 154	<i>Vaccinium icmadophilum</i> .....	92, 109, 117
<i>Saportaspermum</i> .....	92, 101	<i>Vaccinium myrsinefolium</i> .....	92, 109, 117
<i>Saportaspermum occidentale</i> .....	87	<i>Vaccinium vitis-japeti</i> .....	92, 109, 117
<i>Saportaspermum</i> sp. ....	87, 95, 100, 102, 108, 115, 156	<i>Widdringtonia baccifera</i> .....	55
<i>Sapotacites longepetiolatus</i> .....	85	<i>Widdringtonia ungeri</i> .....	55
<i>Sideroxylon hepios</i> .....	92, 108, 116	<i>Widdringtonites ungeri</i> .....	55, 109
<i>Sideroxylon salicites</i> .....	98	<i>Xylomites aceris decipientis</i> .....	78
<i>Smilacites sagittata</i> .....	83, 103, 108	<i>Xylomites aristolochiae</i> .....	84
<i>Smilax</i> .....	83, 86, 93, 99	<i>Xylomites daphnes</i> .....	85
<i>Smilax grandifolia</i> .....	83, 86	<i>Xylomites drymejae</i> .....	61, 134
<i>Smilax sagittata</i> .....	83	<i>Xylomites liquidambaris</i> .....	58
<i>Smilax sagittifera</i> .....	83, 93, 95, 100, 103, 108, 148	<i>Xylomites quercus serrae</i> .....	72
<i>Sorbus</i> .....	88	<i>Xylomites rhamnii aizoonis</i> .....	81
<i>Sparganium acheronticum</i> .....	84, 108, 112	<i>Zelkova</i> .....	66, 67, 69, 93, 98, 99, 101
<i>Sphaeria mediterranea</i> .....	62	<i>Zelkova praelonga</i> .....	69, 98
<i>Sphaeria palaeo-sapindi</i> .....	81, 154	<i>Zelkova ungeri</i> .....	69, 98, 99, 112
<i>Spiraea zephyri</i> .....	71, 72, 109, 116	<i>Zelkova zelkovifolia</i> .....	68, 69, 93, 95, 96, 98, 99, 10 103, 109, 110, 112, 142
<i>Styrax boreale</i> .....	57, 109, 116	<i>Ziziphus paradisiaca</i> .....	101
<i>Symplocos parschlugianus</i> .....	116	<i>Ziziphus protolotus</i> .....	76, 109, 115
<i>Taxodites dubius</i> .....	55, 109, 112	<i>Ziziphus renata</i> .....	76, 104, 115
<i>Taxodites oeningensis</i> .....	55, 109	<i>Ziziphus tremula</i> .....	76, 109, 115
<i>Taxodium distichum miocenicum</i> .....	55		
<i>Ternstroemites pereger</i> ....	45, 63, 72, 93, 95, 100, 104, 105, 110, 111, 116, 138		
<i>Tetraclinis salicornioides</i> .....	98, 101		

## Plate 1

***Osmunda parschlugiana* (UNGER) ANDREÁNSZKY**

1 - LMJ 76520, holotype of *Pteris parschlugiana* UNGER (1847: pl. 36, fig. 6), 2 x

2 - NHMW 1878/6/6795, a - 1 x, b - 3 x

***Pronephrium stiriacum* (UNGER) KNOBLOCH & Z. KVAČEK**

3 - IBUG Ett. coll. 111, 2 x

***Salvinia cf. mildeana* GOEPPERT**

4 - IBUG Ett. coll. 113, 2 x

***Adiantum renatum* UNGER**

5 - IBUG Ett. coll. 344, 5 x

***Pinus sp. div.***

6 - GBA 2002/01/26, 3-short-needled, 1x

7 - NHMW 1878/6/9706, 2-needled, 1 x

8 - NHMW 1878/6/9780, 3-long-needled, 1 x

9 - NHMW 1878/6/2479, male catkin, 4 x

10 - LMJ 76500, male catkin, syntype of *Pinites centrotos* UNGER (1852: pl. 37, fig. 4), 3 x

11 - LMJ 76491, seed, syntype of *Pinites goethanus* UNGER (1852: pl. 35, fig. 18), 2 x

12 - LMJ 76501, seed, syntype of *Pinites hepios* UNGER (1852: pl. 35, fig. 9), 2 x

13 - IBUG Ett. coll.195, cone scale, 1 x

***Glyptostrobus europaeus* (BRONGNIART) UNGER**

14 - NHMW 2001B0017/0001, branched twig, syntype of *Juniperites baccifera* UNGER (1845: pl. 21, fig.1), 1 x

15 - IBUG Ett. coll.190 a, twig taxodioid, 1 x

16 - IBUG Ett. coll.162, seed cone, 2 x

**? *Cupressus sp.*, twigs, all 2 x**

17 - GBA 2002/01/24

18 - GBA 2002/01/23

19 - NHMW 1845/0039/0003

**? *Cathaya sp.***

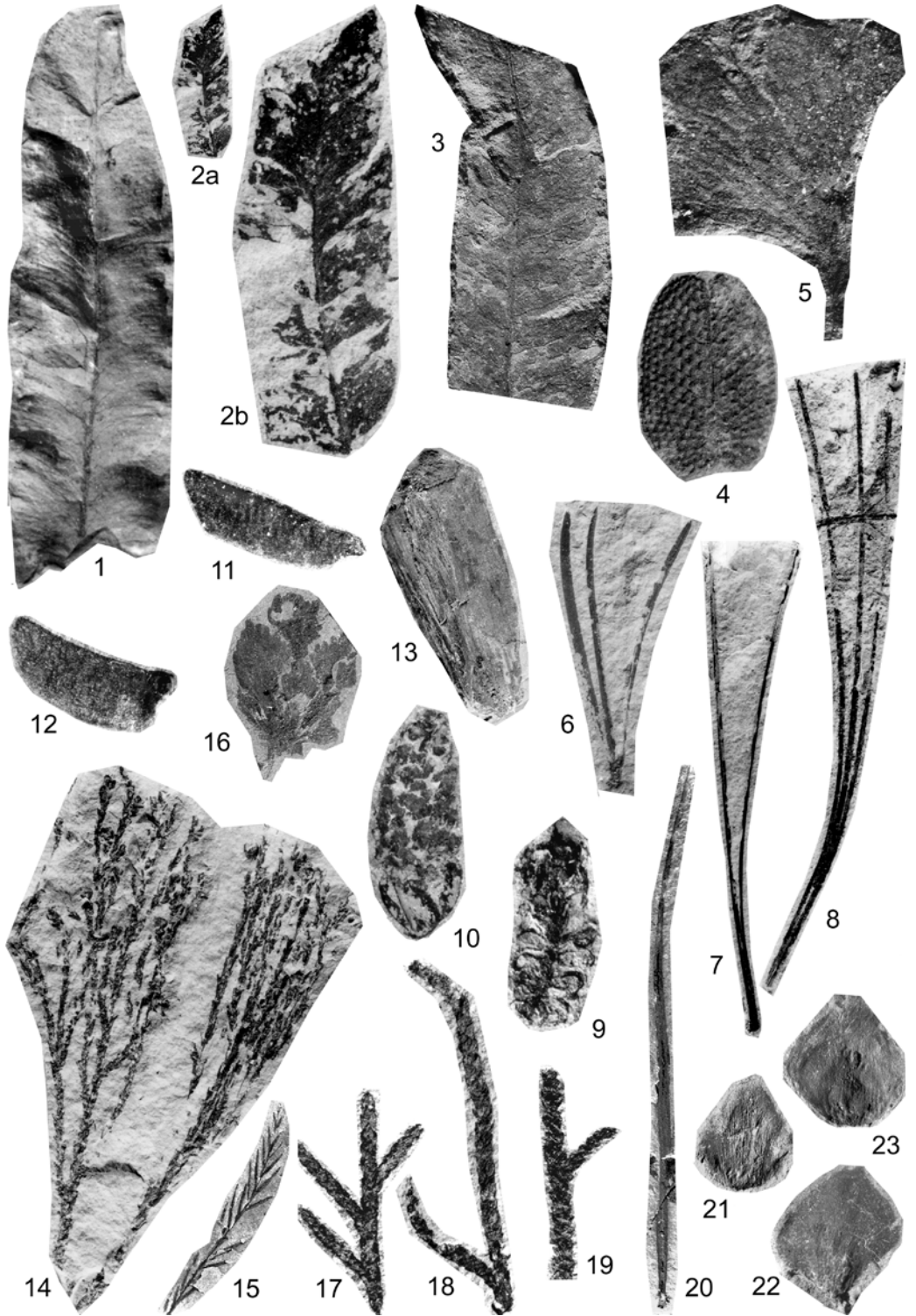
20 - needle, IBUG Ett. coll. 343, 1 x

21 - 23 cone scales, all 2 x,

21 - IBUG Ett. coll. 318

22 - IBUG Ett. coll. 335

23 - IBUG Ett. coll. 317



**Plate 2*****Liquidambar europaea* A. BRAUN**

- 1 - LMJ 76492, holotype of *Liquidambar acerifolia* UNGER (1852: pl. 43, fig. 28), 1 x
- 2 - NHMW 1878/6/2406, a three-lobed leaf, 1 x
- 3 - NHMW 1878/6/9542, 1 x
- 4 - LMJ 76492, holotype of *Liquidambar protensa* UNGER (1852: pl. 43, fig. 27), 1 x
- 5 - NHMW 1878/6/9052, a five-lobed leaf, 1 x

***Liquidambar* sp. - fructus**

- 6 - NHMW 1878/6/9538, 1 x

***Cercidiphyllum crenatum* (UNGER) R. BROWN**

- 7 - NHMW 1878/6/6510, 1 x.

***Daphnogene polymorpha* (A. BRAUN) ETTINGSHAUSEN**

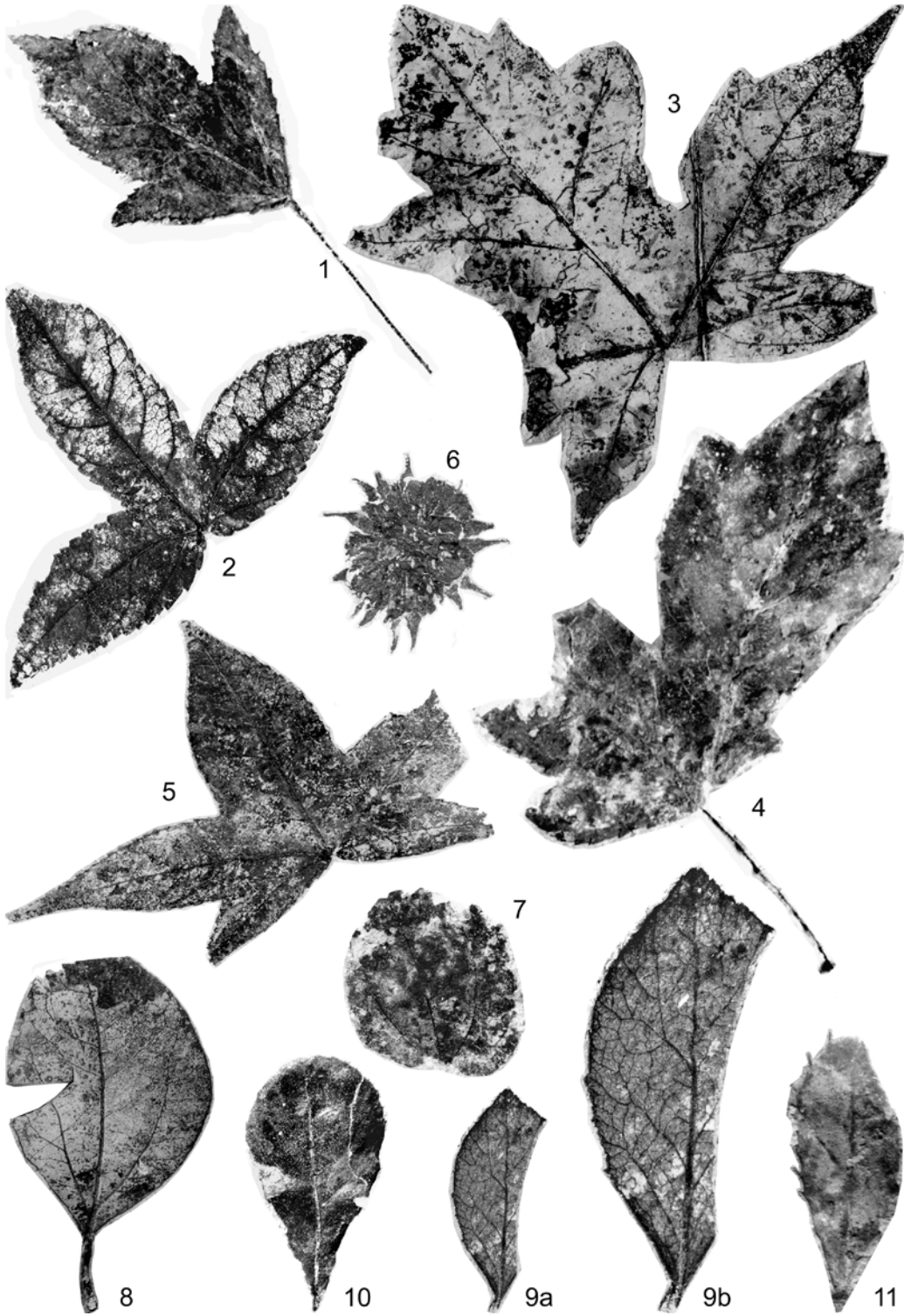
- 8 - NHMW 2001B0017/0002, 1 x

***Berberis teutonica* (UNGER) KOVAR-EDER & Z. KVAČEK comb.nov.**

- 9 - NHMW 1878/6/2153, neotype, a - 1 x, b - 2 x
- 10 - NHMW 1878/6/2442, 1 x

***Berberis* (?) *ambigua* (UNGER) KOVAR-EDER & Z. KVAČEK comb.nov.**

- 11 - LMJ 76519, holotype of *Ilex ambigua* UNGER (1847: pl. 50, fig. 14), 1.5 x



**Plate 3*****Betula cf. dryadum* BRONGNIART**

1 - IBUG Ett. coll. 725, fruitlet, 5 x

***Fagus vel Alnus* sp.**

2 - NHMW 1878/6/9137, 1 x

***Betula vel Alnus* sp.**

3 - LMJ 76489, *Fagus deucalionis* UNGER (1852, pl. 18, fig. 24), a - 1 x, b - detail of leaf margin, 2 x

4 - NHMW 2001B0017/0004, 1 x

***Alnus gaudinii* (HEER) KNOBLOCH & Z. KVAČEK**

5 - NHMW 1878/6/9412, 1 x

***Alnus julianiformis* (STERNBERG) Z. KVAČEK & HOLÝ**

6 - IBUG Ett. coll. 284, 1 x

***Fagus* sp., leaf, all 1 x**

7 - IBUG Ett. coll. 989

8 - NHMW 1878/6/2491

9 - IBUG Ett. coll. 986

***Platanus leucophylla* (UNGER) KNOBLOCH**

10 - IBUG Ett. coll. 1140, 1 x



**Plate 4*****Quercus drymeja* UNGER, all 1 x**

- 1 - LMJ 76524 A, lectotype (UNGER 1847: pl. 32, fig. 1 right)
- 2 - LMJ 76549, figured as *Juglans hydrophila* in UNGER (1850b: pl. 53, fig. 7)
- 3 - NHMW 1878/6/6557, figured by ETTINGSHAUSEN (1878: pl. 3, fig. 10 - bearing the holotype of *Xylomites drymejae* ETTINGSHAUSEN).
- 4 - GBA 2002/01/40
- 5 - NHMW 1878/6/2447
- 6 - GBA 2002/01/108
- 7 - NHMW 1878/6/9388

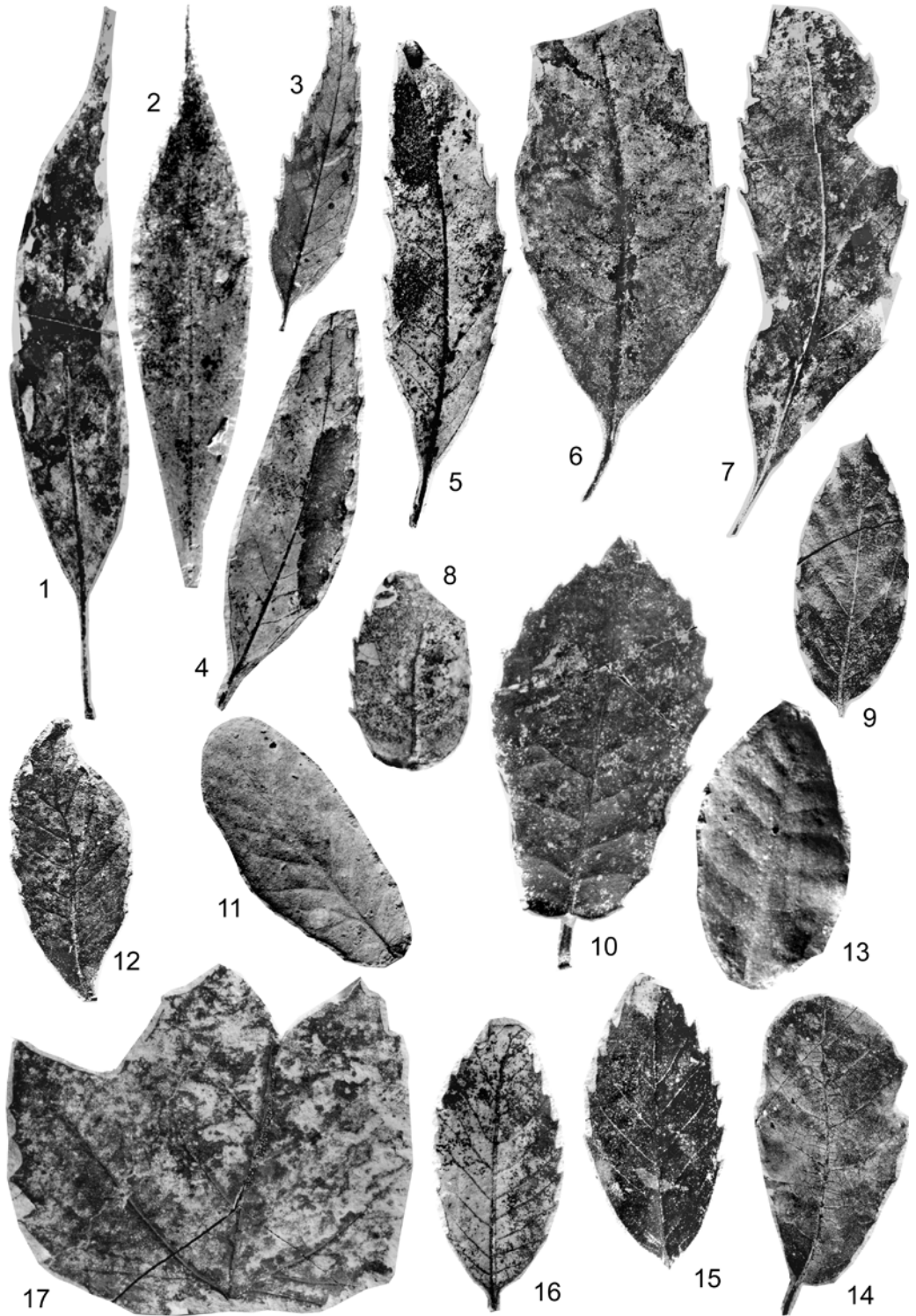
***Quercus mediterranea* UNGER, all 1 x**

- 8 - LMJ 76524 B, lectotype of *Quercus mediterranea* UNGER (1847: pl. 32, fig. 1 top left)
- 9 - NHMW 1845/0034/0004, syntype of *Quercus mediterranea* UNGER (1847: pl. 32, fig. 9)
- 10 - LMJ 76507, UNGER (1852: pl. 18, fig. 1)
- 11 - GBA 1864/01/05
- 12 - GBA 2002/01/19
- 13 - IBUG Ett. coll. 944
- 14 - NHMW 1878/6/7532
- 15 - NHMW 1878/6/9381
- 16 - NHMW 1878/6/9374

***Platanus leucophylla* (UNGER) KNOBLOCH**

- 17 - NHMW 1878/6/7713, 1 x





**Plate 5*****Quercus zoroastri* UNGER, all 1 x**

- 1 - NHMW 1878/6/2401, neotype of *Quercus zoroastri* UNGER
- 2 - LMJ 76866, figured as *Juglans hydrophila* by UNGER (1850b: pl. 53, fig. 6)
- 3 - NHMW 1878/6/6478
- 4 - GBA 2002/01/42

**cf. ? *Gordonia oberdorfensis* KOVAR-EDER**

- 5 - NHMW 1878/6/2009, 1 x
- 6 - NHMW 1878/6/2038, a - 1 x, b - detail of venation, 2 x
- 7 - NHMW 1878/6/2025, 1 x
- 8 - NHMW 1878/6/2005, 1 x



## Plate 6

***Ternstroemites pereger* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**, all 1 x

- 1 - NHMW 1878/6/8169, neotype, a - complete leaf, b - detail of margin, 3 x
- 2 - NHMW 1878/6/8171
- 3 - NHMW 1853/26/473
- 4 - GBA 2002/01/41
- 5 - GBA 2002/01/39
- 6 - LMJ 76562 B
- 7 - GBA 2002/01/111

***Engelhardia macroptera* (BRONGNIART) UNGER**, all 1 x

- 8 - NHMW 1878/6/2698
- 9 - LMJ 76540, syntype of *Carpinus producta* UNGER (1850b: pl. 32, fig. 6)

***Engelhardia orsbergensis* (WEBER) JÄHNICHEN, MAI & WALTHER**

- 10 - IBUG Ett. coll. 723, a - 1 x, b - 2 x
- 11 - NHMW 1878/6/8951, 1 x
- 12 - GBA 2002/01/22, 1 x

***Tilia longibracteata* ANDRAE**

- 13 - IBUG Ett. coll. 1663, 3 x
- 14 - IBUG Ett. coll. 1541, as *Tilia lignitum* in ETTINGSHAUSEN (1869: pl. 42, fig. 6), 1 x
- 15 - GBA 2002/01/31, 1.5 x

***Craigia brononii* (UNGER) Z. KVAČEK, BŮŽEK & MANCHESTER**

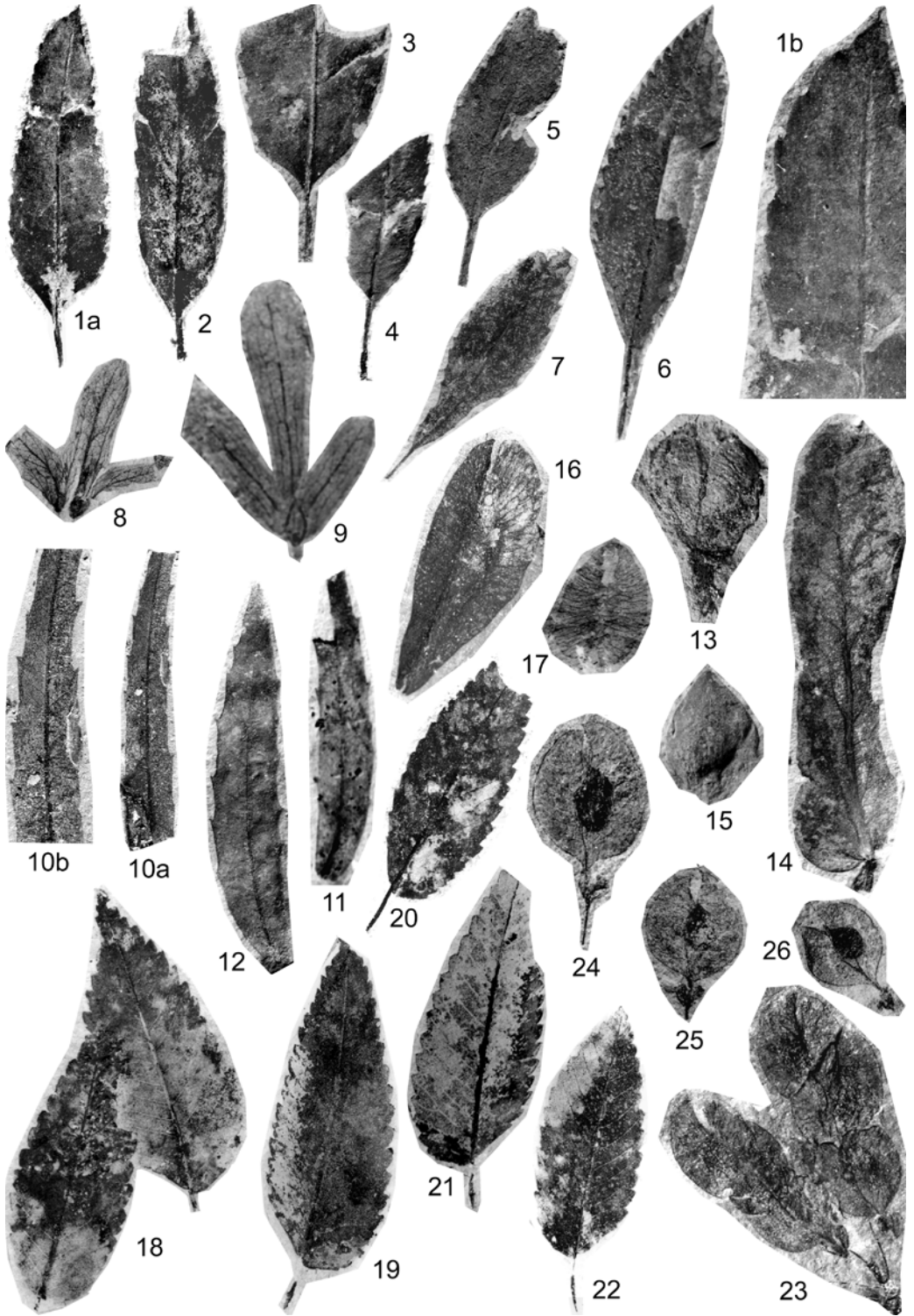
- 16 - IBUG Ett. coll. 2804a, capsule valve, 2 x
- 17 - GBA 2002/01/35, capsule valve, 1 x

***Ulmus plurinervia* UNGER**, all 1 x

- 18 - NHMW 1878/6/9665
- 19 - NHMW 1878/6/9667, neotype of *Ulmus plurinervia* UNGER
- 20 - NHMW 1878/6/9082
- 21 - NHMW 1878/6/9155
- 22 - NHMW 1878/6/7592

***Ulmus parschlugiana* KOVAR-EDER & Z. KVAČEK sp. nov.**, all 2 x

- 23 - IBUG Ett. coll. 1100, group of fruits, holotype
- 24 - NHMW 1878/6/9658, paratype
- 25 - NHMW 1878/6/9081
- 26 - NHMW 1878/6/9651, paratype



**Plate 7*****Myrica lignitum* (UNGER) SAPORTA**

- 1 - LMJ 76510 right, *Quercus lignitum* UNGER (1852: pl. 17, fig. 6), 1 x
- 2 - LMJ 76504, *Quercus lignitum* UNGER (1852: pl. 17, fig. 1), 1 x
- 3 - NHMW 1878/6/9312, a - 1 x, b - detail of venation, 1.5 x
- 4 - NHMW 1878/6/9309, a - 1 x, b - detail of venation, 3 x
- 5 - GBA 1851/04/10, *Dryandroides lignitum* (UNGER) ETT. in ETTINGSHAUSEN (1851b: pl. 5, fig. 5), 1 x
- 6 - LMJ 76503, *Quercus lignitum* UNGER (1852: pl. 17, fig. 4 - lectotype), 1 x
- 8 - LMJ 76510 left, *Quercus commutata* UNGER (1852: pl. 17, fig. 10), 1 x
- 9 - NHMW 1878/6/7382, a - 1 x, b - detail of venation, 1.5 x

***Myrica oehningensis* (A. BRAUN) HEER**

- 7 - LMJ 76546, *Comptonia oeningensis* UNGER (1850b: pl. 29, fig. 3), 1 x



## Plate 8

***Cedrelospermum ulmifolium* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.** (foliage)

1 - NHMW 1878/6/9573, 1 x

2 - GBA 2002/01/38, 1 x

3 - IBUG Ett. coll. 135, 1 x

4 - IBUG Ett. coll. 1085, a - 1 x, b - detail of venation, 5 x

5 - LMJ 76536, lectotype of *Comptonia ulmifolia* UNGER (1850b: pl. 29, fig. 5), 1 x***Cedrelospermum stiriacum* (ETTINGSHAUSEN) KOVAR-EDER & Z. KVAČEK comb. nov.** (fruit)

6 - IBUG Ett. coll. 2899, 2 x

***Celtis japeti* UNGER**

7 - NHMW 1878/6/7654, neotype, 1 x

***Zelkova zelkovifolia* (UNGER) BŮŽEK & KOTLABA**, all 1 x

8 - GBA 2002/01/18

9 - NHMW 1987/57, lectotype of *Ulmus zelkovaefolia* UNGER (1845: pl. 26, fig. 7)

10 - NHMW 1878/6/9642

11 - LMJ 76487, holotype of *Ulmus praelonga* UNGER (1852: pl. 20, fig. 20)***Cedrelospermum ulmifolium* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov. vel *Ulmus plurinervia* UNGER**12 - LMJ 76488, as *Ulmus parvifolia* A. BRAUN in UNGER (1852: pl. 20, fig. 22), 2 x**? *Prinsepia* sp.**

13 - NHMW 1878/6/9747, twig, 1 x

**cf. *Rosa* sp.**

14 - IBUG 1059, 1 x

**? *Buxus* cf. *egeriana* Z. KVAČEK, BŮŽEK & HOLÝ**15 - LMJ 76502, as *Quercus myrtilloides* (UNGER 1852: pl. 18, fig. 17), 2 x

17 - GBA 2002/01/14, 1.5 x

***Buxus* cf. *egeriana* Z. KVAČEK, BŮŽEK & HOLÝ**

16 - LMJ 76524C (reverse side), 1.5 x

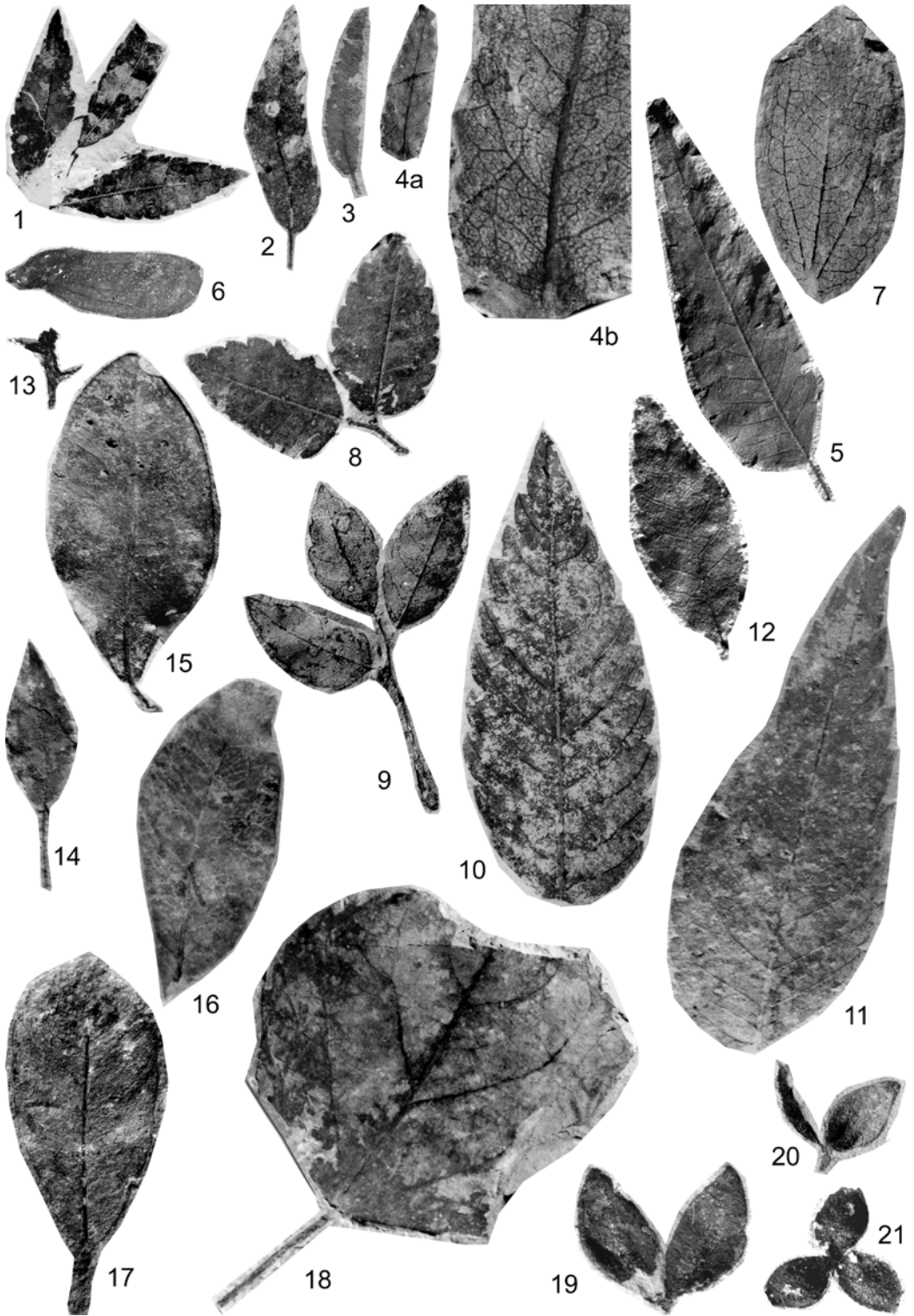
***Populus populina* (BRONGNIART) KNOBLOCH**18 - LMJ 76506, holotype of *Populus aeoli* UNGER (1852: pl. 21, fig. 2), 1 x***Populus* sp. - fructus**, all 2 x

19 - NHMW 1878/6/2387

20 - IBUG 1666

21 - NHMW 1878/6/9896





## Plate 9

***Leguminosites palaeogaea* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

1 - NHMW 2002B0017/0003, neotype, 1 x

***Leguminosites hesperidum* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov., all 1 x**

2 - NHMW 1878/6/9109

3 - NHMW 1878/6/8783

4 - GBA 1864/01/21, lectotype of *Robinia hesperidum* UNGER (1864: 21, pl. 4, fig.13)***Leguminosites dionysi* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**5 - LMJ 76577 holotype of *Cytisus dionysi* UNGER (1864: pl. 4, fig. 1), 1 x***Leguminosites parschlugianus* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov., all 1 x**

6 - NHMW 1878/6/8889

7 - NHMW 1878/6/9895, neotype

***Podocarpium podocarpum* (A. BRAUN) HERENDEEN**

8 - IBUG 2245, pod, 1 x

9 - GBA 2002/01/27, pod, 1 x

10 - GBA 2002/01/28 leaflet, 1 x

11 - NHMW 1878/6/8884 leaflet, a - 1 x, b - 2 x

***"Acacia" parschlugiana* UNGER**

12 - NHMW 1878/6/9117, neotype, 1 x

***Phaseolites securidacus* UNGER, both 1 x**

13 - NHMW 1878/6/2517

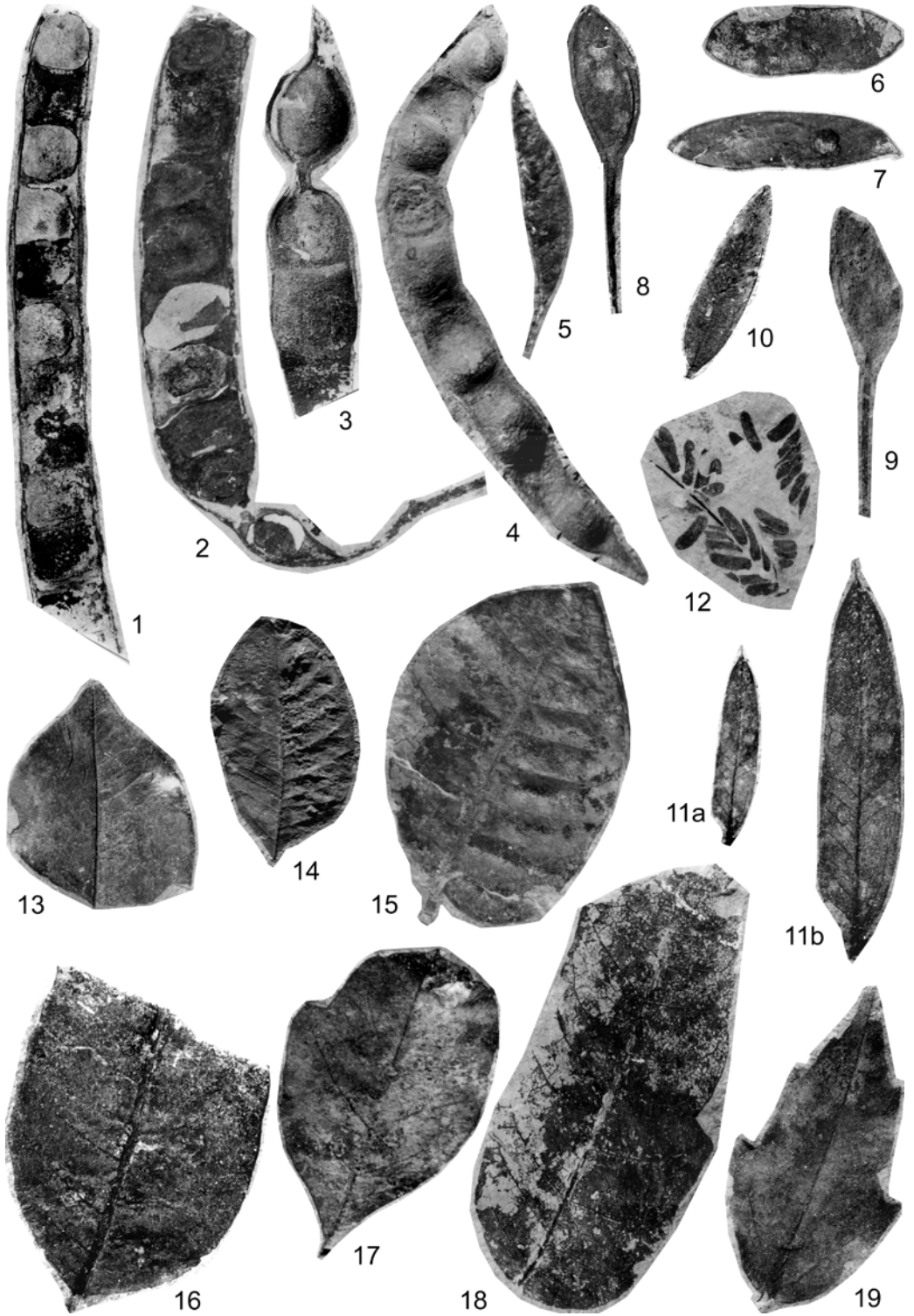
14 - LMJ 76569, lectotype of *Phaseolites securidacus* UNGER (1864: pl. 5, fig. 9)***"Juglans" parschlugiana* UNGER, both 1 x**15 - LMJ 76559, lectotype of *Juglans parschlugiana* UNGER (1860: pl. 19, fig. 2)

16 - NHMW 1878/6/2569

***Toxicodendron herthae* (UNGER) Z. KVAČEK & WALTHER, all 1 x**17 - LMJ 76562, lectotype of *Rhus herthae* UNGER (1860: pl. 20, fig. 8)

18 - NHMW 1878/6/2027

19 - NHMW 1878/6/9252



**Plate 10*****Acer integrilobum* WEBER sensu WALTHER, all 1 x**

forma A

1 - GBA 2002/01/49

2 - LMJ 77894

3 - LMJ 76531, syntype of *Acer pseudomonspessulanum* UNGER (1847: pl. 43, fig. 1)

4 - IBUG Ett. coll. 84

forma B

5 - NHMW 1878/6/6594

6 - NHMW 1878/6/2544

***Acer pseudomonspessulanum* UNGER emend. STRÖBITZER-HERMANN, all 1 x**

7 - LMJ 77899

8 - LMJ 76522, lectotype of *Acer pseudomonspessulanum* UNGER (1847: pl. 43, fig. 2)

9 - NHMW 1878/6/9156

***Acer tricuspidatum* BRONN, all 1 x**10 - LMJ 76526 as *Acer productum* A. BRAUN in UNGER (1847: pl. 42, fig. 8)

11 - IBUG Ett. coll. 1554

12 - LMJ 77900A

***Acer* sp. – fruit, form-group 3**

13 - NHMW 1878/6/9253, 2 x

***Acer* sp. – fruit, form-group 2**

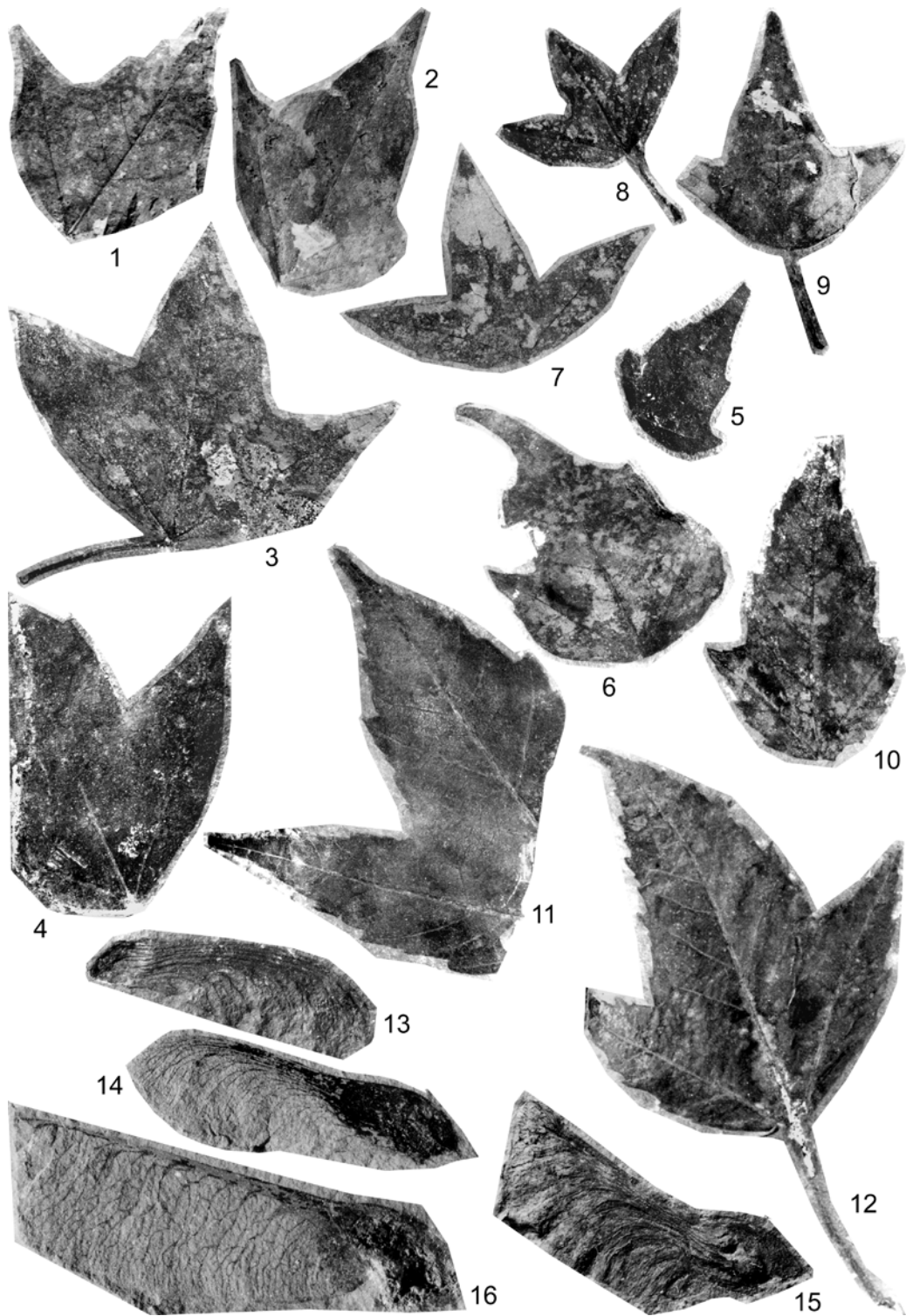
14 - NHMW 1878/6/9891, 2 x

***Acer* sp. – fruit, form-group 2 ?**

15 - IBUG Ett. coll. 2803, 2 x

***Acer* sp. – fruit, form-group 1**

16 - IBUG Ett. coll. 1549, 2 x



## Plate 11

***Paliurus tiliifolius* (UNGER) BŮŽEK**

1 - NHMW 1878/6/8584, 1 x

***Paliurus favonii* UNGER**

2 - GBA 2002/01/36, 1.5 x

3 - NHMW 1878/6/8583, epitype, 1 x

7 - LMJ 76518, lectotype, 1 x

***Berchemia multinervis* (A. BRAUN) HEER, all 1 x**

4 - NHMW 1878/6/9107

5 - NHMW 1878/6/2078

***Cotinus* (?) *aizoon* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov., all 1 x**

6 - GBA 2002/01/8

8 - LMJ 76575, lectotype of *Rhamnus aizoon* UNGER (1864: pl. 3, fig. 44)

9 - LMJ 77607

10 - GBA 2002/01/11

***Ailanthus confucii* UNGER**

11 - NHMW 1878/6/2121, 2 x

***Fraxinus primigenia* UNGER, all 1 x**

12 - IBUG Ett. coll. 1387

13 - Neotype, NHMW 1878/6/8155

14 - NHMW 1878/6/9889

15 - IBUG Ett. coll. 1385

***Nerium* sp.**

16 - IBUG Ett. coll. 1405, capsule, 1.5 x

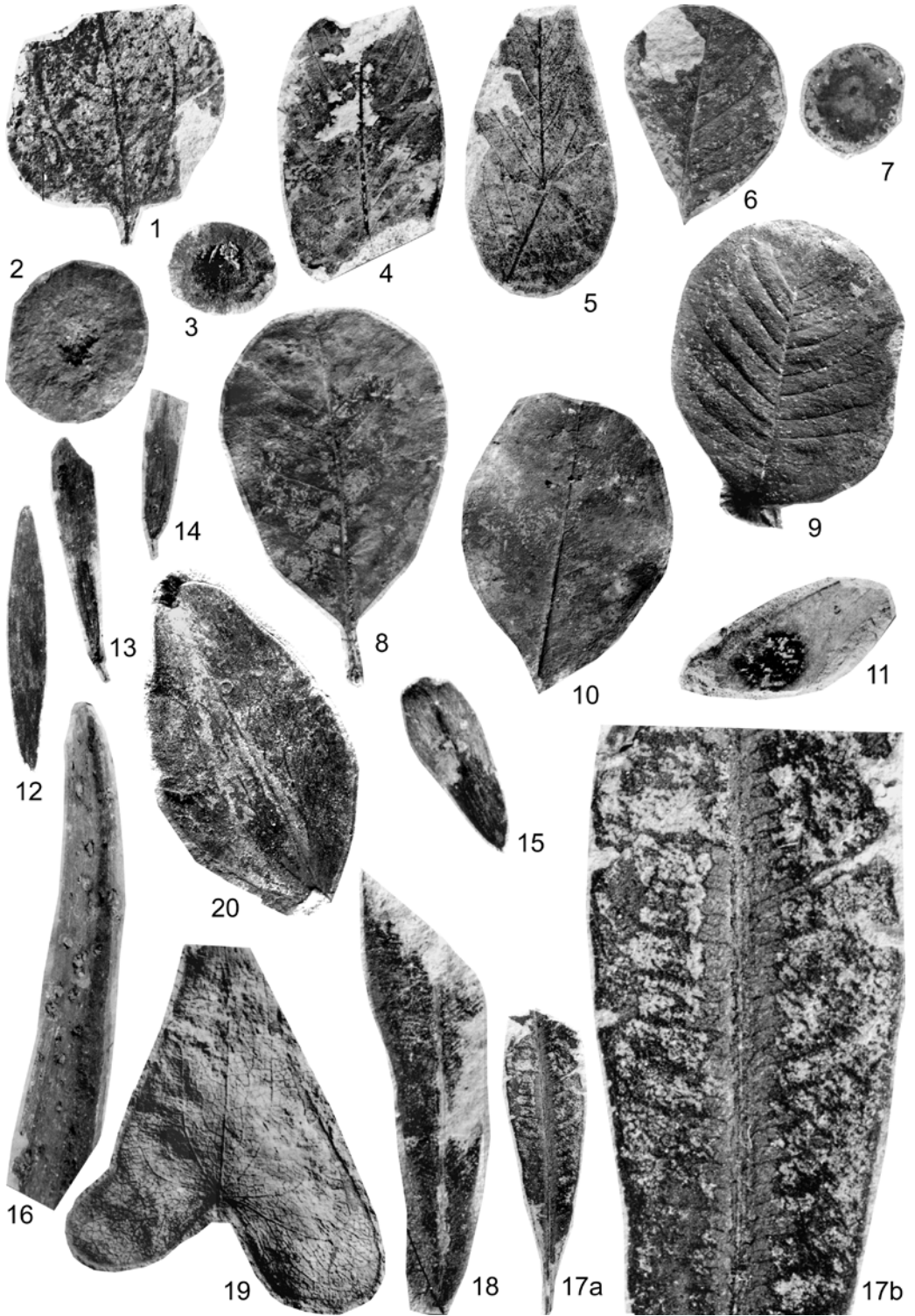
17 - NHMW 1878/6/8173, a - 1 x, b - detail of venation, 4 x

18 - NHMW 1878/6/8175, 1 x

***Smilax sagittifera* HEER emend. HANTKE, all 2 x**

19 - GBA 1847/03/20

20 - IBUG Ett. coll. 399



**Plate 12**

**"*Celastrus*" *europaea* UNGER**, both 1 x

1 - LMJ 76576, lectotype of *Celastrus europaeus* UNGER (1864: pl. 2, fig. 10)

2 - LMJ 76563, syntype of *Celastrus europaeus* UNGER (1864: pl. 2, fig. 12)

**"*Evonymus*" *latoniae* UNGER**

3 - LMJ 76574, lectotype of *Evonymus latoniae* UNGER (1864: pl. 2, fig. 25), 1.5 x

4 - NHMW 1878/6/2063, 1 x

5 - NHMW 1878/6/2742, 1 x

**"*Cornus*" *ferox* UNGER**, both 1 x

6 - NHMW 1878/6/8109 part, neotype

7 - NHMW 1878/6/ 6566 counterpart, neotype

**? *Chaneya* sp.**, both 1 x

8 - NHMW 1878/6/8741

9 - NHMW 1878/6/8742

**"*Quercus*" *daphnes* UNGER**

10 - LMJ 76591 as *Achras lycobroma* UNGER (1866: pl. 8, fig. 1), 1 x

11 - LMJ 76590 counterpart to the holotype of *Rhododendron flos-saturni* UNGER (1866: pl. 12, fig. 15), a - 1 x, b - detail of venation, 2 x

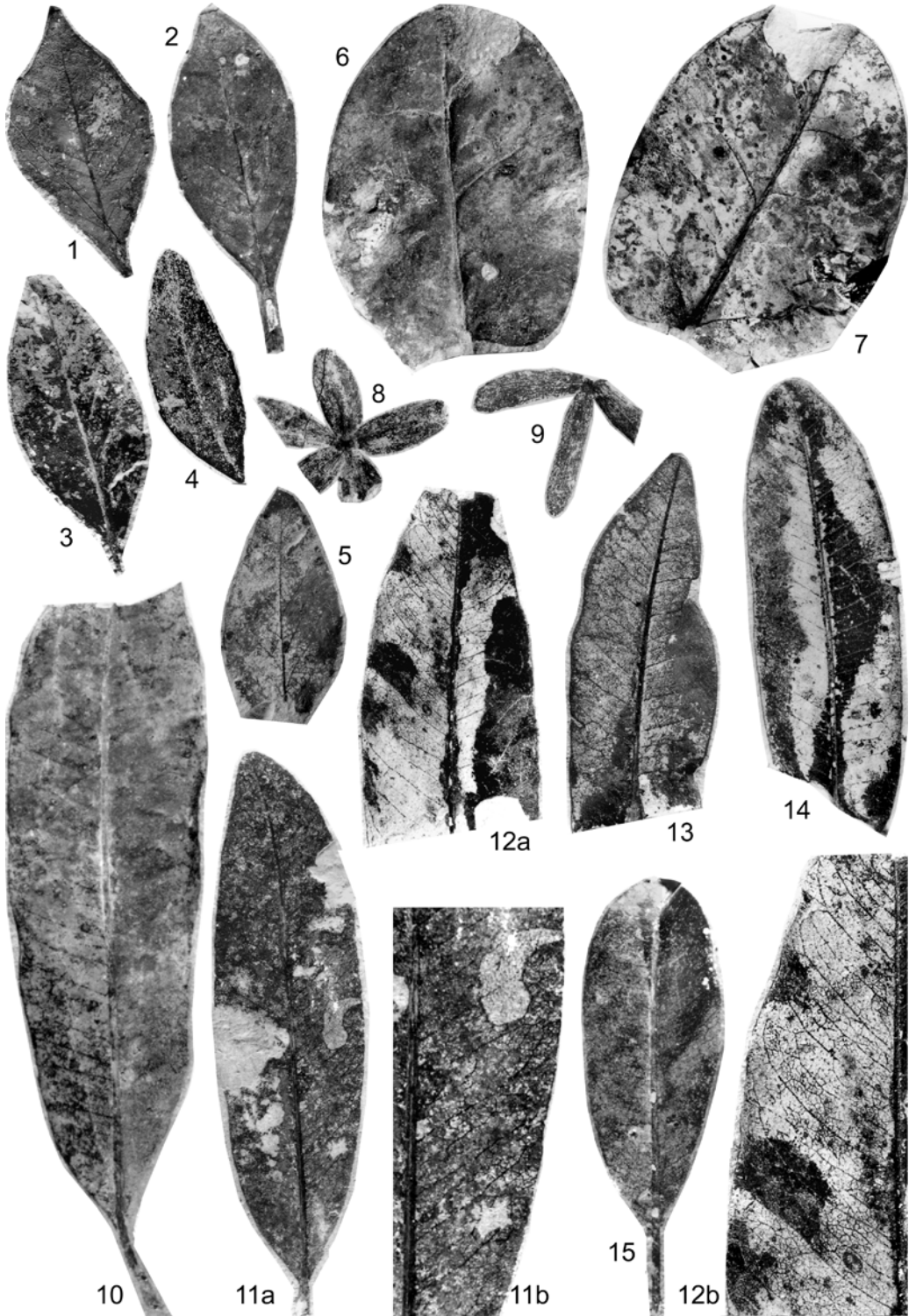
12 - NHMW 1878/6/9460, a - 1 x, b - detail of venation, 2 x

13 - NHMW 1878/6/7557, 1 x

14 - NHMW 1878/6/9459, 1 x

15 - LMJ 76525, lectotype of *Quercus daphnes* UNGER (1847: pl. 31, fig. 3), 1 x



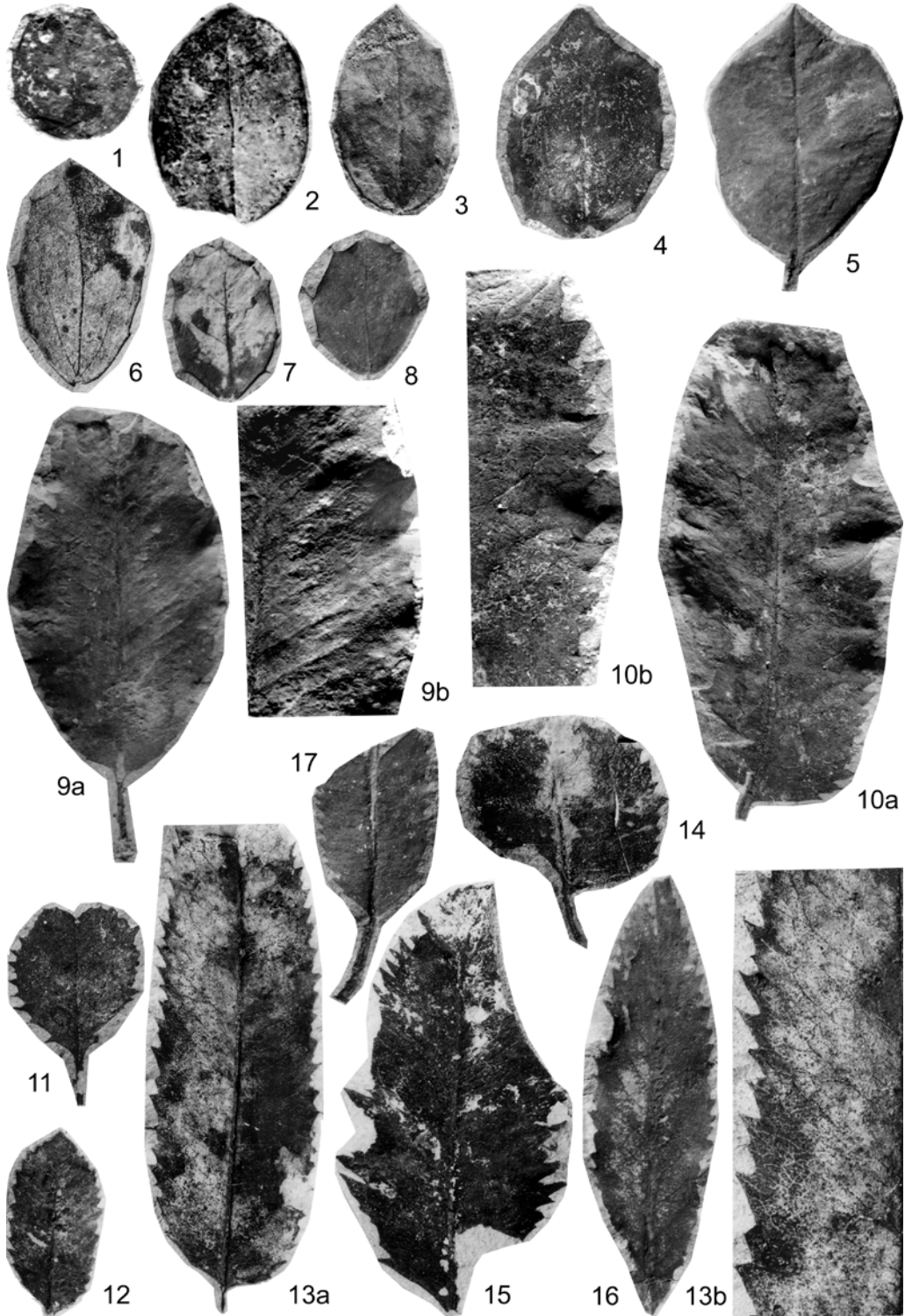


**Plate 13*****Mahonia (?) aspera* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

- 1 - LMJ 76571, as *Ilex sphenophylla* UNGER (1864: pl. 3, fig. 3), 2 x
- 2 - LMJ 76579, as *Ilex cyclophylla* UNGER (1864: pl. 3, fig. 8), 1 x
- 3 - LMJ 76529, lectotype of *Quercus aspera* UNGER (1847: pl. 30, fig. 2), 1 x
- 4 - LMJ 76532, syntype of *Quercus aspera* UNGER (1847: pl. 30, fig. 1), 1 x
- 5 - GBA 2002/01/45, 1 x
- 6 - NHMW 1878/6/2758, 1 x
- 7 - GBA 2002/01/46, 1 x
- 8 - GBA 2002/01/44, 1 x

***Prinsepia serra* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**

- 9 - LMJ 76528, lectotype of *Quercus serra* UNGER (1847: pl. 30, fig. 5),  
a - 1 x, b - detail of venation and margin, 1.5 x
- 10 - LMJ 76495, epitype of *Quercus serra* UNGER (1852: pl. 18, fig. 16),  
a - 1 x, b - detail of venation and margin, 2 x
- 11 - NHMW 1878/6/9509, 1 x
- 12 - NHMW 1878/6/9671, 1 x
- 13 - NHMW 1878/6/7538, a - 1 x, b - detail of venation and margin, 1.5 x
- 14 - NHMW 1878/6/9502, 1 x
- 15 - NHMW 1878/6/9527, 1 x
- 16 - GBA 2002/01/16, 1 x
- 17 - GBA 2002/01/15, 1 x



**Plate 14*****Populus populina* (BRONGNIART) KNOBLOCH**

1 - LMJ 76505 as *Populus latior* A. BRAUN in UNGER (1852: pl. 21, fig. 4), 0.8 x

***Ailanthus pythii* (UNGER) KOVAR-EDER & Z. KVAČEK comb. nov.**, all 1 x

2 - NHMW 1878/6/2649, a pinnate leaf

3 - NHMW 1878/6/2525, leaflet

4 - LMJ 76557, leaflet, lectotype of *Sapindus pythii* UNGER (1860: pl. 14, fig. 8)

5 - NHMW 1878/6/6484, leaflet, as *Sapindus pythii* UNGER in ETTINGSHAUSEN (1878 b: pl. 3, fig. 5 bearing *Sphaeria palaeo-sapindi* ETTINGSHAUSEN)



**Plate 15*****Dicotylophyllum* sp. 1**

1 - NHMW 1878/6/2091, 1 x

***Dicotylophyllum* sp. 2, both 1 x**

2 - GBA 2002/01/109

3 - NHMW 1878/6/6555

***Dicotylophyllum* sp. 6**

4 - IBUG Ett. coll. 1083, 1 x

5 - IBUG Ett. coll. 1084, a - 1 x, b - detail of margin and venation, 2 x

***Saportaspermum* sp., all 2 x**

6 - NHMW 1878/6/8029

7 - NHMW 1878/6/8028

8 - IBUG Ett. coll. 1346

***Dicotylophyllum* sp. 3**

9 - GBA 2002/01/20, a - 1.5 x, b - 1 x

10 - NHMW 1878/6/8571, 1 x

***Dicotylophyllum* sp. 4**

11 - GBA 2002/01/21

***Dicotylophyllum* sp. 5**

12 - NHMW 1878/6/7507, 1 x

***Antholithes stiriacus* KOVAR-EDER & Z. KVAČEK sp. nov. (flowers)**

13 - IBUG Ett. coll. 432, ca. 7 x

14 - IBUG Ett. coll. 427, ca. 7 x

15 - NHMW 1878/6/9870, holotype, 5 x

***Cypselites* sp., seed**

16 - IBUG Ett. coll. 1374, ca. 6 x

