

CARBONIFEROUS PALYNOSTRATIGRAPHY OF POLISH COALS BASINS

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Carboniferous coal basins of Poland (Fig. 1) originated during evolution of Variscan geosynclinal system and adjacent platform areas (12). The Lower Silesian Coal Basin (LSCB) originated as intramontane depression, the Upper Silesia Coal Basin (USCB) was a part of foredeep molasse, while the Lublin Coal Basin (LCB) originated within the East European Platform due to differential movements of the basement. The stratigraphic successions of these coal basins are differentiated and span the Upper Viséan through Stephanian.

Intensive biostratigraphic research in the Polish coal basins has been carried out from many decades, whereas the history of palynological investigations, particularly those based on miospores, comprises the last 30 years. These investigations were initiated and are continued in the USCB by A. Jachowicz (1956–1972), S. Dybova and A. Jachowicz (1956–1968) and by other workers. Detailed data on the history of spore research and the full bibliography for this time periods are given by A. Jachowicz (7). The most important outcome of this research was the recognition of a large number of Carboniferous miospore taxa and the microfloral zonation of coal-bearing deposits in the USCB.

Microfloral investigations in the LCB date back to the discovery of the Carboniferous deposits in the area, whereas a systematic and intensive miospore research began here in early nineteen-sixties of the present century and progressed in accordance with the advances of local Carboniferous geology (A. Jachowicz – 6, H. Kmiecik – 8–10). The results of microfloral investigations in the LSCB are included mainly in publications by T. Górecka (2, 3) and H. Krawczyńska-Grocholska (13, 14).

The purpose of the present paper is (1) to summarize the results of palynological research carried out to data in the Carboniferous of Polish coal basins (2) to correlate palynological zonal schemes of these basins, and (3) to establish the palynostratigraphic correlation between the Polish and West European Carboniferous coal basins.

CARBONIFEROUS MIOSPORE STRATIGRAPHY IN POLISH COAL BASINS

The miospore zonal schemes of the Polish Carboniferous coal basins, as given below, are based mainly on the present author's work in the Upper Silesian and Lublin

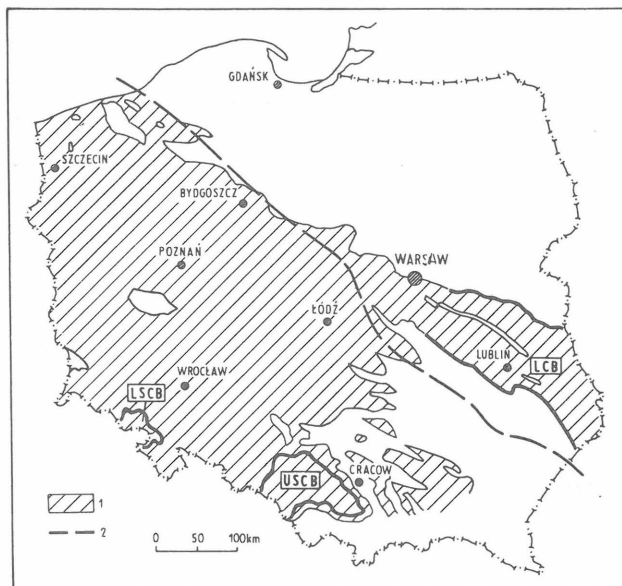


Fig. 1. Location of the Carboniferous coal basins in Poland

1 – extent of the Carboniferous in Poland, 2 – margin of the East-European Platform, LSCB – Lower Silesia Coal Basin, USCB – Upper Silesia Coal Basin, LCB – Lublin Coal Basin

Ryc. 1. Położenie karbońskich zagłębi węglowych w Polsce

1 – zasięg karbonu w Polsce, 2 – brzeg platformy wschodnio-europejskiej, LSCB – Dolnośląskie Zagłębie Węglowe, USCB – Górnośląskie Zagłębie Węglowe, LCB – Lubelskie Zagłębie Węglowe

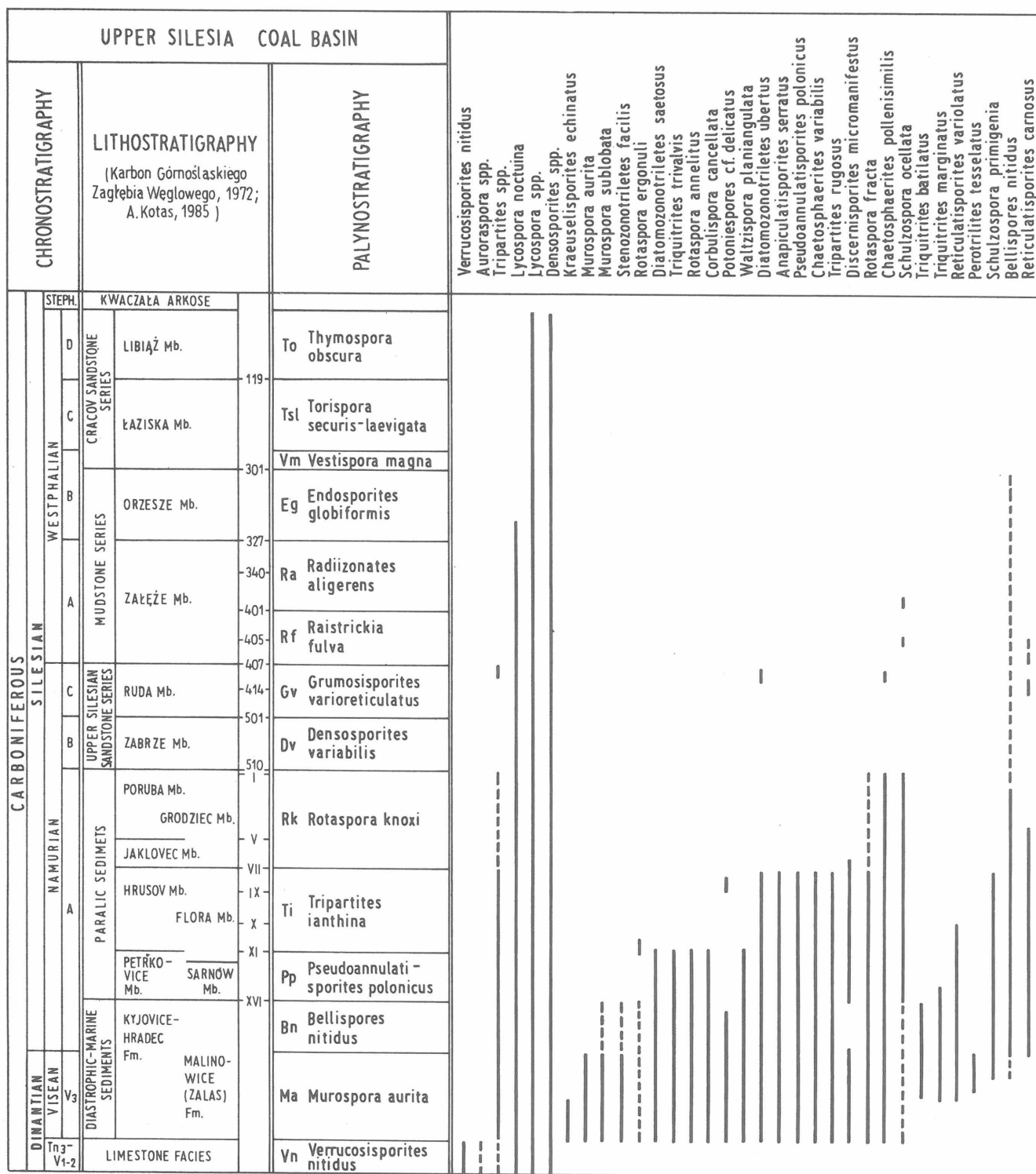


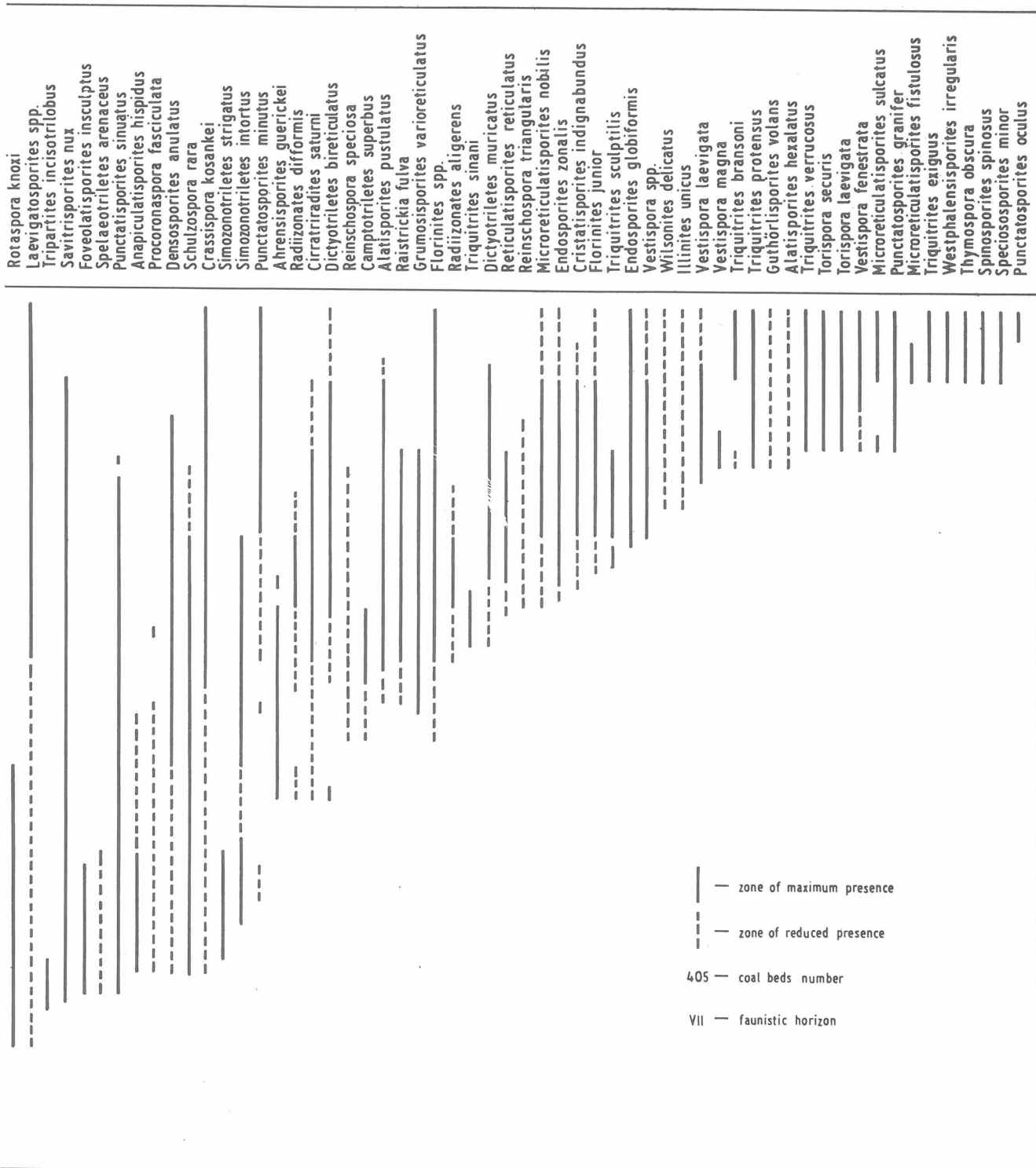
Fig. 2. Distribution of stratigraphically significant miospore species in the Carboniferous deposits of the Upper Silesia Coal Basin

Coal Basins. The relevant data for the Lower Silesia Coal Basin were summarized from the literature (Figs 2, 3 and 4).

Upper Silesia Coal Basin

In the past decade, 20 deep wells were drilled of in the USCB in order to penetrate the deep levels of the coal-bearing succession. The wells were located within the entire basin, particularly in areas of poor recognition. A remarkable advantage of these wells was full coring and, in most instances, nearly full core recovery. The cores

yielded and unique miospore material from the whole profile of the Upper Silesia Carboniferous. The miospore research was concerned on all coal seams and coaly intercalations, as well as on a number of samples of barren rocks, penetrated by the wells. For the first time, excellently preserved miospores were received from the lowest part of the profile, including carbonate rocks, the entire section of the Malinowice/Zalas Beds and the basal part of the paralic deposits (Sarnow Beds). The results of the miospore research were used for erection of a synthetic palynostratigraphic subdivision of the Carboniferous in the USCB (Fig. 2).



Ryc. 2. Rozmieszczenie stratygraficzne ważnych gatunków miospor w utworach karbonu Górnośląskiego Zagłębia Węglowego

The complete of the Upper Silesia Carboniferous comprises the deposits ranging in age from the latest Tournaisian (?)-early Viséan till Stephanian. In the profile, 14 miospore zones were distinguished, 2 in the Dinantian and 12 in the Silesian. This miospore zonal scheme was compared with the lithostratigraphic standard for the area and the age designation of the miospore zones was established.

Lower Silesia Coal Basin

Palynostratigraphic investigations are important in

the LSCB because of the limnic nature of the Silesian in this region. However, the present state of palynological resolution of the Lower Silesia Carboniferous remains still unsatisfactory. Most complete palynological documentations were obtained for the Wałbrzych Formation, Biały Kamień Beds and for the barren deposits of the uppermost Carboniferous (Upper Westphalian-Stephanian). These data are supplemented by the valuable paper by M. Kaise-rova-Kalibova (17), concerning the palynostratigraphy of the Westphalian and Stephanian in the Bohemian part of the basin.

The stratigraphic ranges of selected miospore taxa

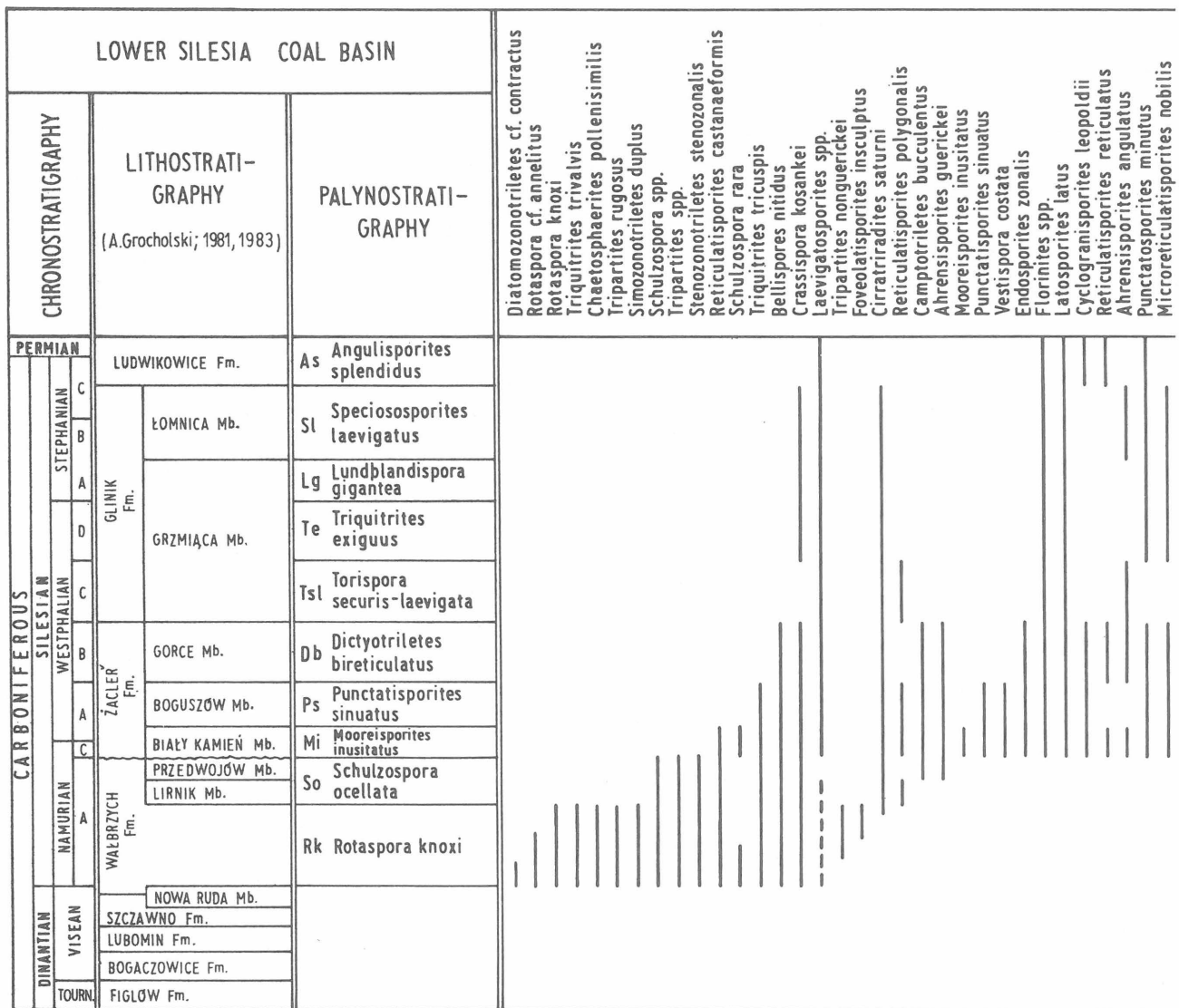


Fig. 3. Distribution of stratigraphically significant miospore species in the Lower Silesia Coal Basin

in the Carboniferous of the LSCB, presented in Fig. 3, are given after the publications listed above, and from contributory notes. These ranges are here set in order and placed within the lithostratigraphic standard of the LSCB. In this standard, 10 miospore zones were distinguished, spanning the Namurian A through Stephanian.

Deposits older than the Namurian were searched for microflora by H. Krawczyńska-Grocholska (14) in the Świebodzice Depression. A mixed Devonian-Early Carboniferous spore assemblage, identified there, was probably formed due to a late Visean redeposition.

Lublin Coal Basin

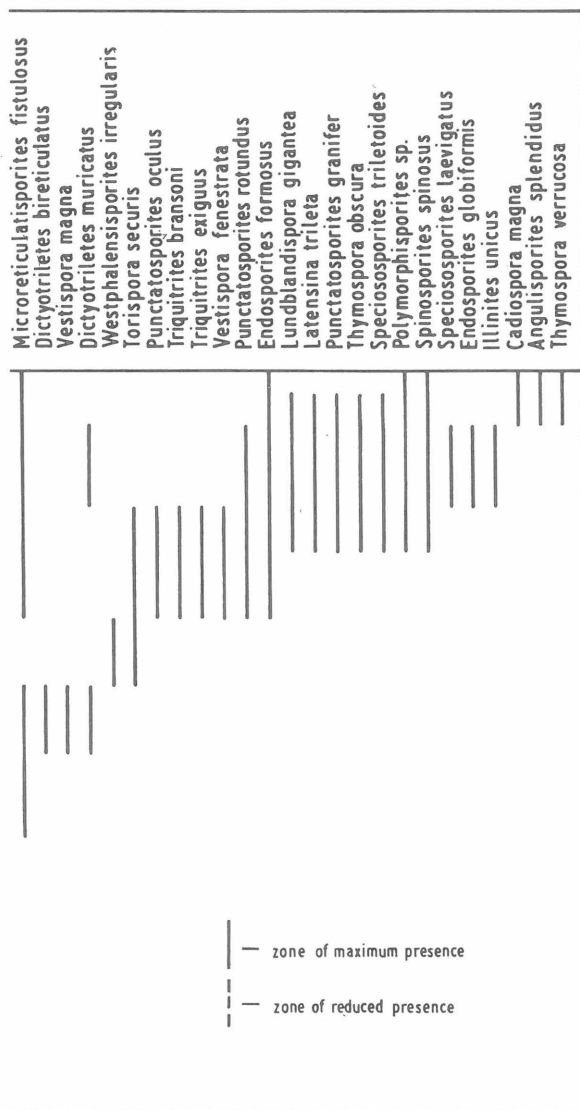
In the past two decades the palynological investigations in the Carboniferous of the Lublin Coal Basin were intensively carried basing on materials from number of wells with coring and nearly full core recovery. They were concentrated mainly on coal seams and coaly intercalation, but also on samples taken from barren intervals. The results of miospore research provided the basis for the erection of a palynostratigraphic zonal scheme in the profile ranging in age from the late Visean till the Westphalian D. In this profile, 13 spore zones were distinguished (Fig. 4).

CORRELATION OF CARBONIFEROUS PALYNOSTRATIGRAPHIC SCHEMES IN POLISH COAL BASINS

Carboniferous spore subdivisions of different coal basins were compared through relating them to the chronostratigraphic standard (Fig. 5). In this way, correlation was made between miospore zones of all three coal basins. The comparison of stratigraphic ranges of the diagnostic taxones and those characteristic of local spore subdivisions permitted to select those taxons which can be considered as diagnostic for a synthetic miospore scheme valid for all Polish basins. In identified spore zones, these taxons form characteristic assemblages of genera and species. This synthetic scheme comprises the deposits spanning the late Tournaisian-early Visean (?) through the Stephanian and includes 14 miospore zones.

Verrucosporites nitidus-Lycospora pusilla (NP) Miospore Zone

This zone was identified in the carbonate deposits of the USC. The sporomorphs, found recently here, indicate an early Visean (?), possibly also late Tournaisian-early Visean (T₃-V₁₋₂) age of these deposits. The Visean age



Ryc. 3. Rozmieszczenie stratygraficzne ważnych gatunków miospor w Dolnośląskim Zagłębiu Węglowym

is suggested by the presence of the species *Lycospora pusilla* (Ibrahim) Somers, *Lycospora noctuina* Butterworth et Williams, *Verrucosporites nitidus* (Naumova) Playford and fragments of *Tripartites* sp. The spore assemblage is relatively rich. It is possible that some sporomorphs were redeposited from older sediments (Devonian?). The final age assignment of the NP Zone must await a comparison with faunistic evidence.

The boundaries of the NP Zone are not yet defined precisely. The upper boundary is erosive.

Murospora aurita-Diatomozonotriletes saetosus (AS) Miospore Zone

The AS Zone was identified in the USCB and LCB. In the USCB it comprises the lower part of the marine-diastraphic deposits (lower part of the Malinowice/Zalas Formation), while in the LCB it corresponds in a Carbonate-Clay "series" (Huczwa Formation). In both coal basins the lower limit of the AS Zone corresponds to the base of the Carboniferous paleontologically documented. The upper limit of the zone is set up by the disappearance of numerous taxons characteristic only this zone, including the index taxon *Murospora aurita* (Waltz) Playford (in both coal basins) and *Diatomozonotriletes saetosus* (Hacquetard et Barss) Hughes et Playford (in LCB).

The AS Zone corresponds to late Visean (V_3), goniatite P_1 (a part ?) and P_2 zones.

Tripartites rugosus-Diatomozonotriletes ubertus (RU) Miospore Zone

The RU Zone was distinguished in all three coal basins. In the USCB it corresponds in the three successive local zones Tb, Pp and Ti, all having the features typical of the RU Zone.

The base of the RU Zone is defined by the absence of relatively numerous Early Carboniferous taxons, and the first appearance of, still rare, younger species, such as *Punctatisporites sinuatus* (Artüz) Neves, *Crassispora kosankei* (Potonié et Kremp) Bharadwaj, *Laevigatosporites* spp. and others. The upper limit of the zone is indicated by the sudden decline of the genus *Tripartites*, which is abundant in the RU Zone together with *Diatomozonotriletes*, *Pseudoannulatisporites* and some species of *Chaetosphaerites* and *Rotaspora*.

In the USCB the RU Zone corresponds to the upper part of the marine-diastraphic deposits (upper part of the Malinowice/Zalas Formation) and to the lower part of parallel deposits running up to the faunistic horizon VII (Enna). In the LSCB the zone includes the lower part of the Wałbrzych Formation, in the LCB – the Komarow Beds (except their uppermost segment) from the limestone A to a level between the limestones G and H.

The RU Zone corresponds to the early Namurian A (E_1 and lower E_2 goniatite zones).

Chaetosphaerites pollenisimilis-Rotaspora knoxi (PK) Miospore Zone

The PK Zone was distinguished in all three coal basins. Its lower limit is established by the abrupt decline of many Early Carboniferous-early Namurian taxons. Its upper limit is set up by final disappearance of last, older species which in a relic form continue from lower zones, for instance such index species as *Chaetosphaerites pollenisimilis* (Horst) Butterworth et Williams and *Rotaspora knoxi* Butterworth et Williams, and others.

In the USCB the PK Zone comprises an interval ranging from the faunistic horizon VII (Enna) to the base of the coal seam 510. In the LSCB it includes the topmost part of the Wałbrzych Formation, while in the LCB the uppermost Komarow Beds and a lower part of the Bug Beds, including the limestone I. The upper limit of the zone is erosional in the USCB and LSCB.

In the chronostratigraphic standard the PK Zone corresponds to the late Namurian A, i.e., upper part of the E_2 goniatite zone and possibly equivalents of the H zone.

Densosporites variabilis-Reticulatisporites carnosus (VC) Miospore Zone

The VC Zone was established in the USCB and LCB, while it is lacking in the LSCB (stratigraphic hiatus). This zone is characterized by the qualitative impoverishment of spore assemblage, lack of most Early Carboniferous-early Namurian taxons, onset of single miospore specimens representing species typical of the Westphalian, and by either the marked quantitative dominance of the genus *Densosporites* and related forms (in the USCB) or the increased content of these genera (in the LCB).

In the USCB the VC Zone comprises the Zabrze Beds

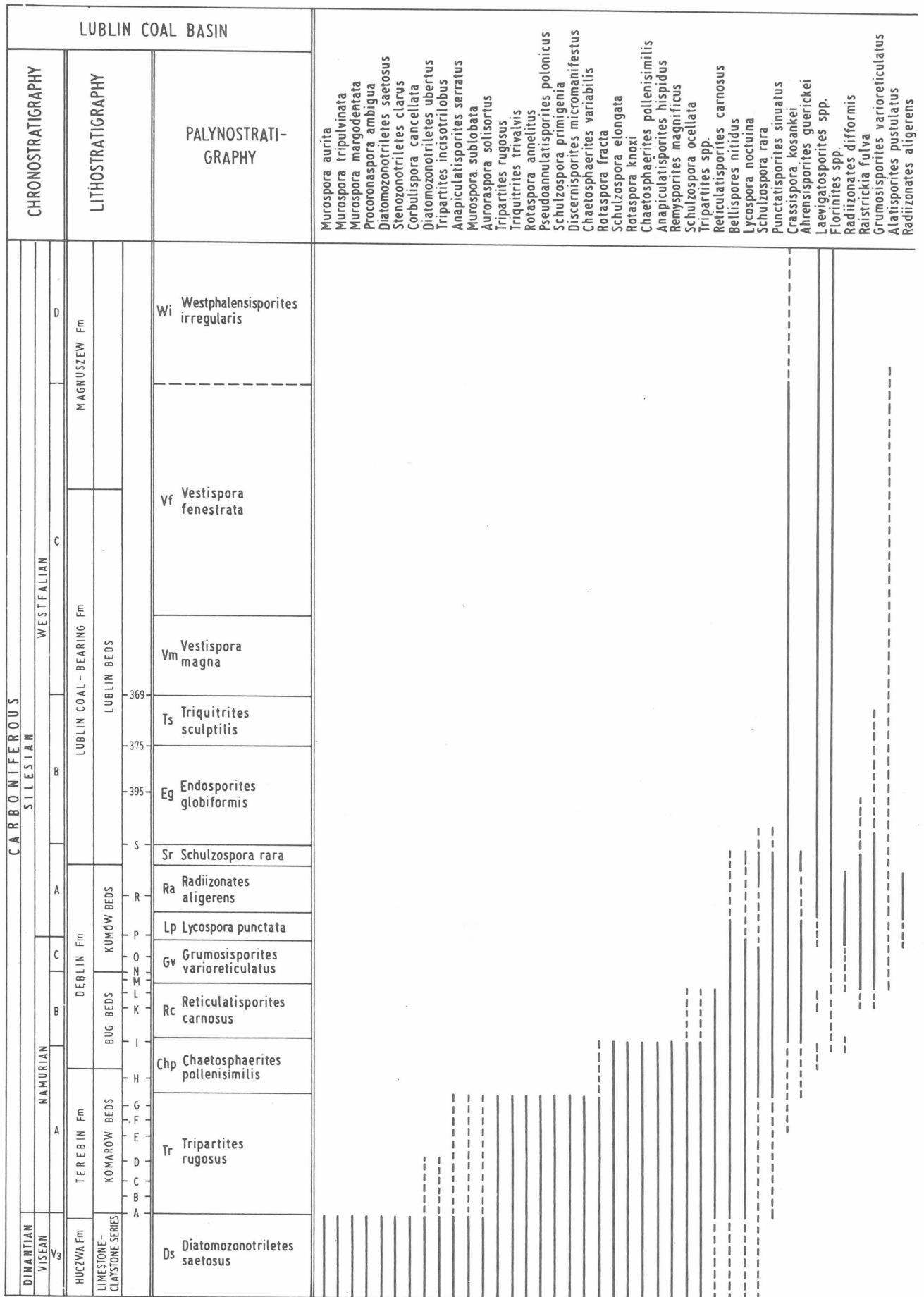


Fig. 4. Distribution of stratigraphically significant miospore species in the Carboniferous deposits of the Lublin Coal Basin

in the LSCB, except their topmost part, up to the base of the limestone M.

The VC Zone corresponds to the Namurian B (R goniatite zone).

Grumosisorites varioreticulatus-Cingulizonates loricatus (VL) Miospore Zone

The VL Zone was identified in the USCB and LCB, whereas in the LSCB the deposits corresponding to the upper part of the zone were reported. The lower limit of the zone is indicated by the onset or regular occurrence of the species *Grumosisorites varioreticulatus* (Naves) Smith et Butterworth, *Cingulizonates loricatus* (Loose) Butterworth et al., and other species which occur sporadically in the highest part of the preceding zone and, from the base of the VI Zone, they appear regularly upwards. Up section there is a systematic younging of the miospore assemblage.

In the USCB the VL Zone includes the Ruda Beds (from the top of the coal seam 501 to a faunistic horizon in the vicinity of the seam 407). In the LCB this zone comprises the topmost part of the Bug Beds and the lower portion of the Kumow Beds, up to the bottom of the limestone P. In the LSCB the zone should include a lower part of the Biały Kamień Beds, equivalent to the highest part of the VL Zone, which occur above a hiatus spanning much of the late Namurian in this basin.

The VL Zone corresponds to the Namurian C (G₁ goniatite zone).

Lycospora punctata-Raistrickia fulva (PF) Miospore Zone

The PF Zone has equivalents in all three coal basins. It is defined by the regular occurrence of relatively abundant sporomorphs characteristic of the Westphalian and the relic occurrence of some Namurian species, such as *Schulzospora rara* Kosanke, *Bellisporites nitidus* (Horst) Sullivan, *Punctatisporites sinuatus* (Artüz) Neves, *Lycospora noctuina* Butterworth et Williams, and others, as well as by the appearance of single specimens of *Lycospora punctata* Kosanke and *L. pusilla* (Ibrahim) Somers. In the USCB the PF Zone contains, in addition, also numerous *Densosporites* and related genera.

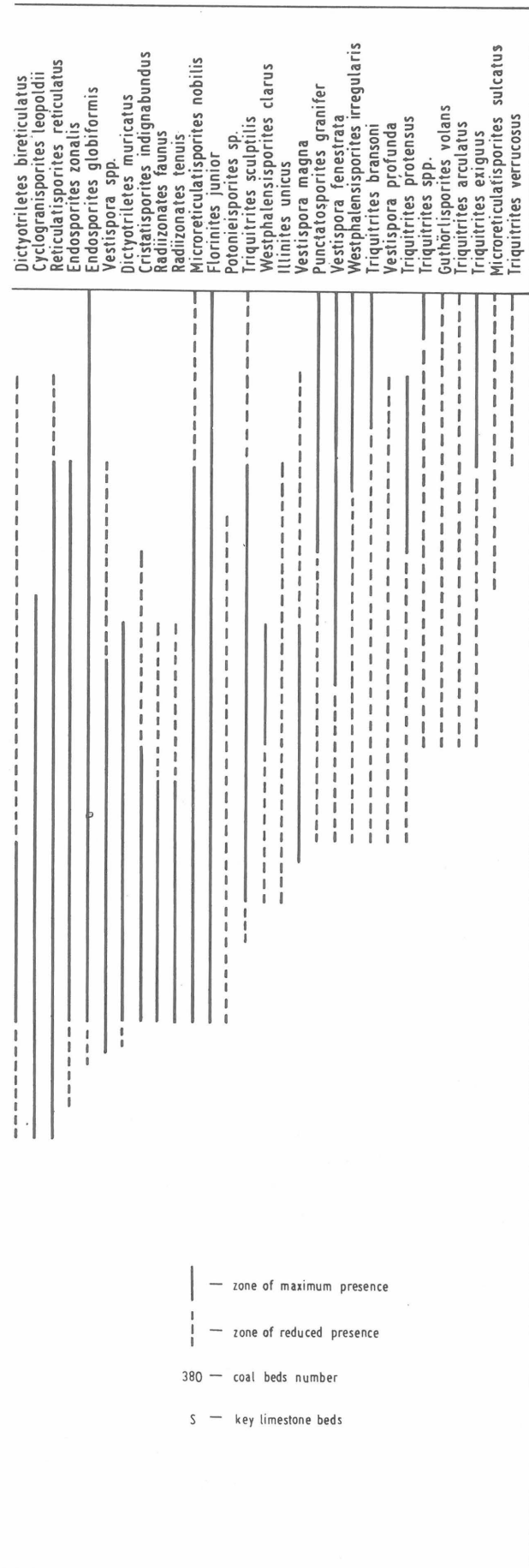
In the USCB the PF Zone corresponds to a lower part of the Zaleze Beds, up to a level near the coal seam 401, in the LCB – a middle part of the Kumow Beds, and in the LSCB – an upper part of the Biały Kamień Beds.

In the chronostratigraphic terms the PF Zone spans a lower part of the Westphalian A, essentially up to the top of the Lenisulcata chronozone.

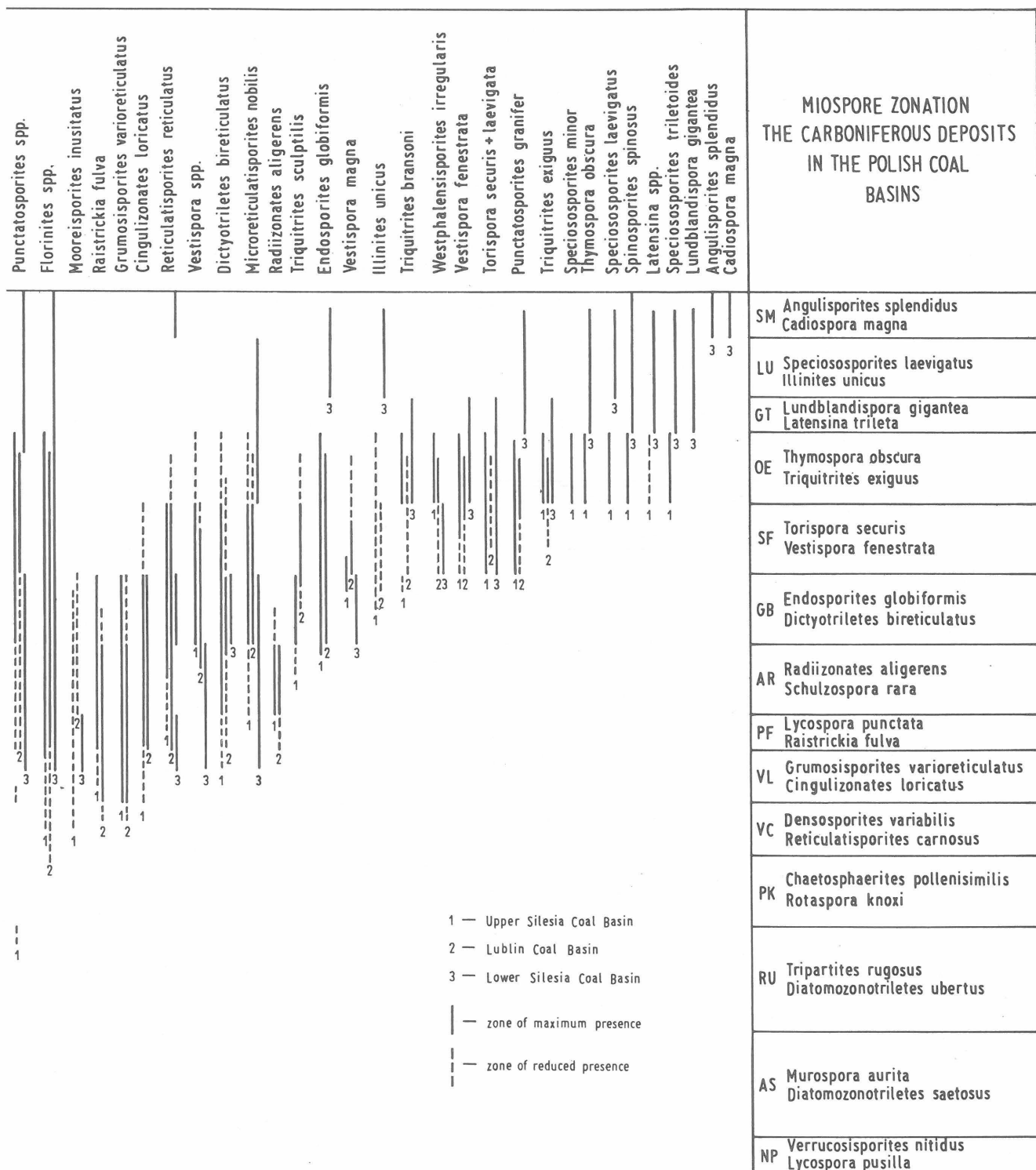
Radiizonates aligerens-Schulzospora rara (AR) Miospore Zone

The AR Zone is identified in all three coal basins. In the USCB and LCB this is the acme zone of *Radiizonates aligerens* (Knox) Staplin et Jansonius. In addition, in all those basins, the last numerous occurrence of the species *Punctatisporites sinuatus* (Artüz) Neves and *Schulzospora rara* Kosanke is recorded from this zone. The spore assemblage of the AR Zone is rich in species and, in most instances, is characterized by the regular occurrence of taxa typical of the Westphalian, as well as by the marked increase in abundance of the genera *Grassispora*, *Laevigatosporites*, *Florinites* and others. Near the top of the zone, there appear sporadically some taxa characteristic of upper Westphalian.

In the USCB the AR Zone corresponds to the upper



Ryc. 4. Rozmieszczenie stratygraficzne ważnych gatunków miospor w utworach karbonu Lubelskiego Zagłębia Węglowego



Ryc. 5. Korelacja palinostratygraficzna zonacji miosporowych zagłębi węglowych w Polsce

species, such as *Bellisporites nitidus* (Horst) Sullivan, *Punctatisporites sinuatus* (Artüz) Neves, *Raistrickia fulva* Artüz, *Grumosporites varioreticulatus* (Neves) Smith et Butterworth, and other species, as well as by the onset of some miospores characteristic of the late Westphalian.

In the USCB the GB Zone include the Orzesze Beds together with a lower part of the Laziska Beds, in the LCB — a part of the Lublin Beds from the limestone S to the coal seam 369, and in the LSCB — an upper part of the Zacler Formation (Gorce Member).

The miospore GB Zone corresponds to the Westphalian B, i.e., upper part of the Modiolaris chronozone — lower part of the Similis-Pulchra zone.

Torispora securis-Vestispora fenestra (SF) Miospore Zone

The miospore SF Zone was identified in all three basins. In the LCB it corresponds to two local zones, Vm and Vf. The base of the SF Zone is indicated by the appearance of taxons typical of the late Westphalian, such as the index species *Torispora securis* (Balme) Alpern, Doubinger et Horst, *Vestispora fenestrata* (Kosanke et Brokwa) Spode and, among others, *Torispora laevigata* Bharadwaj, *Westphalensisporites irregularis* Alpern, *Punctatosporites granifer* Potonié et Kremp, *Triquitrites bransoni* Wilson et Hoffmeister. The top of the zone is indicated by the gradual decline

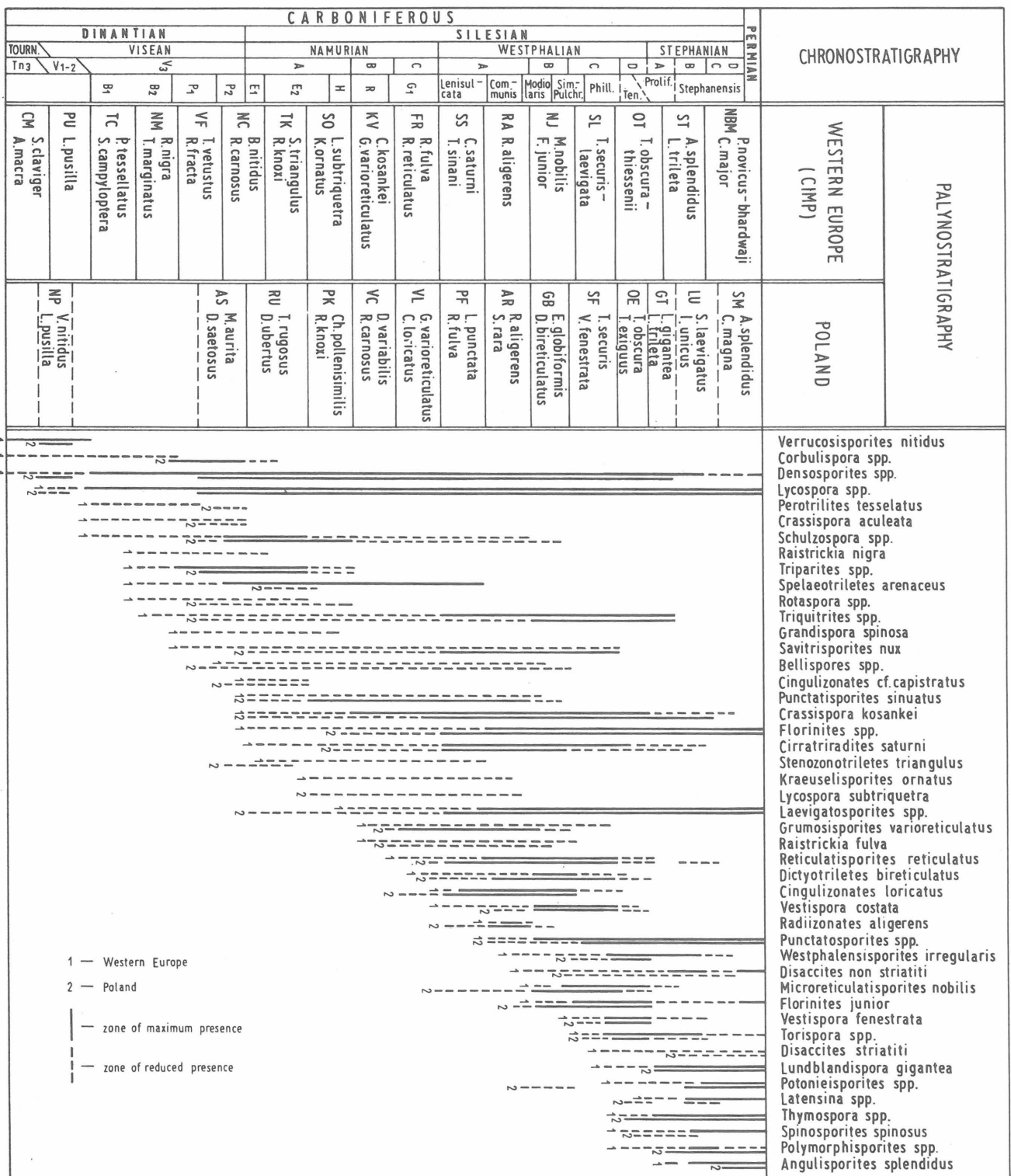


Fig. 6. Stratigraphic distribution of certain selected miospore species in the Carboniferous deposits of Western Europe and the coal basins in Poland

Ryc. 6. Rozmieszczenie stratygraficzne pewnych wybranych gatunków miospor w utworach karbonu zachodniej Europy i zagłębi węglowych w Polsce

or quantitative reduction of some taxa, such as *Dictyotriletes bireticulatus* (Ibrahim) Smith and Butterworth, *Radiizonates* spp., *Vestispora* spp., and the appearance of sporomorphs characteristic of the Westphalian and Stephanian.

In the USCB the SF Zone comprises an upper part of the Laziska Beds, in the LSCB — a lower part of the Glinik Formation, and in the LCB — an upper part of the Magnuszew Formation. The upper boundary of the zone in the LCB is not fixed firmly as yet.

The SF Zone corresponds to the Westphalian C (upper part of the Similis-Pulchra zone and the Phillipsii zone).

Thymospora obscura-Triquitrites exiguus (OE) Miospore Zone

The OE Zone was identified in all three coal basins, although in each of them different parts of the zone are probably present. This is shown by differences in the ranges of the index and characteristic taxa. In the LCB probably

a lower part of the OE Zone occurs, as is suggested by the lack of the majority of miospores characteristic of the latest Westphalian and the Stephanian. In this basin the boundaries of the OE Zone are provisionally set up, due to scarcity of suitable sections. In the LSCB, the spore assemblage of the CE zone is typical of the late Westphalian, although it lacks most of the species characteristic of the latest Westphalian and the Stephanian, which in this basin appear in a higher zone. In the USCB the miospore assemblage of the OE Zone contains species characteristic of the latest Carboniferous, thus, it is the youngest among those assemblages. It is likely that in the USCB only an upper part of the OE Zone is represented, while its lower part falls within a stratigraphic hiatus. On the other hand, these differences may be facies controlled.

In the LSCB the OE Zone includes a higher part of the Glinik Formation, in the USCB – the Libiaz Beds, and in the LCB – an upper part of the Magnuszew Formation.

The OE Zone corresponds to the Westphalian D (Tenuis chronozone).

**Lundblandispora gigantea-Latensina trileta (GT)
Miospore Zone**

The GT Zone and higher zones were identified only in the LSCB, because palynologically dated deposits of a Stephanian age occur only in that basin. The deposits assigned to the Stephanian in the USCB (Kwaczala arkose) contain only single specimens of long-ranging microflora which has little stratigraphic value.

The GT Zone is defined by the disappearance of most taxa characteristic of the Westphalian and by the onset of forms typical of the Stephanian, such as *Lundblandispora gigantea* (Alpern) Doubringer, *Latensina trileta* Alpern, and others, in the LSCB the GT Zone was distinguished in the upper part of the Glinik Formation (upper part of the Grzmiaca Member). It is probably equivalent to the early Stephanian (A–B?) in the Carboniferous chronostratigraphic standard.

**Speciososporites laevigatus-Illinites unicus (LU)
Miospore Zone**

The LU Zone is typified by the absence of some taxa of the latest Westphalian and the early Stephanian, and by the appearance of new species, such as *Speciososporites laevigatus* Alpern, *Potonieisporites* spp. and first occurrences of *Disaccites striatiti*.

In the LSCB the LU Zone comprises the highest part of the Glinik Formation (Lomnica Member) and it probably corresponds to the late Stephanian (B?-early C?).

**Angulisporites splendidus-Cadisporea magna (SM)
Miospore Zone**

The SM Zone, identified in the LSCB, is characterized by the onset of the index species *Angulisporites splendidus* Bharadwaj and *Cadisporea magna* Kosanke.

This zone was distinguished in the Ludwikowice Formation and corresponds to the latest Stephanian (C?) and earliest Permian.

**COMPARISON OF CARBONIFEROUS
PALYNOSTRATIGRAPHIC SCHEME OF POLISH
COAL BASINS WITH CARBONIFEROUS
MIOspore ZONATION OF WEST EUROPE**

The synthetic palynostratigraphic scheme erected for the Carboniferous coal basins of Poland provides a basis

for the inclusion of Polish data to united palynostratigraphic classification of the West European Carboniferous, proposed by the Commission Internationale de Microflore du Paleozoique (G. Clayton et al, 1). The juxtaposition of the stratigraphic ranges of diagnostic taxa in the West European scheme with the ranges of the same miospores in the Polish Carboniferous coal basins (Fig. 6) points to a remarkable convergence of criteria used for the erection of both schemes and to identity, or great similarity, in the miospore zones identified in both areas.

The differences in occurrence and ranges of some taxa, thought to be the index ones for particular sections of the Carboniferous in different coal basins, may be related to development of the coeval deposits in different facies, which gave rise to a growth of flora in variable ecological conditions. The above considerations support the notion on the existence of a large number of index taxa and characteristic miospore assemblages, which permit a very detailed age correlation to be made between distant Carboniferous successions development in the same palaeofloral province.

Translated by S. Porebski

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STRESZCZENIE

Badania mikroflorystyczne karbonu polskich zagłębi węglowych (ryc. 1) mają długą historię, z tym że na ostatnie 30-lecie przypada ich intensywny rozwój. Dotyczy to szczególnie badań miosporowych prowadzonych w aspekcie stratygraficznym (2, 3, 6–10, 13, 14). Celem niniejszego opracowania jest zestawienie i podsumowanie wyników dotychczasowych badań, korelacja podziałów palinostratygraficznych trzech polskich zagłębi karbońskich oraz paralelizacja palinostratygraficzna pomiędzy zagłębiami polskimi i zagłębiami węglowymi Europy Zachodniej.

Podziały miosporowe karbonu poszczególnych zagłębi węglowych Polski, przedstawione w niniejszym opracowaniu, podsumowują głównie badania własne autorki, dotyczące Zagłębia Górnośląskiego i Lubelskiego. Dane dla Dolnośląskiego Zagłębia Węglowego zostały zaczerpnięte z publikacji innych autorów.

Na obszarze GZW w ostatnim 10-leciu wykonano wiele głębokich otworów wiertniczych, w ramach rozpoznania głębokich poziomów karbonu produktywnego. Szczegółowe badania palinologiczne profilów tych otworów dostarczyły obfitego materiału, który wyzyskano do zestawienia podziału palinostratygraficznego pełnego profilu karbonu w tym zagłębiu — od facji węglanowej (górnym turnej—dolnym wizen(?) po utwory stefanu. Wydzielono w tym profilu 14 poziomów sporowych, w tym 2 dla dinantu i 12 poziomów dla silezu (ryc. 2).

W Dolnośląskim Zagłębiu Węglowym stopień rozpoznania palinologicznego utworów karbonu jest jeszcze niepełny. Dokumentacja palinologiczna dotyczy głównie formacji wałbrzyskiej, warstw z Białego Kamienia oraz bezwęglowych utworów najmłodszego karbonu (górnym westfal—stefan). Cennym uzupełnieniem jest opracowanie palinostratygrafii westfalu i stefanu czeskiej części zagłębia (17). Zestawiając wyniki badań miosporowych w DZW z dostępnych publikacji wyselekcjonowano taksony miospor ważnych stratygraficznie dla karbonu dolnośląskiego i po uporządkowaniu i umiejscowieniu w profilu litostratygraficznym zagłębia wydzielono 10 poziomów sporowych dla utworów silezu, w profilu od namuru A do stefanu łącznie (ryc. 3).

Badania palinologiczne karbonu Lubelskiego Zagłębia Węglowego, prowadzone bardzo intensywnie w ostatnim dwudziestolecu, dały podstawę do wprowadzenia podziału palinostratygraficznego karbonu w profilu od górnego wizen po westfal D. W profilu tym wydzielono 13 poziomów sporowych w tym jeden dla dinantu i 12 poziomów dla silezu (ryc. 4).

Porównanie zasięgów stratygraficznych taksonów przewodnich i charakterystycznych dla lokalnych podziałów palinostratygraficznych pozwoliło wyselekcjonować te tak-

sony, które uznać można za diagnostyczne dla syntetycznego podziału miosporowego, wspólnego dla wszystkich trzech zagłębi węglowych (ryc. 5). Podział ten obejmuje utwory od górnego turneju—dolnego wizen (?) do stefanu łącznie. Wydzielono w nim 14 poziomów miosporowych oraz podano ich charakterystykę sporową, określono wiek poszczególnych poziomów i umiejscowiono je w profilach litologicznych poszczególnych zagłębi.

Syntetyczny profil palinostratygraficzny karbonu polskich zagłębi węglowych porównano ze zunifikowanym podziałem miosporowym karbonu zagłębi węglowych Europy Zachodniej, zaproponowanym przez CIMP (1) (ryc. 6). Porównanie to wykazuje dużą zbieżność kryteriów podziału miosporowego i w większości przypadków identyczność lub duże podobieństwo wydzielonych zon sporowych. Różnice w występowaniu i zasięgach niektórych taksonów przewodnich wynikają prawdopodobnie z różnic w rozwoju facjalnym utworów tego samego wieku, które spowodowały zróżnicowanie warunków ekologicznych dla rozwoju flory karbońskiej.

РЕЗЮМЕ

Микрофлористические исследования карбона польских угольных бассейнов (фиг. 1) имеют уже долгую историю, но самое интенсивное их развитие наблюдается в последнем тридцатилетии. Это касается прежде всего мiosporовых исследований проводимых в стратиграфическом аспекте (2, 3, 6, 7, 8, 9, 10, 13, 14). Целью настоящей статьи является составление и подытожение результатов проведенных до сих пор исследований, корреляция полиностратиграфических разделений трёх польских карбоновых бассейнов, а также палиностратиграфическая параллелизация между польскими бассейнами и угольными бассейнами западной Европы.

Мiosporовые разделения карбона отдельных угольных бассейнов Польши, представленные в настоящей статье, резюмируют прежде всего собственные исследования автора, проведенные в Верхнесилезском и Люблинском угольных бассейнах. Данные для Нижнесилезского угольного бассейна взяты из публикации других авторов. На территории Верхнесилезского угольного бассейна за последнее десятилетие был отбурен ряд глубоких скважин в рамках разведки глубоких горизонтов продуктивного карбона. Детальные палинологические исследования разрезов этих скважин дали много материалов, которые были использованы для составления палиностратиграфического разделения полного разреза карбона в этом бассейне от карбонатной фации (верхний турне—нижний вizen (?)) до отложений stefанского яруса. В этом разрезе выделено 14 споровых горизонтов, в том числе 2 для динанта и 12 для силеза (фиг. 2).

В Нижнесилезском угольном бассейне палинологическая разведка карбоновых отложений ещё неполная. Палинологическая документация касается прежде всего валбжиской формации, слоев из Белого Камня, а также безугольных осадков самого верхнего карбона (верхний вестфаль—стefан). Ценным дополнением является разработка палиностратиграфии вестфала и stefана чешской части бассейна (17).

На основании результатов мiosporовых исследований проведенных в Нижнесилезском угольном бассейне, собранных в публикациях, проведена селекция тех таксонов мiospor, которые являются важными со-