Paleogene vegetation of the Pannonian region. (NKFIH 120123, 2016.10-2022.12)

Project participants: Boglárka Erdei (project leader), Lilla Hably

Final Report

Terrestrial climate and its change are potentially reflected by vegetation patterns and their evolution through time. Palaeovegetation data, besides its intrinsic value as an ecological-climatological indicator, can serve as useful proxy data for climate-vegetation modelling studies testing simulation outputs and reliability (Francois et al. 2011, Henrot et al. 2017). The main focus of this project was to compile and review palaeobotanical data available for the Palaeogene of the Pannonian region and adjacent areas and to apply this dataset to reconstruct palaeovegetation in terms of plant functional types (PFTs) and their distribution. During this project the participants have published 9 papers (in international scientific journals with a cumulative impact factor 16.9) and 3 book chapters (in Hungarian), submitted a monograph (currently under revision), and have completed 4 conference presentations. Palaeobotanical data provided include both formerly unpublished floras documented in the scope of this project and well-documented, already published ones. We first introduce palaeobotanical data and results compiled during the project, then give details on the vegetation reconstruction incorporating floristic data.

1. Systematic study of fossil plant remains from Paleogene localities of the Intra-Carpathian region (including new collections)

1.1. The late Oligocene (Egerian) floras of Hungary

The systematic revision of late Oligocene floras was based on fossil collections in the Hungarian Natural History Museum, the Kuny Domokos Museum, and the Mining and Geological Survey of Hungary. In addition to the description of nearly a hundred taxa, flora, vegetation, and climate reconstructions using floristic data have been completed. The monograph on the Oligocene floras of Hungary has been submitted to the journal "*Acta Palaeobotanica*" and is currently under review: ***Hably L. & Erdei B. – The late Oligocene (Egerian) flora of Hungary.*** The study is approximately 130 pages including the main text, supplementary material, 1 figure, 1 table and 23 photo plates. Example

pages of the manuscript and plates are given at the end of the final report.

Late Oligocene (Chattian, reg.str. Egerian) plant remains have been preserved in sediments of the Törökbálint and Eger formations in Hungary. Nearly a hundred plant taxa have been described from the localities Andornaktálya, Csörög, Eger Wind-brickyard (lower and upper floras), Kesztölc, Környe, Leányfalu, Máriahalom, Nagysáp, Pomáz, Pusztaberki, Rétság, Tarján, Verőcemaros, and Vértesszőlős. The high diversity of lauraceous elements and palms corroborates a considerably warm, frostless climate. At the same time, the obvious appearance of temperate flora elements in the late Oligocene floras may have been related to edaphic associations and the better adaptability of temperate genera to a quickly changing environment. The lower flora of the Wind-brickyard (Eger) provided a poorer, but partly different floristic association than the upper flora. The occurrence of "*Rhamnus warthae"*, an endemic element of Egerian floras of Hungary, however, supports that the lower flora belongs to the Egerian as well.

1.2. The Oligocene flora of Zsámbék

Fossil plants have been discovered in the dolomite quarry on Strázsa Hill, west of Zsámbék in 2021. The fossil plant assemblage includes a low number of taxa with a relatively high frequency of gymnosperms. Among gymnosperms taxodiaceous twigs (?*Taxodium*) are dominant. Angiosperms are represented with the family Lauraceae (*Daphnogene* and *Laurophyllum*), Betulaceae (*Alnus*), Ulmaceae (*Ulmus*), and „*Rhamnus*" *warthae*. The flora, characterised by the dominance of gymnosperms and „*Rhamnus*" *warthae*, and by the lower ratio of other taxa, is definitely comparable to the Egerian flora of Környe. Although the plant fossils of Zsámbék suggest wetland vegetation types, the relatively high ratio of lauraceous elements suggests a frostless, warm climate with mean annual temperatures above 15 °C. Results have been published in the international journal "*Fossil Imprint*" (***Erdei et al. – The late Oligocene macroflora of Zsámbék, N Hungary***).

1.3. The Oligocene flora of Tarján

Fossil remains, mainly leaves were collected from the Egerian locality near Tarján. The flora comprises exclusively angiosperms, among them Lauraceae, *Platanus neptuni*, *Engelhardia* and other well-known elements of Egerian floras. Results have been published in the international journal "*Neues Jahrbuch für Geologie und Paläontologie*" (***Hably et al. – A new upper Oligocene flora from Tarján (Gerecse Mts, NW Hungary)***.

1.4. Fruit remains of the tropical genus *Sloanea* from the Oligocene of Romania

Well-preserved fruit remains of the genus *Sloanea* (Elaeocarpaceae) were recorded for the first time in Romania, from the Oligocene Dâlja-Uricani Formation of the Petroșani Basin and were assigned to *Sloanea eocenica* (Rásky) Kvaček, Hably & Manchester, a species previously described from the lower Oligocene Tard Clay Formation in Hungary. This occurrence represents the second record of the species. Modern species of the genus *Sloanea* inhabit tropical-subtropical regions in Central-America, Southeast Asia, and Australia. Results have been published in the international journal "*Review of Palaeobotany and Palynology*" (***Pirnea, Hably & Popa – Fruits of Sloanea (Elaeocarpaceae) from the Oligocene of Petroșani Basin, Romania***).

1.5. Fossil fungi from the Oligocene flora of Csolnok

Fossil epiphyllous callimothalloid fungi belonging to the fossil-genera *Callimothallus* and *Cribrites* (?Microthyriales) have been described on lauraceous leaves from the Oligocene flora of Csolnok. Other fungus remains with unique morphological characters were also found on the leaf cuticle of lauraceous leaves and were compared with the modern representatives of the anamorphic genus *Zygosporium*. The fossil fungi have both climatological and ecological implications. The fossil *Zygosporium* species presumably preferred warm climate and, similarly to most modern members of the genus, was a saprophyte on fallen, decaying leaves Results have been published in two papers in the international journals "*Fungal Biology*" and "*Mycological Progress*" (***Worobiec & Erdei – Fossil callimothalloid fungi: revised taxonomy, modern equivalents and palaeoecology; The first fossil record of the anamorphic genus Zygosporium Mont. from the Oligocene of Csolnok (N Hungary)***).

1.6. The Eocene flora of Tatabánya

The Lutetian fossil plant assemblage from Tatabánya (N Hungary) comprises remains dominated by angiosperms (Lauraceae, Rhamnaceae, Malvaceae s.l., Leguminosae, ?Myrtaceae, ?Fagaceae, ?Anacardiaceae, ?Berberidaceae, ?Juglandaceae, ?Theaceae, Palmae, and Dioscoreaceae). Gymnosperms and ferns show extremely rare occurrence which may reflect real floristic composition but might also be attributable to taphonomic constraints. Although the subordinate role of gymnosperms is shared by other Eocene floras of Hungary, e.g. Csordakút, the latter shows different floristic composition, which may reflect differing facies (Csordakút –lacustric, Tatabánya- marine).

The high number of linear shaped leaves with entire margin and coriaceous texture (Lauraceae vel Fagaceae), and small-leaved Leguminosae suggests a "subhumid" character of the vegetation, which is recognisable also in early Palaeogene floras of eastern Central and Southeastern Europe, e.g., the Tard Clay floras in Hungary. A frost-free climate with high mean annual temperatures similar to that estimated for coeval European floras may also be inferred for the Tatabánya flora. Results have been published in the international journal "*Palaeobiodiversity and Palaeoenvironments*" (***Erdei & Wilde – The middle Eocene flora of Tatabánya ("marl mine", N Hungary)***).

1.7. **Study of palm fossils from Paleogene and Early Miocene localities of Hungary**

In the Hungarian Cenozoic, palms occur frequently in the Paleogene fossil record, become very rare in the middle Miocene, and disappear in younger floras. The study of palm fossils has been focussed on petrified palm fruit remains from an Eocene locality on Martinovics-hegy (Kis-Sváb-hegy), three-dimensional, permineralized fossils of palm stems from Early Miocene localities near Parádfürdő and Rákóczibánya, and palm remains from the Egerian floras of Hungary. CT scans have been made of a fruit (Martinovics-hegy) and one of the stem fossils (Parádfürdő) with varying results. The study of the palm remains has provided preliminary results which can be applied for vegetation and palaeoclimate reconstructions. A more thorough systematic treatment, however, would require additional investigations and comparisons (e.g. visit of palm material in major herbaria) that are beyond the scope of this project.

1.7.1. Fossil palm fruit remains (endocarps) from the Martinovics-hegy had been formerly assigned to the palm genus *Actinorhytis* (Rásky 1956). Using available details and modern comparisons, the fruits might have belonged to a palm related to the genus *Areca*. These results have been included in the book edited by Dulai: Üvegház alatt – Eocén élővilág a Kárpát-medencében.

1.7.2. Three-dimensionally preserved fossil palm stems have been recovered by collectors from two Early Miocene localities, Parádfürdő (Ilonavölgy) and Rákóczibánya. Thin sections have been made of both stems and CT scan of the stem from Parádfürdő has been performed. The CT scan of the Parádfürdő specimen has evidenced that the stem represents the upper part of the palm trunk just below the crown of leaves also showing the apical meristem. Based on available information obtained from thin sections and CT scans, the specimen from Parádfürdő may represent a palm species having a stem showing corypha type anatomical details whereas the stem from Rákóczibánya belonged probably

to arecoid palms. Results are submitted to the international journal "*Studia botanica hungarica*" (***Erdei et al. – Early Miocene palm stem remains from Northern Hungary***). 1.7.3. Palm fossils identified in the Egerian floras of Hungary are the following: *Sabalites* sp. (costapalmate leaves), *Phoenicites* sp. (pinnate leaves), *Amesoneuron* sp. (unidentified fragmentary leaves of palms), Palmae gen. et sp. (stem remain), *Tuzsonia hungarica* (?palm inflorescence remains). Although temperate elements were apparently members of the Egerian floras, the high diversity of palms corroborates a considerably warm, frostless climate. Results are included in the monograph of the Hungarian Egerian floras (see 1.1.).

1.8. **Contribution to a book on the Eocene fauna and flora of Hungary** (edited by Alfréd Dulai: Üvegház alatt – Eocén élővilág a Kárpát-medencében)

The project leader (B.Erdei) contributed with three chapters to the book published in Hungarian for a wider audience: ***Trópusi erdők archívuma: a paleobotanikai gyűjtemény***; ***A gyűjtemény színe-java: eocén típusok***; ***Mangrove mocsarak és társaik: eocén növénymaradványok***.

1.9. **Study of Paleogene flora elements in younger floras**

Members of the Theaceae family, a typical Paleogene flora element, were discovered in the early Miocene flora of the Mecsek Mts (Magyaregregy). Seeds were assigned to the fossil-genus and species, *Mecsekispermum gordonioides* Hably & Erdei gen. nov. et sp. nov., and were related to the family Theaceae. The seeds are most comparable to modern species of *Gordonia* J. Ellis (s.l.,) in Theeae. Results have been published in the international journal "*Palaeobiodiversity and Palaeoenvironments*" (***Erdei & Hably – Fossil Gordonia (s.l.)–like (Theaceae) winged seeds from the early Miocene of the Mecsek Mts, W Hungary***).

1.10. **A permineralized Osmundales stem from the early Miocene of Hungary**

A permineralized osmundaceous axis was discovered in Karpatian sediments deposited in freshwater-swamp environment near Rákóczibánya. Based on observations applying traditional thin section preparations the fossil rhizome has been assigned to the subgenus *Plenasium* (Osmundaceae). This is the second record of the subgenus from Europe. Results were presented at the 11th European Palaeobotany and Palynology Conference (***Erdei & Prakfalvi – An anatomically preserved Osmundales axis from the Early Miocene of Hungary***).

2. Vegetation reconstructions adopting PFTs

2.1. Methodological discussions

2.1.1. Regarding PFT classification several methodological questions have arisen which significantly influence the adaptability of PFT based vegetation reconstructions for vegetation model validations, e.g. usage of certain bioclimatic thresholds. A talk was given by B. Erdei on selected bioclimatic variables (sensitive climate variables) and other ecological factors determining the distribution of plants at the 4th NECLIME Workshop on Digital Plant Distribution, Liege, Belgium.

2.1.2. Evaluation of cycad fossils for vegetation reconstructions (e.g. early Oligocene, Tard Clay flora). A short discussion on this topic is included in a paper published in the international journal "*Biology Letters*" (***Erdei et al. – First cycad seedling foliage from the fossil record and inferences for the Cenozoic evolution of cycads***).

2.2. Vegetation reconstructions

The PFT approach was applied on Rupelian and Chattian fossil floras of Western Eurasia to trace spatial vegetation pattern across the study area. Palaeobotanical data of more than 100 macro- (leaves, fruits, and seeds) and microfloras including Paleogene floras of the Central Paratethys region were compiled. Taxa of these palaeofloras were classified in PFTs including herbaceous to arboreal classes (the PFTs are defined using traits and climatic thresholds of key taxa, and comprise species assigned by morphological and phenological features). Diversity values of each PFT were calculated for the fossil floras and spatial gradients over Western Eurasia were investigated for the Rupelian and Chattian. Based on PFT diversity maps and transects showing basic patterns of the vegetational structure at the continental scale, it was demonstrated that in both time slices tropical and broadleaved evergreen PFTs were more diverse in the West and at lower latitudes. Congruently with the global climate evolution inferred from marine archives and regional continental records, the ratio of tropical and broadleaved evergreen PFTs was higher in the Rupelian than in the Chattian. Low diversities of xeric PFTs are in accordance with the previously assumed general humid climate in Western Eurasia throughout the Oligocene, however, the reconstructed spatial gradients suggest somewhat drier conditions to the Southeast. Results have been published in the international journal

"*Geological Journal*" (***Utescher, Erdei***,…– ***Oligocene vegetation of Europe and western Asia - diversity change and continental patterns reflected by Plant Functional Types***).

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Rásky K. 1956. Fosszilis növények a Martinovics-hegyi (Budapest) felsőeocénból. *Földtani Közlöny* **86**, 295–298.

Example pages from the manuscript entitled "**The late Oligocene (Egerian) flora of Hungary" by Hably L. & Erdei B.,** submitted (under revision) to *Acta Palaeobotanica*:

Discussion

Late Oligocene (Egerian) fossil flora and vegetation in Hungary

The fossil flora of the late Oligocene (Egerian) of Hungary shows a diverse picture, ferns, gymnosperms, and angiosperms are all represented in the assemblages with varying diversity (Table 1). Ferns include the families Equisetaceae, Osmundaceae, Blechnaceae, Aspleniaceae, Thelypteridaceae, and Polypodiaceae. The most frequent fern is *Pronephrium stiriacum* (Thelypteridaceae), which was recorded in the floras of the Wind-brickyard, Környe, and Pomáz. Among gymnosperms the *Pinus* genus of the Pinaceae family provided high number of fossils, mainly cones.

The Cupressaceae family proved to be quite diverse in the Egerian floras, with the genera *Glyptostrobus, Sequoia, Tetraclinis*, and high number of leafy shoots representing the Taxodioideae subfamily. *Glyptostrobus* and other remains of Taxodioideae must have characterized mainly swamps and coalswamps in Csörög, Wind-brickyard, Kesztölc, Környe, Nagysáp, Pomáz, and Vértesszőlős.

The most populous group was the angiosperms, first of all with dicots. The Lauraceae family, mainly with *Daphnogene* and *Laurophyllum* div. sp., was a dominant member of the Egerian floras. Except for Rétság, its species turned up at all the localities, usually dominating the floras. In Rétság, the lack of lauraceous fossils may be attributable to the coarse-grained sediments and the low number of fossil remains. A deciduous member of the Lauraceae family, *Sassafras lobatum*, was recorded from a single locality, the Wind-brickyard.

The Platanaceae family with the species *Platanus neptuni* (Platanaceae), characteristic of the Oligocene floras of Europe, is one of the most frequent elements of the Hungarian Egerian floras. Data on the species is missing at merely two localities, Környe and Máriahalom. The former is definitely a flora of wetland habitats (swamp) and the latter has coarse-grained sedimentary matrix, which may explain the absence of the species in these floras. One species of the Rosaceae family, *Rosa lignitum*, appeared as a rare element at three localities, in fine-grained sediments. The family Fagaceae was recorded with leaves assigned to the genus *Quercus*, but in several cases the systematic affinity of these remains is uncertain. The fossils leaves of ?*Decodon* in the Pomáz flora support the presence of wetlands. The Trochodendraceae family is present with one species of *Tetracentron* at the locality of Wind-

brickyard. The *Sloanea* genus of the family Elaeocarpaceae, which was a frequent element of early Oligocene floras, has only scarce fossil record in the late Oligocene, a sole fruit fragment in Vértesszőlős. The legume family is much more diverse, besides "*Acacia" parschlugiana*, numerous leaflets turned up belonging to diverse genera. Legume diversity is corroborated by the high variety of legume pods at the localities of Andornaktálya, Wind-brickyard, Kesztölc, Pomáz, and Vértesszőlős. Moreover these occur in high number at some localities, e.g. Wind-brickyard, and Pomáz. An even higher share of the legumes, nearly 50% of the fossil specimens, was recorded at the somewhat older locality near Oroszlány (Selmeczi and Hably, 2009). This may have taphonomical reasons as well, but the high ratio of legumes is unambiguous in the younger Oligocene. The Juglandaceae family is well represented, first of all with the genus *Egelhardia*. Leaflets of *E. orsbergensis* were recorded at the localities Andornaknaktálya, Csörög, Wind-brickyard, Kesztölc, Pomáz, Pusztaberki, and Tarján. Fruit remains of the genus, *E. macroptera*, were found in Csörög, Wind-brickyard, and Pomáz. In some of the floras, e.g. Csörög, the species occurs in high number, with both fruit and leaf remains. The family Ulmaceae is also a dominant member of the Egerian floras, first of all with various species of the genus *Ulmus*, *U. pyramidalis, U. pseudopyramidalis, U. fischeri,* and *U. braunii*. Among them the most widespread species was *U. pyramidalis*, which was present at most of the localities, often as a frequent element. The species *Zelkova zelkovifolia*, a well-known member of the Hungarian Miocene floras, was also present, but as a rare element in the floras of the Wind-brickyard, Kesztölc, Verőcemaros, and Vértesszőlős.

The Myricaceae family was present with several species, among which *M. lignitum* was the most widespread. Other *Myrica* species turned up only as scattered, rare elements in the floras. It is noteworthy that *M. longifolia* and *Comptonia dryandroides* were dominant species in the rich wetland assemblage of the Wind-brickyard. The family Betulaceae was present with the genus *Alnus*. The species *A.oligocaenica* was present, but relatively rarery, in the floras of the Wind-brickyard, Leányfalu, Nagysáp, Tarján, and Vérteszőlős. Other alder fossils – leaves, female inflorescence or fruits, were recorded at numerous other localities. In this way the genus turned up at nearly all the localities. The Malvaceae and Theaceae families are subordinate in the floras with low number of specimens. Some remarkable, malvaceous specimens assigned putatively to the genus "*Kydia*" turned up in the lower flora of the Wind-brickyard locality. The Nyssaceae family was recorded with few remains of the genus *Nyssa*. The presumed occurrence of both vegetative and reproductive organs of *Nyssa* is noteworthy, since as a member of mastixioid floras it indicates a thermophilous flora and vegetation. The

Berberidaceae family was represented with a single species *B. andreanszkyi* in the flora of the Wind-brickyard. Similarly, the Aquifoliaceae family was recorded with a single species ?*Ilex andreanszkyi* also at the Wind-brickyard. Among monocots *Smilax weberi* (Smilacaceae) was documented as a rare element at the Wind-brickyard, Kesztölc, and Vértesszőlős.

The presence and diversity of palms are noteworthy, although most of the palm remains, both leaves and possible inflorescences, i.e. *Sabalites, Phoenicites, Tuzsonia*, are recorded at the Wind-brickyard, both in the upper and lower floras. Palms also occurred in the flora of Nagysáp, Csörög, Kesztölc, and Verőcemaros.

Many taxa were documented that have uncertain systematic affinity. Some of them even predominated or were quite frequent elements in the floras. One of the most important "incertae sedis" taxa is „*Rhamnus*" *warthae*, which had numerous leaves at the localities Andornaktálya, Wind-brickyard, Kesztölc, Környe, Nagysáp, and Pusztaberki. In most of these floras the taxon was relatively rare, but in the flora of the Wind-brickyard it was dominant, similarly to the late Oliogcene flora of the Zsil Valley (Transylvania, Romania; Staub, 1887), or the flora of Petrusany (Petrozsény, Transylvania, Romania), though here with less number of specimens (Hably, 2001). Its appearance in the lower flora of the Wind-brickyard supports a late Oligocene age of these layers. The species "*Rhamnus*" *warthae* was an endemic element of swamp habitats during the Egerian of the Inner Carpathian Region (Hably, 2001). Another species of unknown systematics is the extinct species, ?*Debeya hungarica,* which turned up with high number of specimens in the flora of Verőcemaros. It was presumably an endemic and thermophilous element of the Egerian floras. Numerous taxa with uncertain systematics were documented from the Egerian floras, many of which are potentially endemic elements, e.g. *Carpolithes* sp. (Pomáz) and "*Talauma" egerensis* (Wind-brickyard).

Based on the diverse floristic information on the localities, some localities seem to reflect the azonal wetland (e.g. swamp) vegetation. e.g. Wind-brickyard and Környe. At other localities, elements of both the zonal and azonal vegetations are documented, e.g. Vértesszőlős. Elements of the riparian vegetation often co-occur with members of the swamp or zonal vegetation. At most of the localities representing dominantly the zonal vegetation, wetland elements also appear, although rather subordinately, e.g. Pomáz, which may be attributed to the remote location of the swamp vegetation from the depositional basin. The presence of the wetland vegetation can be easily interpreted with alternating shallow marine and brackish inundations evidenced by cyclic sedimentation. There is a high frequency of arboreal species indicating extended thermophilous forests during the Egerian. Species of *Daphnogene*

cinnamomifolia, Laurophyllum sp., *Platanus neptuni, Engelhardia orsbergensis, E. macroptera, Leguminocarpon* sp., Leguminosae gen. et sp., palms, and *Pinus* played an important role in these forests as dominant elements. In wetland (e.g. riparian) areas *Ulmus* (*U. pyramidalis*) may have participated in forming the vegetation. In swamps mainly cupressaceous species occurred, e.g. *Glyptostrobus europaeus* and other taxodiaceous taxa. Angiosperms, e.g. "*Rhamnus*" *warthae, Alnus, Myrica*, were also significant elements of this vegetation. At some localities other swamp elements appeared, e.g. *Comptonia dryandroides, Acer hungaricum,* and *Nyssa*. Lianas were also part of the landscape with *Smilax* species and possibly palms, which suggests lush vegetation.

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Plate 3.
1. *Pinus* sp., cone, Csörög, HNHM-PBO 85.52.1.
2. *Pinus* sp., cone, Máriahalom, HNHM-PBO 2001.647.1.
3. *Pinus* sp., cone, Eger-Wind brickyard (lower flora), HNHM-PBO 2007.991.1.
4. *Tetraclinis salicornioides* (Unger) Kvaček, scale leaf, Vértessőlős, Tata 76.116.1.
5. *Tetraclinis* sp., cone, Eger-Wind brickyard (upper flora), MM 56.1390.1.
6. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.99.4.
7. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.202.1., cones
8. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.161.2.
9. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.193.1., ?male cones
10. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.180.1., seed cones
11. Taxodiaceaea gen. et sp., Környe, HNHM-PBO 2009.381.1.
12. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.229.2., ?male cones
13. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.388.2., seed cone
14. *Glyptostrobus europaeus* (Brongn.) Unger, Környe, HNHM-PBO 2009.193.1. seed, bar 0.5 cm.

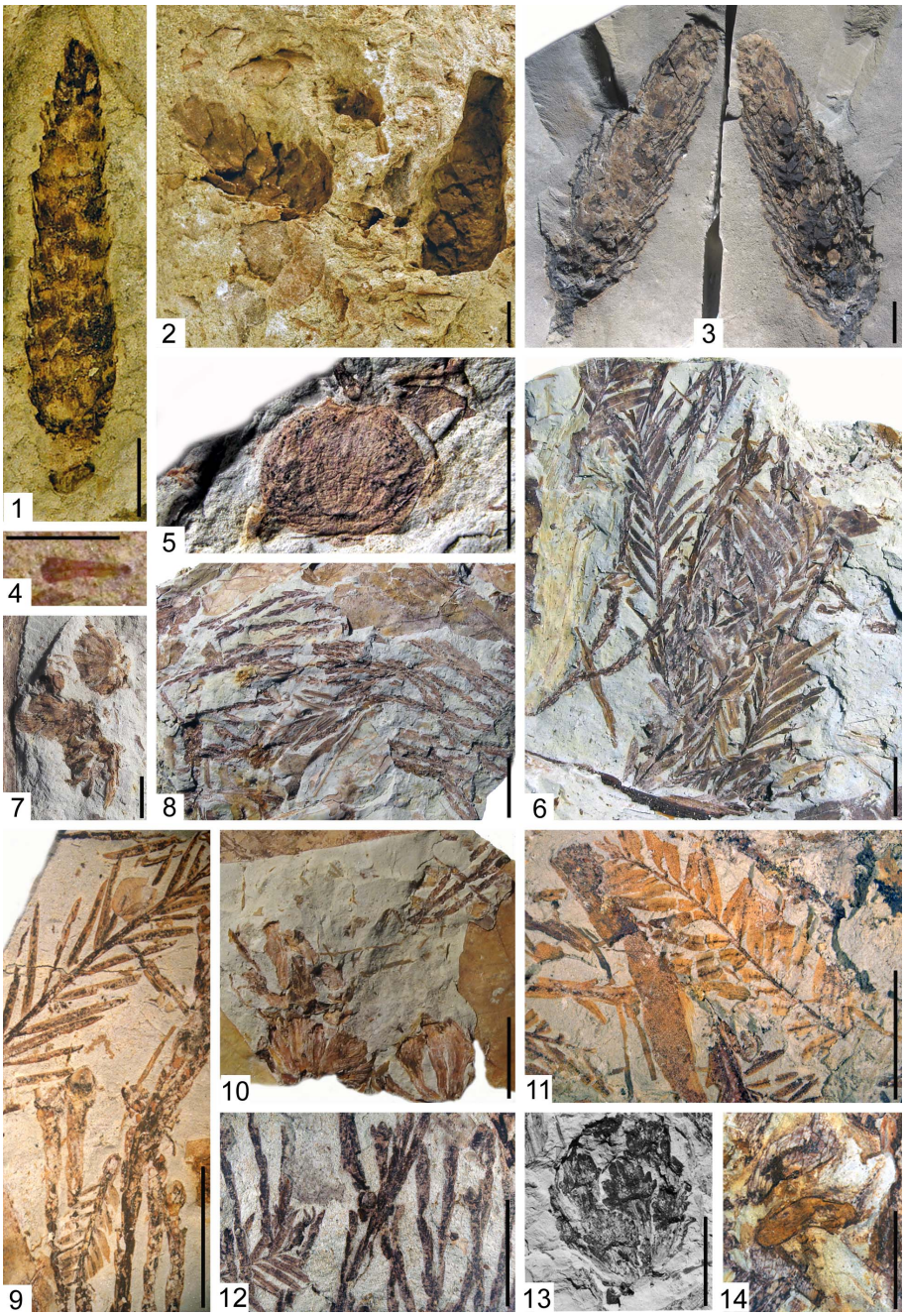

Plate 5.
1. *Daphnogene cinnamomifolia* (Brongn.) Unger, Vértesszőlős, Tata 76.6.1.
2. *Daphnogene cinnamomifolia* (Brongn.) Unger, Pomáz, HNHM-PBO 86.407.1.
3. *Daphnogene cinnamomifolia* (Brongn.) Unger, Tarján, HNHM-PBO 2014.261.2
4. *Daphnogene cinnamomifolia* (Brongn.) Unger, Csörög, HNHM-PBO 2005.436.1.
5. *Daphnogene cinnamomifolia* (Brongn.) Unger, Környe, HNHM-PBO 2009.158.1.
6. *Daphnogene cinnamomifolia* (Brongn.) Unger, Vértesszőlős, Tata 76.6.1.
7. *Daphnogene cinnamomifolia* (Brongn.) Unger, Tarján, HNHM-PBO 2014.265.2.
8. *Daphnogene cinnamomifolia* (Brongn.) Unger, Vértesszőlős, Tata 76.1.1.
9. *Daphnogene cinnamomifolia* (Brongn.) Unger, Környe, HNHM-PBO 2009.182.1.
10. *Daphnogene cinnamomifolia* (Brongn.) Unger, Vértesszőlős, Tata 76.92.1.
11. *Daphnogene* sp., Vértesszőlős, Tata 76.106.1.