ACTA PALAEOBOTANICA
XXI (2): 101—114, 1981

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A PRELIMINARY REPORT ON A NEW STUDY OF THE NEOGENE FLORA FROM SOŚNICA NEAR WROCŁAW IN LOWER SILESIA, WEST POLAND (LEAF AND FRUIT-SEED FLORAS)

Wstępne doniesienie o nowym opracowaniu neogeńskiej flory z Sośnicy koło Wrocławia na Dolnym Śląsku (flora liściowa i owocowo-nasienna)

ABSTRACT. The fossil flora of Sośnica (former Schossnitz) in Lower Silesia, described by H. Goeppert in 1855, revised in 1912–1921, is one of the classical leaf floras of the Neogene of Central Europe. H. Goeppert's original collection so far preserved and some later collections of numerous leaf impressions are now subjected to fresh investigations, supplemented with a study carried out by the method of cuticular analysis. The results of studies on fruits and seeds washed from Sośnica clays have been presented for the first time. They add many new taxons to the floral list.

INTRODUCTION

The fossil flora of Sośnica was studied and published for the first time by Goeppert (1855) in *Die tertiäre Flora von Schossnitz in Schlesien*. It belongs to the classical leaf floras of Central Europe, many of its original specimens are preserved and the locality of its occurrence has been providing further abundant fossil materials for over 120 years. This flora is a particularly valuable material for study, since the fine-grained clays of this locality contain not only countless leaf remains, perfectly well seen on impressions, but also numerous fruits, seeds, cones, shoots, flowers and inflorescences, not infrequently with some plant tissue preserved. In 1892 Raciborski wrote that "pollen grains can be observed in stamina on very subtle clay under the microscope". At that time the clays of Sośnica were second only to the Miocene deposits of Switzerland in respect of the abundance of plant remains. Heer's fundamental work *Flora tertiaria Helvetiae* was published in 1856–1859 and than later than Goeppert's publication. Thus, numerous specimens from Sośnica are the type of the taxons

given later not only by Heer (l. c.) from Oehningen, but also from many other localities of the Arcto-Tertiary flora.

The determinations of plants from Sośnica have been subjected to a revision chiefly by German palaeobotanists (e.g. Kräusel *et al.* 1919). However, the manner of this elaboration and publication of the results was rather unlucky. Giving the characters of the fossil species, the authors used not only the specimens from Sośnica but also those from other localities of the Silesian Tertiary (among others, Malczyce (Maltsch), Kokoszyce (Kokoschütz), Brzeg Dolny (Dyhernfurth) and Zielona Góra (Grünberg)). Specimens varying in age and origin were treated together as one species, which caused many obscurities and inappropriate interpretations of plant remains in later publications concerning other fossil floras.

Having at our disposal Goeppert's original collection, complemented with further collections from the same locality, we have embarked upon a new study of the Sośnica flora. Its purpose is a comprehensive critical analysis of the material as well as the designation of the types and the modernization of the classification of taxons on the basis of the International Code of Botanical Nomenclature.

The investigation is being made under the scheme of cooperation between the Institute of Botany, Polish Academy of Sciences, in Kraków and Staatliches Museum für Mineralogie und Geologie zu Dresden. The morphology of leaf remains is studied in the Institute of Botany (Dr. Ewa Zastawniak) and by the method of cuticular analysis in the Staatliches Museum (Dr. Harald Walther). The study of the fruit-seed flora is being carried out by Assist. Prof. Maria Łańcucka-Środoniowa in the Institute of Botany.

SHORT HISTORY OF THE FORMER STUDIES

Three main periods can be distinguished in the scientific study of the flora of Sośnica.

1. The first study of this flora was carried out by Heinrich Robert Goeppert, Professor of Botany and Director of the Botanical Garden, University of Wrocław (former Breslau), in the middle of the last century. He learnt about the fossil flora at Sośnica from von Oynhausen and published his first report in 1851. From January till March 1852 Goeppert succeeded in determining 130 species from about 300 kg of clay (Goeppert 1852a, b). 118 of these species had been unknown up to that time. The work was finished and published in 1855. Altogether 139 species were described, mainly on the basis of leaves, and additionally 9 species of leaf-epiphytic fungi.

Goeppert's method of work was very precise. The systematic part is preceded by valuable remarks about the conditions of sedimentation and preservation of fossils, a close description of the locality where the flora was found and information about the profile. Observations about the frequency of individual species are also given. The description of each taxon begins with

its Latin diagnosis, followed by a systematic description and comparison with recent species.

According to Goeppert, the species of *Carpinus*, *Platanus*, *Populus*, *Quercus*, *Ulmus* and "Storax" *(Liquidambar)* were prevailing trees, and so were the species of the "Cupressinen". *Alnus*, *Betula* and *Salix* are regarded as the most frequent genera of the shrub layer. The true tropical plants, among which Goeppert counts *Daphnogene* as well as *Palmae*, are absent. In considering the stratigraphic distribution of fossils, he distinguished long persisting taxons, which are of no importance to stratigraphy. Goeppert (1855), basing himself on the dominance of deciduous trees and the lack of a tropic element, dates the flora of Sośnica at the Pliocene. In his opinion, there are remarkable analogies between the Tertiary vegetation and some recent floras of the temperate zone of North America, Mexico, South Europe and the Caucasus.

In 1861 Goeppert revised his point of view as regards the determination of a number of fossil taxons of the genera *Acer*, *Carpinus*, *Fagaceae*, *Liquidambar*, *Populus*, *Salix* and *Ulmus* in the Sośnica flora.

Later the flora of Sośnica was mentioned in numerous papers on Tertiary palaeobotany and its species were subjected to partial and critical revisions by authors who frequently had not seen the original material (Heer 1856–1859; Schimper 1870–1874; Menzel 1906, and many others). Raciborski (1892) wrote about the flora of Sośnica in his unpublished work *Fossil Floras of Poland.* He quoted all the species described by Goeppert and provided some of them with critical notes. Schlechtendal (1897) studied Goeppert's collection in Wrocław closely and revised several species.

2. At the beginning of the present century some more revisions of the plant remains of Sośnica were made. Reichenbach (1912), Reimann (1912) and Mayer (1913), who worked under the direction of Prof. Ferdinand Pax of Wrocław University, presented their dissertations, in which the fossil species of the Silesian Tertiary were dealt with only from the systematic point of view. In 1919 Kräusel published their results in *Die Pflanzen des Schlesischen Tertiärs*, which was followed by supplements (Kräusel 1920, 1921), in which further originals of Goeppert's collection were revised. This again attracted the interest of palaeobotanists to Sośnica. Although the nearly complete original material of Goeppert was available at that time, only some species were revised, the whole of the flora being left unchanged.

It seems remarkable that Kräusel (1920, 1929) was the first to succeed in tracing the structure of epidermis in the material of Sośnica (*Libocedrites salicornioides* Endl., *Viscophyllum miquelii* (Geyler & Kink.) Engelh. & Kink.).

Kirchheimer (1937) published comprehensive considerations on the species of the Sośnica flora but without any revisions. He also critically catalogued some fruits and seeds from Sośnica in 1957.

3. A period of intense collection of new materials began after 1945. Raniecka-Bobrowska and Czeczott (1958) presented the general characteristics of the Sośnica flora against the background of the Miocene vegetation

of Poland. Szafer (1954) mentioned the species *Trapa silesiaca* Goepp. from Sośnica in his work on living and fossil forms of the water chestnut and Jentys-Szaferowa (1958) gave much attention to the remains of *Carpinus* in her work on fruit involucres of this genus present in fossil floras. Micek's study on the fruits of *Eucommia europaea* Mädler appeared in 1959 and the inflorescences of *Salix* were used to illustrate a stage of the evolution of this tree (Szafer 1959, figs. 1a, 1b). The leaf flora of Sośnica was besides the subject of the thesis for a master's degree made by M. Kordysz in the Department of Palaeobotany, Wrocław University, under the direction of Assist. Prof. A. Stachurska. The results of geological and palynological studies were published by Stachurska, Sadowska & Dyjor (1973).

MUSEUM COLLECTIONS

The specimens of the Sośnica flora are at present in the possession of the following institutions:

Museum of the Institute of Geological Sciences, Wrocław University, Wrocław (UWr.),

Institute of Botany, Polish Academy of Sciences, Kraków (IB),

Museum of the Earth, Polish Academy of Sciences, Warszawa (MZ),

Institute of Geology, Warszawa (IG),

Paläontologisches Museum, Museum für Naturkunde der Humboldt-Universität zu Berlin in the GDR (MP).

The Wrocław collection consisting of more than 3400 impressions is the richest. It is in great part composed of original specimens examined by Goeppert, which have outlasted World War II together with other palaeobotanic collections of the Institute of Botany, Wrocław University. Packed in parcels, they were hidden in various places in the University. Prof. M. Kostyniuk found them after the war and, as the Head of the Department of Palaeobotany, Wrocław University, at that time, started a hard job of putting the collection in order. Many specimens had undergone more or less grievous damage and many had been lost for good. Out of the 334 plant remains illustrated with drawings in Goeppert's work of 1855, 159 were found in the Wrocław collection. All the documents of the collection, inventories and record cards of particular specimens had been lost or, in the case of these last, mixed up. Only a small number of specimens bore their original labels dating from Goeppert's times. Some other labels, written later (among other workers, by Kräusel) were found separately.

In 1952–1975 the Palaeobotanic Museum of the Department of Palaeobotany, Wrocław University, was in the charge of W. Micek, who went on arranging the collection. In 1952 and 1953 Assist. Prof. Z. Zalewska found and identified some specimens illustrated in Goeppert's (1855) work or in photographic plates in papers by later authors *.

* For the information concerning the history of the Wrocław collection after 1945 we are indebted to Assist. Prof. A. Sadowska.

Other collections rich in specimens are in the possession of the Institute of Botany, Polish Academy of Sciences, in Kraków (2100 impressions), Museum of the Earth, Polish Academy of Sciences, in Warszawa (517 specimens) and Institute of Geology in Warszawa (314) specimens. These collections were made in the years 1954 to 1973 and their specimens were determined by the scientific workers of the Department of Palaeobotany, Wrocław University, Assist. Prof. M. Łańcucka-Środoniowa (IB), Prof. H. Czeczottowa (MZ), the scientific workers of the Palaeobotanical Laboratory of the Museum of the Earth and Prof. J. Raniecka-Bobrowska (IG).

The collection of the fossil flora of Sośnica stored in the Paläontologisches Museum in Berlin consists of 381 specimens, most of which (298) were examined and partly published by Kräusel *et al.* (1919, 1920, 1921, 1929). Moreover, among them there are also some plant remains illustrated in Goeppert's work of 1855. Special attention should be given to 83 specimens of leaf impressions preserved in clays which differ somewhat from those from which all the remaining specimens of this fossil flora come. According to Dr. H. Jähnichen's information, these specimens were collected in 1941 on the initiative of Prof. W. Gothan, who also identified them. The name of the locality given on the original labels, "Reichbergen/Schossnitz bei Kanth", refers to Sośnica (near Kąty Wrocławskie), for which the name Reichbergen was used in the late thirties.

The remains preserved exclusively in the form of impressions, often coloured by traces of iron compounds ($Fe(OH)_3$), predominate among the fossil specimens. Some of them have carbonized plant matter on the surface, frequently coated with shellac or varnish, used earlier to protect specimens.

In addition to the collection of impressions, which are leaf impressions in 84%, the Institute of Botany, Polish Academy of Sciences, possesses a collection of fruits and seeds and other parts of plants obtained from clay. These remains, sometimes very fragile, were preserved only in the layer of grey clays, occurring within the so-called variegated clays (cf. Fig. 2). A total of about 730 specimens have been washed from the clays, not counting numerous single anthers, buds, roots, etc. The state of preservation of this group of remains is relatively good, they are rather strongly carbonized, sometimes pyritized, but little deformed.

The post-war collections of the fossil flora of Sośnica came to be thanks to many persons, among others, to Z. Baranowska-Zarzycka (MZ), B. Brzyski, S. Chaczyńska (MZ), H. Czeczott (MZ), A. Hummel (MZ), A. Kohlman-Adamska (MZ), J. Jentys-Szaferowa (IB), M. Kordysz (UWr.), M. Kostyniuk (UWr.), W. Micek (UWr.), J. Raniecka-Bobrowska (IG), M. Łańcucka-Środoniowa (IB), J. Oszast (IB), M. Reymanówna (IB), A. Sadowska (UWr.), A. Stachurska (UWr.), L. Stuchlik (IB), W. Szafer (IB), A. Środoń (IB), P. Szczypek (UWr.), E. Zastawniak (IB) and students of geology in the Faculty of Natural Science, Wrocław University, in 1954–1973.

GEOLOGICAL SITUATION

The locality of this fossil flora (Fig. 1), situated 18 km west of Wrocław in the Silesian Lowlands, lies within the range of the basin of the Poznań series. Besides the late Tertiary brown coal basin in the Middle-Polish Lowlands, this basin constitutes the main sedimentational and tectonic unit of Western Poland, recently closely explored by Dyjor (1970, and other). Older deposits of the coal-bearing formations occur in the form of several rock series and brown coal beds, of which the youngest, the Tortonian brown coal bed "Henryk", makes a reliable correlation horizon in this area (Dyjor & Sadowska 1977).

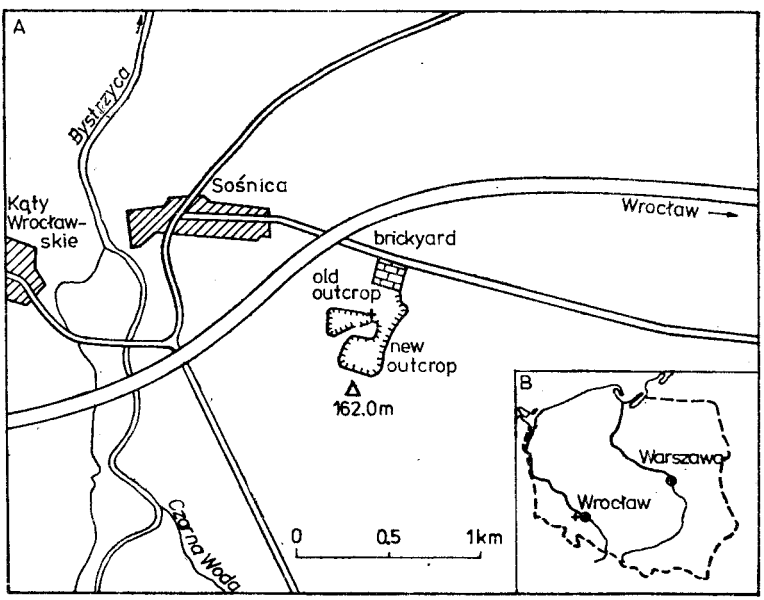

Fig. 1. A — situation of the outcrops with the fossil flora at Sośnica; + — site of sampling for pollen analysis; B — situation of the locality investigated (after Stachurska *et al.* 1973, somewhat simplified)

The "Henryk" horizon is overlain by a fairly thick complex of the clayey-sandy Poznań series. On the basis of the lithological structure and mineralogical composition of clays three horizons are distinguished in this series; their sedimentation took place under various facial conditions. The lower horizon, the so-called horizon of grey clays, was formed in the conditions of flooded marshes and peatbogs. According to the palaeobotanic datings, its origin, and then the commencement of sedimentation of the Poznań series, falls in the Upper Tortonian (among other authors, Ziembińska 1964; Sadowska 1977). The middle horizon, the so-called horizon of green clays, originated in marine or brackish conditions. The top of the series is built of variegated clays, which were deposited in a gradually drying-up water body. They are as a rule grey and green clays with yellow, brown or brick-red patches. It is

just this youngest link of the Poznań series that the plant remains found in the brick-kiln at Sośnica come from (Fig. 2).

Stachurska, Sadowska & Dyjor (1973) give a description of the outcrops with the fossil flora, the place where the palynological profile was taken, and detailed geological data. They also present a historical outline of the geological studies and different opinions held hitherto on the age of the flora. Since the

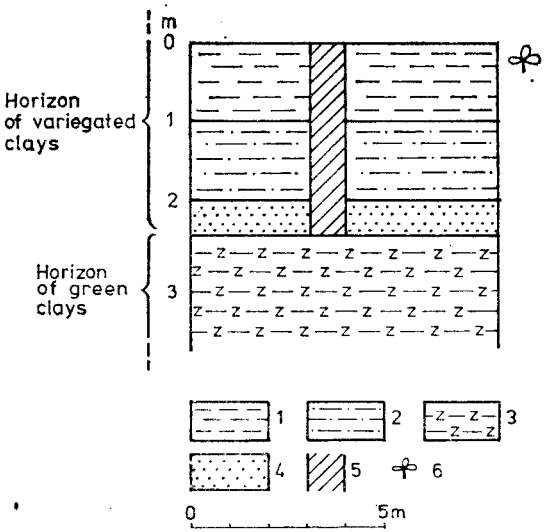

Fig. 2. Geological profile of Tertiary deposits at Sośnica (after Stachurska *et al.* 1973, simplified)
1 — grey clay; 2 — sandy clay; 3 — green clay; 4 — sand; 5 — situation of palynological profile; 6 — macroscopic flora

dating of the horizon of variegated clays, and then that of the end of the sedimentation cycle of the Poznań series, was possible exclusively on the basis of plant remains, the age of the flora of Sośnica was the subject of considerations of numerous palaeobotanists and geologists. On the basis of the results of palynological studies it has been established as Lower Pliocene (Stachurska *et al.* 1973).

LEAF FLORA

Remains of two genera, *Salix* and *Ulmus*, are dominant in this flora. The leaf impressions of these trees or shrubs, belonging to different fossil species, form almost a half of all the specimens. Very numerous are also the impressions of leaves of *Alnus* sp. div. (Pl. I, fig. 10), *Betula* sp. div. (Pl. I, figs. 2, 6), *Carpinus grandis* Ung. *sensu* Heer (Pl. I, fig. 1), *Liquidambar europaea* A. Br. (Pl. I, fig. 9), *Parrotia pristina* (Ett.) Stur (Pl. II, figs. 2b, 3), *Platanus leucophylla* (Ung.) Knobl. (Pl. III, fig. 6), *Populus* sp. div., *Pterocarya paradisiaca* (Ung.)

Iljinsk. (Pl. III, fig. 5), *Vitis strictum* (Goepp.) Knobl. *Zelkova praelonga* (Ung.) Berger (Pl. II, fig. 2a) and *Zelkova zelkovaefolia* (Ung.) Bůžek & Kotlaba. The family *Fagaceae* is represented by *Fagus attenuata* Goepp. (Pl. II, figs. 4, 5), *Quercus pseudocastanea* Goepp. and the impressions of leaves and a cupule of an oak of the section *Cerris* (Spach) Oerst. (Pl. II, fig. 1). There are many leaf impressions of *Salvinia mildeana* Goepp. (Pl. I, fig. 8), while in the group of relatively poorly-differentiated conifers only the impressions of shoots of *Taxodium dubium* (Sternb.) Heer (Pl. I, fig. 7) are abundant. Species of the genus *Acer*, e.g. *Acer subcampestre* Goepp. (Pl. III, fig. 1), *A. tricuspidatum* Bronn *sensu* Procháska & Bůžek and *A. vindobonensis* (Ett.) Berger (Pl. II, fig. 6), as well as *Celtis begonioides* Goepp., *Myrica* sp. (Pl. II, fig. 2c), *Rosaceae* and some others occur as single specimens. Out of the taxons of uncertain systematic position, the most specimens belong to "*Juglans*" *salicifolia* Goepp., "*Rhododendron*" *retusum* Goepp. and "*Rhus*" *quercifolia* Goepp.; there are also numerous small entire leaves of the type of *Leguminosae* sensu Berger. The best represented assemblage of the leaf flora is a rich mesophilous deciduous forest with a well-developed shrub layer and many climbers. The presence of *Taxodium* indicates also the occurrence of swamp forests.

In composition the leaf flora of Sośnica resembles some recent forest communities in warm temperate and temperate climates.

FRUIT-AND-SEED FLORA

This flora consists of two kinds of remains. The first of them are specimens preserved as impressions, which form about 16% of the Wrocław (UWr.) and Kraków (IB) collections. The work on these remains is very difficult, because the details of their morphology are often very poorly seen. This is probably the reason why most specimens derived from Goeppert's collection were not described either in 1855 or later on the occasion of the revision of this flora. At present a study of all the impressions of small plant remains, mostly fruits and seeds, has been taken up.

Relatively well preserved specimens washed from clay are the other kind of remains. In many cases they corroborate the determinations of genera based on poorly preserved leaf impressions (e.g. cf. *Araliaceae*, *Carya*, *Celtis*, *Myrica* and *Paliurus*) and — which is particularly important — enrich the flora composition with herbs, the leaves of which are rarely found in the fossil state.

As a result of preliminary studies, 74 taxons (Table 1) have been distinguished, most of which have been identified on the basis of remains obtained from clay (50 taxons) and only a small part on the basis of impressions (11 taxons). The remaining 13 taxons are documented by both impressions and specimens obtained from clay.

The genera *Eoeuryale*, *Salix*, *Salvinia*, *Taxodium* and *Trapa* are represented by the largest numbers of specimens. *Cyperaceae* (cf. *Dichostylis*), *Liquidambar*

Table 1

Sośnica. A list of plants determined in the material consisting of the fruit-and-seed flora (cf. Łańcucka-Środoniowa 1979; mosses were assigned by Dr. R. Ochyra)

Explanation: x = remains washed from clay, o = impressions, + = 1 — 3 specimens, ++ = 4 — 10 specimens, +++ = over 10 specimens

Preservation	Taxa	Kind of remains	Number of specimens
	Cryptogamae		
o	*Amblystegiaceae* gen.	stem	++
x	*Amblystegium serpens* (Hedw.) B.S.G.	stem	+
x	*Azolla nikitinii* Dorof.	megaspore	+
x	*Brachythecium* sp.	stem	+
o	*Equisetum* sp.	rhizome	+
x	*Fungi* gen.	sclerotium	+++
x	*Hypnum* sp.	leaf	+
x	*Neckera pumila* Hedw.	leaf	+
x	*Platydictya* sp. (= *Amblystegiella* sp.)	stem	+
x	*Polypodiaceae* gen.	sporangium	+
x	*Pylaisiella* sp. (= *Pylaisia* sp.)	leaf	+
x	*Salvinia* cf. *aspera* Dorof.	megaspore	+++
x	*Salvinia* sp.	microsporangium	+
x	*Selaginella pliocenica* Dorof.	megaspore	+++
x	*Selaginella* sp.	megaspore	+
	Gymnospermae — Coniferae		
x	*Amentotaxus gladifolia* (Ludwig) Ferguson, Jähnichen & Alvin	epidermis	+
x, o	*Libocedrites salicornioides* Ung.	twig	+++
x, o	*Pinus cohniana* (Goepp.) Schimper	cone	+
x	*Pinus* sp.	male flower	++
x	*Pinus* sp.	needle	+
x, o	*Taxodium dubium* (Sternb.) Heer	cone, seed, male inflorescence, twig, needle	+++
x	*Tetraclinis brongniartii* (Endl.) Kräusel	cone	+
	Angiospermae		
o	*Acer* sp. div.	fruit	++
x	*Alnus* sp.	fruit	+
o	*Alnus* sp.	male inflorescence	+
o	*Ampelopsis ludvigii* (A. Br.) Dorof.	seed	+
x	*Aralia* cf. *rugosa* Dorof.	fruit	+
x	*Batrachium* sp.	fruit	+
x	*Betula longisquamosa* Mädler	fruit	++
x	*Betula* sp.	fruit	+
x	*Boehmeria sibirica* Dorof.	fruit	++
o	*Callitriche* sp.	fruit	++
x	*Carex* sp. div.	fruit	++
x, o	*Carpinus betulus* L. type	fruit, involucre	+++
o	*Carya* cf. *ventricosa* (Sternb.) Brongn.	fruit	+
x, o	*Celtis* sp.	fruit	++
x	*Decodon gibbosus* (E. M. Reid) Nikitin	seed	+
x	cf. *Dichostylis* sp.	fruit	+++
x	*Dulichium spathaceum* Rich.	fruit	+
x, o	*Eoeuryale brasenioides* Miki	seed, spine	+++
x	*Eucommia* sp.	leaf fragment	+
x, o	*Fagus* sp.	fruit	+
o	*Gramineae* gen.	fruit	+
x, o	*Hamamelidaceae* gen. div.	fruit	++
x	*Hypericum coriaceum* Nikitin	seed	+++
x	*Hypericum tertiaerum* Nikitin	seed	+

Table 1 c.d.

Preservation	Taxa	Kind of remains	Number of specimens
x	*Juncus* sp.	seed	+
x	cf. *Leitneria venosa* (Ludw.) Dorof.	fruit	+
x	*Liquidambar* sp.	seed	+ + +
x	*Loranthaceae* gen.	epidermis	+
x	*Lycopus antiquus* E. M. Reid	fruit	+
x, o	*Myrica ceriferiformis* Kownas	fruit	+ + +
x	*Myrica* cf. *minima* Negru	fruit	+ +
o	*Nyssa* cf. *ornithobroma* Ung.	fruit	+
x	*Paliurus* sp. (*P.* aff. *ramosissimus* Poir.)	fruit	+
o	*Papilionaceae* gen. div.	fruit	+ +
x	*Phyllanthus compassica* Dorof.	seed	+ +
x, o	*Platanus* sp. (*P.* aff. *orientalis* L.)	fruit	+ +
x	*Polygonaceae* gen.	fruit	+
x	*Polygonum* sp.	fruit	+
o	"*Porana*" *membranosa* (Goepp.) Schimper	flower	+ +
x, o	*Pterocarya pterocarpa* Kunth.	fruit	+ +
x, o	*Quercus* sp.	fruit	+ +
x	*Rumex* sp. div.	fruit	+ +
x, o	*Salix* sp.	male infloresecence, fructification	+ + +
x	*Scirpus* cf. *sylvaticus* L.	fruit	+
x	*Solanaceae* gen.	seed	+ +
x	*Sparganium neglectum* Beeby foss.	fruit	+
x, o	*Symplocos lignitarum* (Quenst.) Kirchh.	fruit	+
x, o	*Trapa silesiaca* Goepp.	fruit, fruit spine	+ + +
x	*Typha* sp.	seed	+
o	*Ulmus* sp. div.	fruit, flower	+ +
x	*Vitis sylvestris* Gmel. foss.	seed	+
x, o	*Vitis* cf. *lusatica* Czecz. & Skirg.	seed	+
x	*Vitis* sp.	seed	+

and *Myrica* are also frequent. The presence of several genera of floating plants *(Azolla, Eoeuryale, Batrachium, Salvinia* and *Trapa)* proves the existence of a water body or fairly large flooded areas in swamp forests *(Taxodium, Nyssa* and *Leitneria)*. Most of the plants distinguished come from wet habitats, but the genera whose requirements as regards humidity are comparatively low *(Paliurus, Papilionaceae, Tetraclinis* and probably *Libocedrites)* are also present.

The fruit-and-seed flora contains several taxons characteristic of the Miocene floras but so far not recorded from the Pliocene of Central Europe. These are, among other species, *Amentotaxus gladifolia* (Ludwig) Ferguson, Jähnichen & Alvin, *Eoeuryale brasenioides* Miki, *Libocedrites salicornioides* Ung., *Symplocos lignitarum* (Quenst.) Kirchh., *Tetraclinis brogniartii* (Endl.) Kräusel and *Vitis* cf. *lusatica* Czecz. & Skirg.

The occurrence of a large number of seeds of *Eoeuryale* at Sośnica is particularly noteworthy. This extinct genus is known from the Neogene of Japan, the Oligocene and Miocene of West Siberia and the Miocene of Europe. In Dorofeev's (1974) opinion, two other — also extinct — genera, *Palaeoeuryale* and *Pseudoeuryale* (Miocene of West Siberia, Pliocene of Europe) were descended from it. The latest link is the present-day genus *Euryale*, which lives in the Far East and has been reported in the fossil state from the Pleistocene of Europe.

It should be added that fruits of *Eucommia europaea* Mädler (Micek 1959) and cones of *Pinus leizii* Kirchh. vel *P. palaeostrobus* (Ett.) Heer (Micek, oral communication) have also been found in the Sośnica flora.

ACKNOWLEDGEMENTS

The authors wish to express their thanks to the Director of the Institute of Geological Sciences, Wrocław University, to Assist. Prof. A. Sadowska, Head of the Department of Palaeobotany of this Institute, and to Dr. J. Skałowa, Curator of the Museum, for the loan of the Wrocław collection to the Institute of Botany, Polish Academy of Sciences, in Kraków, which made it possible for them to take up a new study of the Sośnica flora. They are indebted to the Authorities of the Museum of the Earth and the Institute of Geology in Warszawa for giving them access to the materials stored in these institutions. Words of gratitude are also owed to Dr. H. Jähnichen and the Management of the Paläontologisches Museum, Museum für Naturkunde der Humboldt-Universität zu Berlin for permitting the authors to use the materials in their possession. The anatomical study of the fossil specimens of the Sośnica flora is being carried out in the Staatliches Museum für Mineralogie und Geologie zu Dresden thanks to the kind support from Dr. H. J. Prescher, the Director of the Museum.

Many thanks are also due to M. Kleiberowa and A. Pachoński for the photography.

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STRESZCZENIE

WSTĘPNE DONIESIENIE O NOWYM OPRACOWANIU NEOGEŃSKIEJ FLORY Z SOŚNICY KOŁO WROCŁAWIA NA DOLNYM ŚLĄSKU (FLORA LIŚCIOWA I OWOCOWO-NASIENNA)

Flora kopalna z Sośnicy należy do klasycznych i doskonale zachowanych flor liściowych, reprezentatywnych dla roślinności neogenu na obszarze środkowej Europy. Opracowanie H. Goepperta z 1855 r., *Die tertiäre Flora von*

Schossnitz in Schlesien, jest jednym z pierwszych, tak obszernych i wszechstronnych w literaturze paleobotanicznej. Oznaczenia poszczególnych okazów były w latach późniejszych w wielu przypadkach korygowane przez licznych autorów (m. in. Heer 1855–1859, Schimper 1870–1872, 1874, Raciborski 1892, Menzel 1906), a w 1861 r. także przez samego Goepperta. Z początkiem obecnego stulecia podjęto szczegółową rewizję flory (Reichenbach 1912, Reimann 1912, Meyer 1913, Kräusel *et al.* 1919, Kräusel 1920, 1921). Wymienieni autorzy uwzględniali jednak łącznie zarówno okazy pochodzące z Sośnicy, jak i z innych stanowisk śląskiego trzeciorzędu. Zaważyło to niekorzystnie na ocenie wielu kopalnych taksonów oraz na interpretacji paleoflorystycznej i paleoklimatycznej flor trzeciorzędowych w podejmowanych później badaniach flor liściowych neogenu.

Flora z Sośnicy ma istotne znaczenie dla stratygrafii osadów trzeciorzędowych południowo-zachodniej Polski. Zachowana w iłach, zlokalizowanych przez Dyjora (1970) w stropie miąższego kompleksu ilasto-piaszczystej serii poznańskiej (ryc. 2), stała się podstawą datowania końcowej fazy sedymentacji w basenie serii poznańskiej na tym obszarze. W wyniku badań palinologicznych wiek iłów z florą oceniono na dolny pliocen (Stachurska *et al.* 1973).

Dysponując oryginalną kolekcją Goepperta, uzupełnioną obfitymi zbiorami z tego stanowiska znajdującymi się w kilku polskich placówkach naukowych i w Muzeum Przyrodniczym w Berlinie (NRD), przystąpiono do nowego opracowania flory sośnickiej. Celem studiów jest nie tylko wszechstronna analiza flory na podstawie krytycznych oznaczeń szczątków roślin, uzupełnionych wynikami badań liści metodą analizy kutikularnej, ale także wyznaczenie typów oraz unowocześnienie nomenklatury taksonów.

Po raz pierwszy przedstawiono wyniki badań owoców i nasion wypłukanych z iłów sośnickich (por. tabela 1). Wzbogaciły one listę florystyczną o liczne nowe taksony, m. in. o gatunki nie podawane dotychczas z pliocenu Europy środkowej (*Amentotaxus gladifolia* (Ludwig) Ferguson, Jähnichen & Alvin, *Eoeuryale brasenioides* Miki, *Symplocos lignitarum* (Quenst.) Kirchh., *Tetraclinis brongniartii* (Endl.) Kräusel, *Vitis* cf. *lusatica* Czecz. & Skir. i inne).

We florze liściowej i owocowo-nasiennej reprezentowane są różnorodne zbiorowiska roślinne, między innymi mezofilne lasy liściaste zrzucające liście na zimę, z niewielką domieszką szpilkowych, lasy szpilkowe bardzo wilgotnych siedlisk (lasy bagienne z *Taxodium*), oraz zbiorowiska roślin wodnych. Przeważająca większość oznaczonych we florze sośnickiej rodzajów roślin występuje dziś w warunkach klimatu umiarkowanie ciepłego i umiarkowanego.

Plate I

1. *Carpinus grandis* Ung. sensu Heer, specimen No 54/329, IB
2. *Betula brongniarti* Ett., specimen No 2227p, UWr.
3. *Ulmus carpinoides* Goepp., specimen No 54/188, IB
4. *Ulmus pyramidalis* Goepp., specimen No 54/622, IB
5. "*Alnus*" *rotundata* Goepp., specimen No 54/87, IB
6. *Betula prisca* Ett., specimen No 54/88, IB
7. *Taxodium dubium* (Sternb.) Heer. specimen No 54/684, IB
8. *Salvinia mildeana* Goepp., × 1·5. specimen No 2456p, UWr.
9. *Liquidambar europaea* A. Br., × 1·5, specimen No 54/54, IB
10. *Alnus* sp., specimen No 2585p, UWr.

Natural size except figs. 8 and 9


1


2


3


4


7


8


5


6

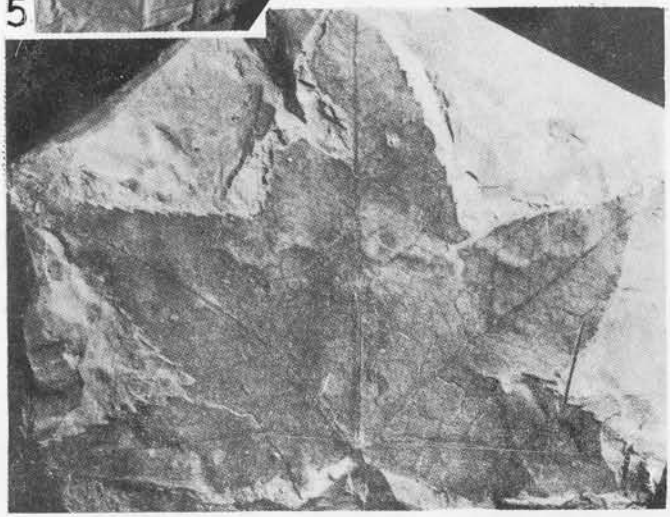
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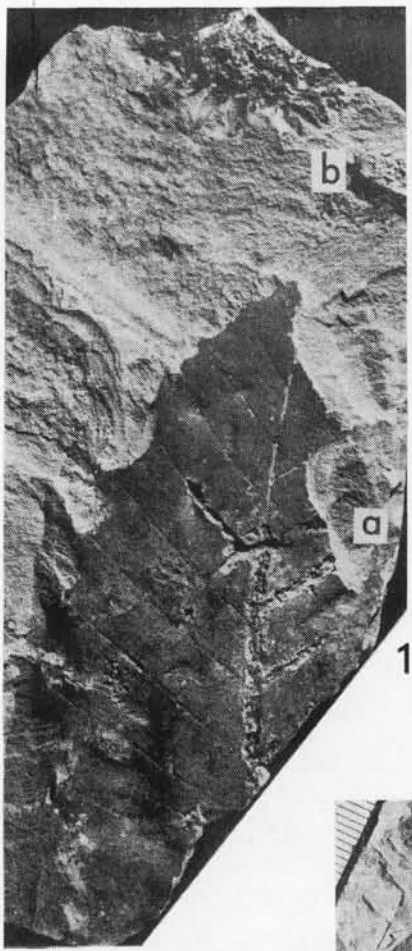
Plate II

1. *Quercus* sect. *Cerris* (Spach) Oerst. a — leaf, b — cup; specimen No 551p, UWr.
2. a — *Zelkova praelonga* (Ung.) Berger, b — *Parrotia pristina* (Ett.) Stur, c — *Myrica* sp., specimen No 2373p, UWr.
3. *Parrotia pristina* (Ett.) Stur, specimen No 1082p, UWr.
4. *Fagus attenuata* Goepp., specimen No 820p, UWr.
5. The original of *Fagus attenuata* Goepp., holotype, specimen No 2584p, UWr. (Goeppert 1855, Taf. V, Fig. 9)
6. *Acer vindobonensis* (Ett.) Stur, specimen No 403, MZ

All the natural size



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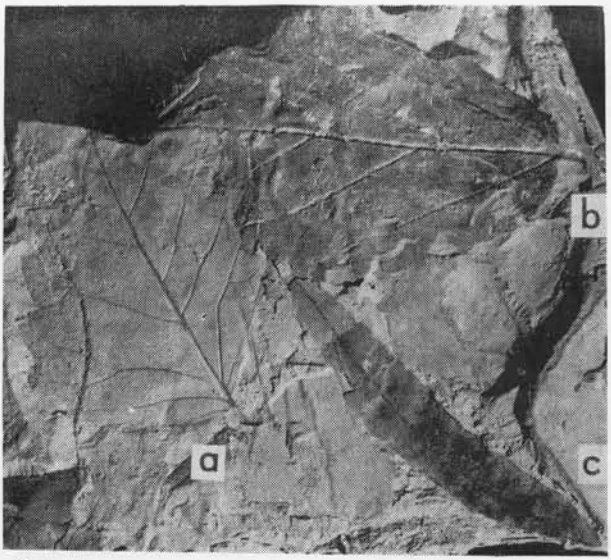

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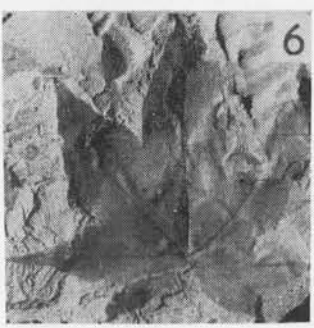
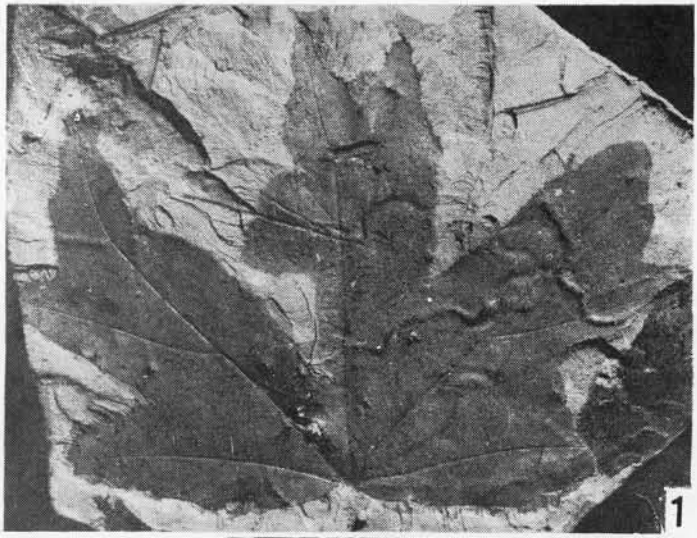


Plate III

1. *Acer subcampestre* Goepp., neotype, specimen No 75, MZ
2. *Salix* sp., × 1·3, specimen No 54/677, IB. a — fruiting catkin, b — staminate catkin, c — leaf
3. Pterocarya sp., specimen No 54/567, IB. Lower epidermis, x 400, MMG 972. Phot. H. Walther
4. *Salix varians* Goepp., specimen No 635p, UWR
5. *Pterocarya paradisiaca* (Ung.) Iljinskaja, specimen No 54/567, IB
6. *Platanus leucophylla* (Ung.) Knobl., specimen No 54/70, IB

Natural size except fig. 2 and 3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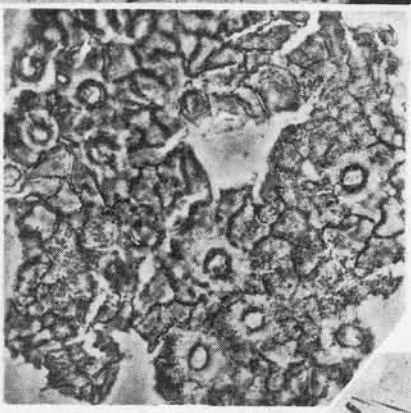
a
b
c
2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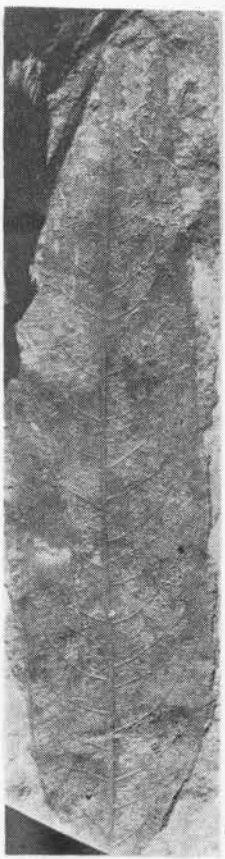
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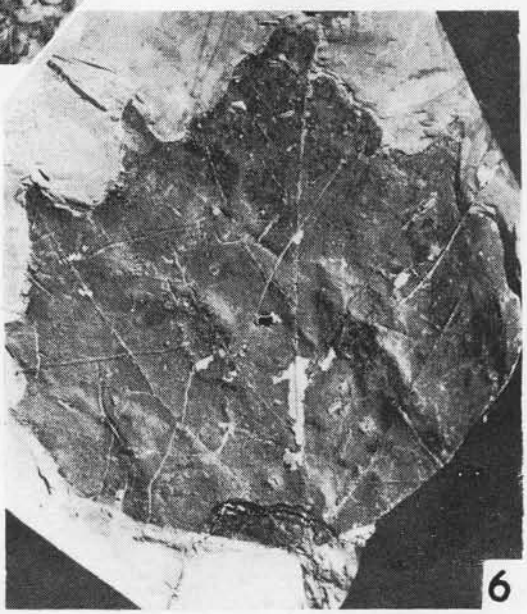
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