NECLIME working group on taxonomy of Neogene palynomorphs

Second Workshop, Cracow, Poland, June 14-15, 2011

Program and Abstracts

W. Szafer Institute of Botany, Polish Academy of Sciences, Cracow, Poland

ORGANISING COMMITTEE

Dr. Torsten UTESCHER
(NECLIME general coordination)

Prof. Dr. Dimiter IVANOV
(Working group on taxonomy of Neogene palynomorphs coordination)

Dr. Elżbieta WOROBIEC
(W. Szafer Institute of Botany, Polish Academy of Sciences, Cracow)

Design and typeset by Elżbieta and Grzegorz Worobiec

Cracow 2011

LIST OF PARTICIPANTS AND AUTHORS OF PRESENTATIONS

Veronika ALEXOVÁ
Faculty of Science, Department of Geological Sciences
Masaryk University
Kotlářská 267/2, Veveří, Brno, Czech Republic
e-mail: *nela"at"sci.muni.cz*

MSc. Petra BASISTOVÁ
Faculty of Science, Department of Geological Sciences
Masaryk University
Kotlářská 267/2, Veveří, Brno, Czech Republic
e-mail: *nela"at"sci.muni.cz*

Dr. Nela DOLÁKOVÁ
Faculty of Science, Department of Geological Sciences
Masaryk University
Kotlářská 267/2, Veveří, Brno, Czech Republic
e-mail: *nela"at"sci.muni.cz*

Dr. Ewa DURSKA
Institute of Geology, Warsaw University
Żwirki i Wigury 93, 02-089 Warsaw, Poland
e-mail: *ewadurska"at"uw.edu.pl*

MSc. Viktoria HRISTOVA
Div. Palaeobotany and Palynology
Institute of Biodiversity and Ecosystem Research
Bulgarian Academy of Sciences
Acad. G. Bonchev Str., 23, BG-1113 Sofia, Bulgaria
e-mail: *viktoria_anguelova“at“abv.bg*

Prof. Dr. Dimiter IVANOV
Div. Palaeobotany and Palynology
Institute of Biodiversity and Ecosystem Research
Bulgarian Academy of Sciences
Acad. G. Bonchev Str., 23, BG-1113 Sofia, Bulgaria
e-mail: *dimiter"at"bio.bas.bg; dimiter"at"gbg.bg*

Dr. Magda KONZALOVÁ
Institute of Geology AS ČR
Rozvojová 269, 165 Praha 6, Czech Republic
e-mail: *konzalova”at”gli.cas.cz*

Dr. Marianna KOVÁČOVÁ
Comenius University
Faculty of Sciences
Dept. of Geology and Paleontology
Mlynska dolina G, 842 15 Bratislava, Slovakia
e-mail: *kovacova"at"fns.uniba.sk*

Dr. Barbara SŁODKOWSKA
Polish Geological Institute
Rakowiecka 4, 00-975 Warsaw, Poland
e-mail: *bslo"at"pgi.gov.pl*

Prof. Dr. hab. Leon STUCHLIK
W. Szafer Institute of Botany, Polish Academy of Sciences
Lubicz 46, 31-512 Cracow, Poland
e-mail: *l.stuchlik"at"botany.pl*

Dr. Adam SZYNKIEWICZ
Institute of Geological Sciences, Wrocław University
Pl. M. Borna 9, 50-204 Wrocław, Poland
e-mail: *adam.szynkiewicz"at"ing.uni.wroc.pl*

Dr. Torsten UTESCHER
Senckenberg Research Institute, Frankfurt M
Steinmann Institute, University of Bonn
Nußallee 8, 53115 Bonn, Germany
e-mail: *utescher"at"geo.uni-bonn.de*

Dr. Elżbieta WOROBIEC
W. Szafer Institute of Botany, Polish Academy of Sciences
Lubicz 46, 31-512 Cracow, Poland
e-mail: *e.worobiec"at"botany.pl*

Dr. hab. Grzegorz WOROBIEC
W. Szafer Institute of Botany, Polish Academy of Sciences
Lubicz 46, 31-512 Cracow, Poland
e-mail: *g.worobiec"at"botany.pl*

Dr. Maria ZIEMBIŃSKA-TWORZYDŁO
Institute of Geology, Warsaw University
Żwirki i Wigury 93, 02-089 Warsaw, Poland
e-mail: *m.ziembinska”at”uw.edu.pl*

PROGRAM

June 14, 2011 (Tuesday)

10:00 – 10:10

Elżbieta Worobiec, Dimiter Ivanov and Torsten Utescher: ***Welcome address***

10:10 – 10:30

Torsten Utescher: ***Where we are now – report on recent activities of the NECLIME working groups on taxonomy of Neogene palaeobotanical record***

10:30 – 10:50

Dimiter Ivanov: ***NECLIME working group on taxonomy of Neogene palynomorphs – progress and objectives***

10:50 – 11:00

Leon Stuchlik: ***Rereference palynological collection of the W. Szafer Institute of Botany, PAS, Cracow***

Coffee break: 11:00 – 11:30

11:30 – 12:30

Barbara Słodkowska: ***A short presentation of Polish Palynological Data Base - Neogene***
Marianna Kováčová, Nela Doláková, Petra Basistová, Veronika Alexová: ***LM and SEM analysis of Badenian pollen spectra from selected Paratethyan localities***
Dimiter Ivanov, Viktoria Hristova: ***SEM studies of Neogene palynomorphs from Bulgaria – new data***

Lunch: 12:30 – 14:00

14:00 – 15:20

Ewa Durska: ***Some untypical pollen grains from the Polish Neogene***
Barbara Słodkowska, Maria Ziembińska-Tworzydło, Magda Konzalová: ***Botanical affinity of new morphological genus*** **Edmundipollis**
Grzegorz Worobiec, Adam Szynkiewicz, Elżbieta Worobiec: **Reevesia*-like macro and microremains in the Upper Miocene deposits from the Bełchatów Lignite Mine (Central Poland)***
Torsten Utescher: ***Assessing dry climate conditions from the palynomorph record***

Coffee break: 15:20 – 15:50

15:50 – 17:30

Discussion:

Critical palynomorph taxa in respect of taxonomy and climate evaluation;

Optional: Microscope works – recent and fossil pollen (Please don't forget to bring your slides);

Optional: Free discussion.

Dinner: 19:30

June 15, 2011 (Wednesday)

9:00 – 12:30

Discussion and practice:

Microscope works – recent and fossil pollen (Please don't forget to bring your slides).

Coffee break: 11:00 – 11:30

Optional: Free discussion.

Lunch: 12:30 – 14:00

14:00 – 17:00

Discussion and practice:

Microscope works – recent and fossil pollen (Please don't forget to bring your slides).

Coffee break: 15:00 – 15:30

Elżbieta Worobiec, Dimiter Ivanov and Torsten Utescher: **Closing Remarks**

ABSTRACTS

Some untypical pollen grains from the Polish Neogene

Ewa DURSKA

Institute of Geology, Warsaw University, Warsaw, Poland

In the Polish Neogene palynofloras some untypical colpate pollen grains are found. These are grains with untypical configuration of colpi where no polar regions can be defined or grains with four colpi one pair of which forms a “cross” in light microscope view. Some of these grains resemble morphogenus *Oligopollis* Krutzsch 1959, another with “crossed” colpi, are the same as *Tetracolporopollenites andreanus* Bruch 1998, the other are different from any described fossil pollen grains. All these forms are probably teratological ones. What supports this theory is lack of forms with strange colpi arrangement of these types in recent pollen floras and a presence of a different sculpture in grains with the same colpi arrangement (in *T. andreanus* type).

NECLIME working group on taxonomy of Neogene palynomorphs – progress and objectives

Dimiter IVANOV

Div. Palaeobotany and Palynology, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Bulgaria

The proper data basis of palynomorph taxa in terms of taxonomy and Nearest Living Relatives (NLRs) is crucial when we reconstruct climate and vegetation from the palynological record. The analysis of large scale palaeoclimate and vegetation patterns in time and space, the studies of ecosystems and plant evolution in the context of palaeoclimate dynamics requires concentration on the enhancement of basic data and methodologies used within NECLIME. Only in this way consistent climate and biodiversity patterns over all Eurasia can be obtained. Therefore, the idea came up to establish a working group ***on taxonomy of Neogene palynomorphs*** that will organize data input from current taxonomical research of NECLIME members and make available new results obtained in their specific fields of interest. Emphasizing on key pollen types, identification of palynomorphs, and assignment of NLRs, data used in NECLIME could be successively improved.

Present report focuses on general progress and activities of NECLIME working group on taxonomy of Neogene palynomorphs. It aims to elucidate current state of taxonomic research, to reply on questions like “Do we need to force taxonomic studies?”, “Why we need to improve taxonomy of Neogene palynomorphs?”, or “How can we improve vegetation reconstructions, climate reconstructions, evolution of plants and vegetation?”. The importance of SEM studies and reference palynological collections for identification of palynomorphs, possible source of errors, the potential of non-pollen palynomorphs in climate reconstruction also need to be discussed.

SEM studies of Neogene palynomorphs from Bulgaria – new data

Dimiter IVANOV, Viktoria HRISTOVA

Div. Palaeobotany and Palynology, Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Bulgaria

The present report is focused on pollen morphology of some of the most abundant fossil pollen types from Miocene sediments in some freshwater Basins (Southwest Bulgaria). The study includes detailed morphological characteristic of the pollen types using observations under scanning electron microscope. Materials from the cores drilled in Karlovo Basin, Tundzha Basin, Satovcha Basin, Sofia Basin etc. are the subject of this presentation. The age of sediments from different basins was determined as middle and upper Miocene on the basis of molluscs, mammals, diatoms and other proxies. Different pollen types from gymnosperm plants (Taxodiaceae type, *Pinus* and *Tsuga*) and from angiosperm plants (Ulmaceae, Fagaceae, Betulaceae, Juglandaceae, Chenopodiaceae, Polygonaceae, Sparganiaceae a.o.) are identified, described, and are subject of taxonomic and morphological discussions.

LM and SEM analysis of Badenian pollen spectra from selected Paratethyan localities

Marianna KOVÁČOVÁ[1], Nela DOLÁKOVÁ[2], Petra BASISTOVÁ[2], Veronika ALEXOVÁ[2]

[1]*Comenius University in Bratislava, Slovak Republic*

[2]*Masaryk University in Brno, Czech Republic*

The Badenian (Langhian - Early Serravallian) marine sediments from the adjacent areas within the Central Paratethys, namely Moravian part of Carpathian Foredeep, NE part of Vienna Basin (Slovakia, Austria), Mura Basin in Slovenia, were studied from the palynological point of view. The pollen data document subtropical climate during the Middle Miocene Climatic Optimum with a dominant representation of zonal vegetation - evergreen broadleaved forests. Higher differentiation of the oak type pollen, increasing number of *Platanus* pollen and different type of herbs were observed.

Decreasing of some thermophilous elements (especially Sapotaceae, *Palmae,* Mastixiaceae, Lygodiaceae) and increasing of the warm to cold temperate zone taxa were registered first during the Late Badenian. These findings together with a higher portion of extrazonal vegetation (*Tsuga, Picea, Abies*) in the Late Badenian pollen spectra document changes due to the uplift of the Carpathian Mountain chain.

Increased proportion of the arctotertiary taxa (*Quercus, Ulmus, Carya*) is visible in the Late Badenian palynospectra. Thermophilous elements (*Platycarya, Engelhardia, Myrica, Distylium* and thermophillous Fagaceae) are still present, but Sapotaceae disappeared. Herbs are represented dominantly by the halophytic taxa – mostly Chenopodiaceae. From the Late Badenian first we observe higher portion of extrazonal (mountain) vegetation in pollen spectra (*Picea, Abies, Tsuga, Cedrus*).

Using LM and SEM technics in reversal way (first SEM and next step LM microscopy) allowed us much easier to study the same object. We focused our study in critical taxa (thermophilous Fagaceae, Caryophyllaceae...), which are common in Badenia pollen spectra.

A short presentation of Polish Palynological Data Base – Neogene

Barbara SŁODKOWSKA

Polish Geological Institute, Warsaw, Poland

The electronic implementation of the “Atlas of pollen and spores of the Polish Neogene” is the Polish Palynological Data Base - Neogene.

During over fifteen years the database was developed and modified. The new concept of the PPDB service based on the relational database management system (RDBMS) and open source network technology. The web application connects to the MySQL database engine, running on Apache web server with PHP hypertext preprocessor extension.

The database contains data from more than 80 localities (boreholes and outcrops) from the Polish Neogene deposits. Each borehole has a detailed description, including information about locality, map name in the 1:100 000 scale, the year of study and author, geographic region, altitude, longitude and latitude, etc.

Moreover, the geological data on lithology, lithostratigraphy and chronostratigraphy are available. List of distinguished taxa are stored together with their percentage contents in each sample. The primary advantage of using the PPDB service is a possibility to construct the queries to database of all elements contained therein.

According to published four volumes of the “Atlas of pollen and spores of the Polish Neogene” the upgrades and modifications of taxa names and their botanical affinity will be performed.

Botanical affinity of new morphological genus *Edmundipollis*

Barbara SŁODKOWSKA[1], Maria ZIEMBIŃSKA-TWORZYDŁO[2], Magda KONZALOVÁ[3]

[1] *Polish Geological Institute, Warsaw, Poland*

[2] *Institute of Geology, Warsaw University, Warsaw, Poland*

[3] *Institute of Geology AS ČR, Prague, Czech Republic*

In the Neogene terrestrial sediments pollen grains defined as *Araliaceoipollenites edmundi* or *Tricolporopollenites edmundi* are frequently mentioned. This name is used to describe pollen grains of widely varying morphology. Studies of the fossil pollen grains under LM and SEM revealed they similarities to the recent pollen grains from Araliaceae and Cornaceae-Mastixioideae families. Various and clearly different morphological forms that were included into the *edmundi*-group are to be sanctioned as morphological species within the new genus. The authors propose to increase the previously used species *edmundi* to the new genus *Edmundipollis* and different morphological forms distinguish as separate species. Diagnostic features of *Edmundipollis* are rhomboidal outline in equatorial view, colpi on elevation of the exine, large size and very thick exine.

The features of Araliaceae pollen grains are reticulate sculpture formed by fused heads of columellae, elements of sculpture significantly higher in the polar field than in the equatorial area, the colpus and pores forming double-funnel endoapertures. Morphologically these fossil pollen grains are similar to pollen of *Brassaiopsis glomerulata, Heteropanax chinensis* and *Macropanax oreophilus.*

Typical features of Cornaceae-Mastixiaceae pollen grains are combination of colpus and pores forming characteristic H-shaped endoaperture, formed by the thinning of the endoexine. Surface sculpture is scabrate. Morphologically these fossil pollen grains are similar to pollen of *Mastixia* and *Diplopanax stachyantus.*

Reference palynological collection of the W. Szafer Institute of Botany, PAS, Cracow

Leon STUCHLIK

W. Szafer Institute of Botany, Polish Academy of Sciences, Cracow, Poland

The history of the collection begun just after the creation of the Department of Botany Polish Academy of Sciences in 1953. At the beginning it was a small collection which started to develop after the transformation to Institute of Botany Polish Academy of Sciences. At that time the whole amount of slide was about 400, mainly the most common species. This was the amount when I was employed in the Institute. From that time the development of the collection was my hobby. Thanks to a grate exchange program with many countries in the whole world (Europe, Africa, North and South America, China, India) the palynological collection was increased of several hundreds new slides every year. Actually the whole amount of the main collection is 16 580 slides, 2652 species, 807 genera and 182 families. Apart from this the collection of Polish Flora 1097 slides of species and the Flora of Cuba 1700 species.

Assessing dry climate conditions from the palynomorph record

Torsten UTESCHER

Senckenberg Research Institute, Frankfurt M, and Steinmann Institute, University of Bonn, Bonn, Germany

Unlike macrofloras the palynomorph record in general has a better potential to reflect dry / seasonally dry palaeoclimate conditions, and thus the existence of open landscapes in the past because it reflects not only local vegetation but contains also elements originating from areas outside the depo-centre. In the classical approach, openness of landscape is estimated using proportions of palynomorphs based on pollen counts (e.g., AP/NAP; other indices). Although this method is well capable to account for the presence of major biomes it does not really allow quantification of palaeoclimate conditions. Furthermore, data obtained may have a taphonomical bias depending on local settings of the sedimentary facies.

In NECLIME research the Coexistence Approach is commonly used to obtained quantitative estimates of palaeoprecipitation – also from pollen spectra. However, in practical experience it is shown that the method reveals some series flaws when applied at the dry end of climate space. This is not only due to the low number of palynomorph components indicative for dry climates that contribute with climate data in the CA analysis (e.g., *Artemisia, Nitraria, Ephedra*), but also depends on the restricted resolution in potentially meaningful taxonomical units (e.g., Chenopodiaceae).

To enhance the potential of the CA in quantifying dry climates climate data of drought indicators have to be checked and identifications of relevant palynomorphs at the subgeneric level should be discussed as one possible solution. The use of drought indices can be most useful in order to obtain complementary data. Here a NECLIME standard should be established.

Where we are now – report on recent activities of the NECLIME working groups on taxonomy of Neogene palaeobotanical record

Torsten UTESCHER

Senckenberg Research Institute, Frankfurt M, and Steinmann Institute, University of Bonn, Bonn, Germany

To keep the NECLIME data base up-to-date work is in progress to include palynomorph taxa published in the Polish Atlas of Neogene Pollen and Spores (Stuchlik (ed.), vols. 1-3) and to adjust interpretations of Nearest Living Relatives (NLRs) cited for the fossil taxa. The 4th volume of the Atlas which actually is going to be released will be considered as well in the near future. So far, the data base contains a total of ca. 2,200 palynomorph taxa (morphotaxa and botanical system), including 90 new taxa entries taken from the Atlas. For ca. 70 palynomorph taxa the NLR interpretation provided by the Atlas differs from already existing data base entries. Partly the Atlas cites species while in the data base, NLRs are assigned at the generic level. In rarer cases, both resources contain different or even conflicting NLR solutions. The workshop provides the ideal frame to discuss these cases in detail and to decide which base entries will be modified. Quantitative palaeoclimate and vegetation reconstructions are among the focal points of research within NECLIME. In order to obtained consistent and comparable results it is crucial to harmonize basic data and to agree on a standard which the working group can provide.

In the frame of recent activities of the NECLIME working group on taxonomy of the Neogene macrobotanical record (coord. B. Erdei) ca. 80 leaf and carpological taxa have been added to the data base, and NLR interpretations have been updated, respectively. These data will be online in the near future. To intensify scientific exchange and to improve the botanical concept behind the identification of morphotaxa, a joint meeting of the micro and macro group was proposed at the workshop in Budapest (May 24, 2011), to take place in 2012. At such a joint meeting, e.g. taxa complexes could be a focal topic. So far, 11 taxa complexes were established (by kind assistance of Z. Kvaček), 7 involving palynomorph taxa. Solutions for additional palaeo-species will be needed in the future to better assess palaeobiodiversity.

Reevesia-like macro and microremains in the Upper Miocene deposits from the Bełchatów Lignite Mine (Central Poland)

Grzegorz WOROBIEC[1], Adam SZYNKIEWICZ[2], Elżbieta WOROBIEC[1]

[1] *W. Szafer Institute of Botany, Polish Academy of Sciences, Cracow, Poland*

[2] *Institute of Geological Sciences, Wrocław University, Wrocław, Poland*

Neogene deposits of the Bełchatów Lignite Mine are rich in finely preserved assemblages of plant macro and microremains (Stuchlik et al. 1990, Worobiec 2003). In the course of investigations of the Upper Miocene deposits in the mine outcrop in July 2004, abundant assemblage of the fossil leaf flora accompanied by carpological remains were found. Macroremains represent genera *Acer*, *Betula*, *Carpinus*, *Carya*, *Dicotylophyllum*, *Fagus*, *Laria*, *Liquidambar*, *Populus*, *Pterocarya*, *Quercus*, *Reveesia*, *Salix*, *Taxodium*, *Trapa* and *Ulmus*. The assemblage represents remains of vegetation of riparaian and mesophytic forests which is confirmed by the results of palynological analysis. Particularly interesting is the co-occurrence of fossil macroremains of *Laria rueminiana* (Heer) G. Worobiec & Kvaček (leaf morphotaxon), *Reevesia hurnikii* Kvaček (fruit morphotaxon) and the pollen grains of *Reevesiapollis* Krutzsch in the deposit. Up till now remains of *Laria rueminiana* and *Reevesia hurnikii* that represent family Malvaceae Jussieu, nom. cons. *sensu lato* were found together only in the Lower Miocene deposits from the Bílina Mine, Czech Republic (Kvaček 2006). Since these two taxa in Bełchatów are accompanied by *Reevesia*-like pollen grains of the genus *Reevesiapollis*, it is very probable that all three morphotaxa of macro and microremains derived from one extinct plant, representative of the subfamily Helicteroideae Griseb. (Malvaceae *sensu lato*), possibly form the genus *Reevesia* Lindl. or extinct genus closely related to *Reevesia*.

NOTES