ANTONI M. ŻELICHOWSKI

Geological Institute, Rakowiecka 4, 00-975 Warsaw

THE CARBONIFEROUS IN WESTERN POMERANIA

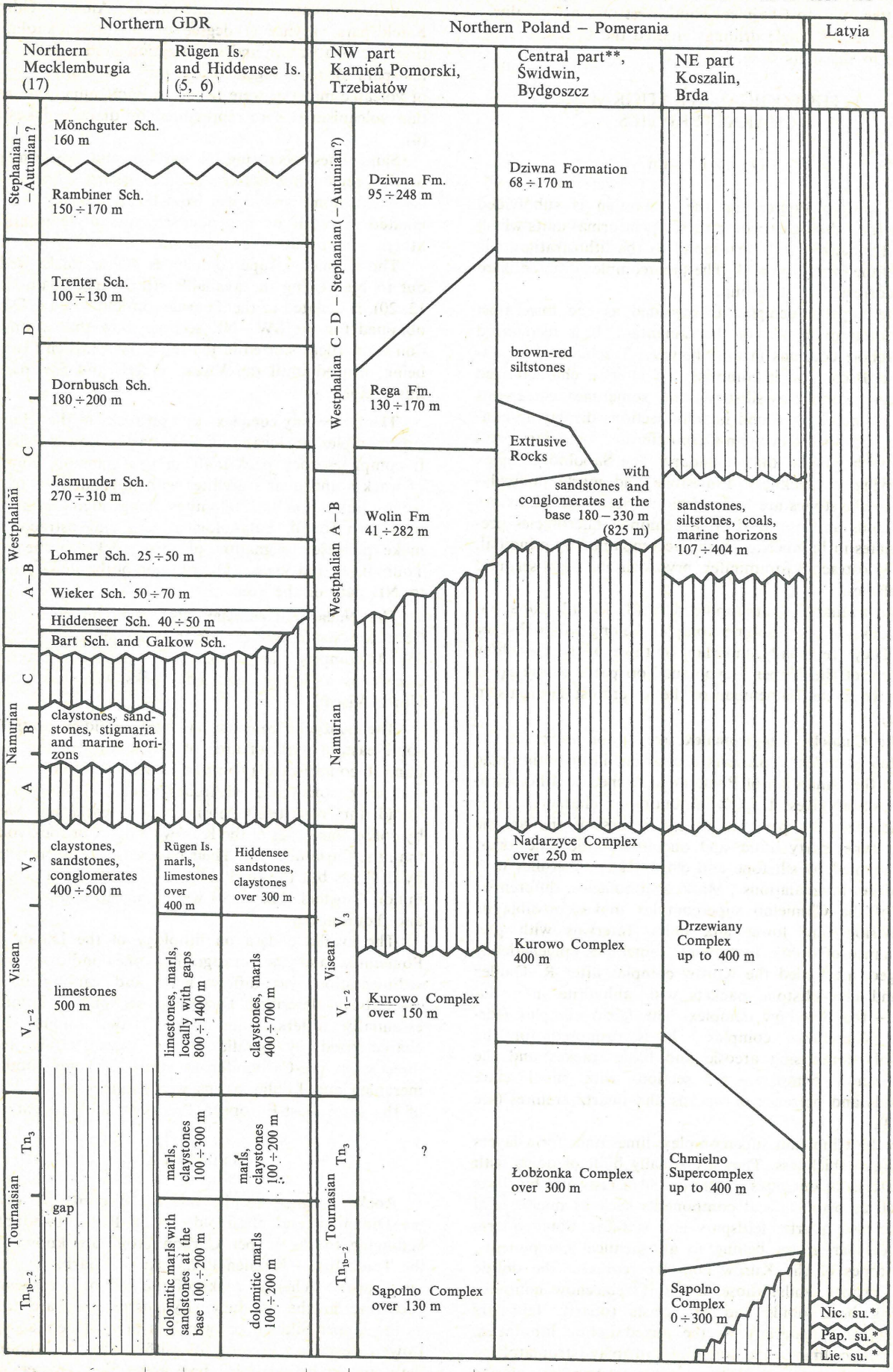
UKD 551.735.1/.2.022:561/562:552.5(438 – 16 Pomorze Zachodnie)

In the last two decades, Carboniferous strata have been encountered in some tens drillings in western Pomerania. Both the Dinantian and Silesian have been recorded there. The history of studies on these rocks goes back to 1961 when J. Poborski and L. Cimaszewski described Lower Carboniferous dolomites and claystones from the borehole column Bobolice 1. The progress in drillings works, mainly carried out by the oil industry as well as the Geological Institute, gave new boreholes of the Carboniferous. The studies on macrofauna, carried out by K. Korejwo (7), showed the presence of the Tournaisian, Visean and Upper Carboniferous. Drillings made in area between Kołobrzeg and Chojnice revealed the presence of Carboniferous rocks markedly differing in lithology from those known in northern G.D.R. (6, 17) whilst the Silesian resembling coeval strata from Rügen and northern Mecklenburgia were found in area between Trzebiatów and Kamień Pomorski not before the mid-seventies. The stratigraphic studies were accompanied by attempts to establish local lithostratigraphic subdivisions made by J. Kuchciński, B. Sikorski, J. Ryba and A. Łobza, mainly on the basis of well logs. Taking into account lithological differentiation of strata in the interval between Upper Devonian carbonate complex and Permian rocks, R. Dadlez (1) proposed subdivision of the Lower Carboniferous into a few complexes. In the latter subdivision, quartz sandstones encountered beneath the Permian in over a dozen boreholes were assigned to the Upper Carboniferous, in accordance with contemporaneous stratigraphic interpretations.

Stratigraphic studies on Carboniferous and Devonian strata, initiated at the beginning of the seventies, questioned several earlier views (7, 21). H. Matyja (12) and K. Korejwo (8 – 10) showed Tournaisian age of several sequences hitherto regarded as the Visean. Palynological analyses carried out by E. Turnau (19 – 20) showed that a part of rocks previously assigned to the Upper Carboniferous actually represent the Dinantian whilst H. Krawczyńska-Grocholska (11) and H. Kmiecik evidenced the presence of the Westphalian. The stratigraphic works were accompanied by petrographic analyses (4, 13), supplementing lithostratigraphy (1, 21). The lithology of Dinantian strata is here discussed with reference to lithological subdivision proposed by R. Dadlez and subsequently modified by the present author (22) and the Silesian – with reference to the subdivision proposed by the present author.

In western Pomerania, Carboniferous strata have been found in a belt stretching along the Baltic coast from the

CORRELATIONS OF THE CARBONIFEROUS IN NORTHERN GDR, NORTHERN POLAND AND LATVIA



* Nic – Nicaskaja Suite, Lie – Lietiżhskaja Suite, Pap – Paplakskaja Suite.

** Strata here assigned to the Silesian are regarded as the Rotliegendes in (14, 15).

vicinities of Kamień Pomorski to Koszalin and also from the latter town to Chojnice. South-west of the Koszalin – Chojnice zone, single drillings entered the Carboniferous, failing to reach its base.

LITHOLOGICAL-STRATIGRAPHIC CHARACTERISTICS

Dinantian

In western Pomerania, the Dinantian is subdivided into a few lithological complexes, i.e. informal units which when formalized will correspond to the lithostratigraphic ones of the formation rank. The supercomplex differentiated here corresponds to group.

The Sąpolno complex is regarded as the lowermost lithostratigraphic unit of the Dinantian. It is recognized in borehole columns in area between Trzebiatów, Koszalin and Brda, and it comprises an interval characterized by presence of clay-siltstone and sometimes calcareous rocks. It has been found in both sections displaying continuity at the Devonian-Carboniferous boundary and those with gaps at that boundary. The Sąpolno complex is varying in thickness. Limestone and marly intercalations in claystones are built of biomicrites with admixture of pelloids and quartz dust. Brachiopod microfacies predominates in biomicrites, being accompanied by crinoidal, bivalve, ostracod, foraminifer, bryozoan and algal-serpulid microfacies.

The available stratigraphic data (8, 10, 12, 20) show, that rocks of the Sąpolno complex belong to Tn1b-2 or Tn3. They are usually underlain by those of the Człuchów complex of the Upper Devonian. Top parts of the latter are dated at the Famennian or the lowermost Tournaisian (Tn1a).

The Chmielno supercomplex, resting on rocks of the Sąpolno complex, represents a clear-cut lithostratigraphic unit in the Dinantian of Pomerania. A specific lithological composition gives it fairly autonomous character. It is characterized by presence of sandstones of the arcosic wacke type, party lithic, and oncolitic-oolitic limestones, accompanied by siltstone and clay rocks, sometimes with anhydrite intercalations. Marked lithofacies differentiation of the Chmielno supercomplex makes possible its subdivision into lower-rank units. Intervals with predominance of oolitic limestones, sometimes epigenetically changed, are called the Kurów complex after R. Dadlez (1) and clay-siltstone packets with anhydrite intercalations – the Grzybów complex. The Gozd complex (formerly Wierchowo complex – 1) is proposed for the intervals comprising arcosic and lithic wackes and the Trzebiechów complex – for sections with small share of ooids and presence of wackes and quartz arenites (see Fig. 2).

In the Chmielno supercomplex, limestones form layers varying in thickness. They are usually built of ooids with admixtures of oncolites, peletoids, intraclasts and bioclasts as well as ortochemical components such as micrite and sparite and quartz, feldspars and sulfates. Some quartz and feldspar grains belong to allochemical components. Limestones of the Kurów complex represent the oolitic facies proper whilst those of the Trzebiechów complex, yielding both ooids and extraclasts (quartz, feldspars and volcanic material), – the mixed oolitic lithofacies. The oolitic limestones sometimes display stromatolites.

Arcosic, sometimes lithic wackes predominate among sandstones of the Gozd complex. They are built of feldspar grains, debris of trachytes, rhyolites and volcanic glass as well as quartz grains and micas. Among feldspars, K-feldspars varying in degree of alteration, kaolinitization, carbonatization and sulfatization predominate. Some feldspars display regeneration rims. No direct sources of volcanic material were found in Pomerania and Dinantian volcanism is here represented by diabase dykes only (4).

Sandstones occurring in eastern and western parts of this region are mainly built of quartz (Trzebiechów complex). Some anhydrites from the Kołobrzeg area originated in result of epigenetic changes of feldspars and others – in result of evaporation.

The Chmielno supercomplex is 400 m thick, wedging out to NE. Using the available stratigraphic data (8, 10, 12, 20), it is dated at the Tournaisian and Visean. Datings obtained for the SW – NE section show that sedimentation of its rocks started in the Early Tournaisian (Tn1b-2), being delayed until the Visean in NE and SW parts of this region.

The Drzewiany complex rests on rocks of the Chmielno supercomplex or, locally, directly on the Lower Paleozoic. It comprises rock packet 400 m thick, mainly composes of wackes and quartz arenites with intercalations of claystones, limestones and dolomites. Some stigmaria horizons were also found. Palynological (20) and ostracod data make possible assignation of these rocks to the Upper Tournaisian and Visean. Distribution of the rocks is limited to NE part of the area.

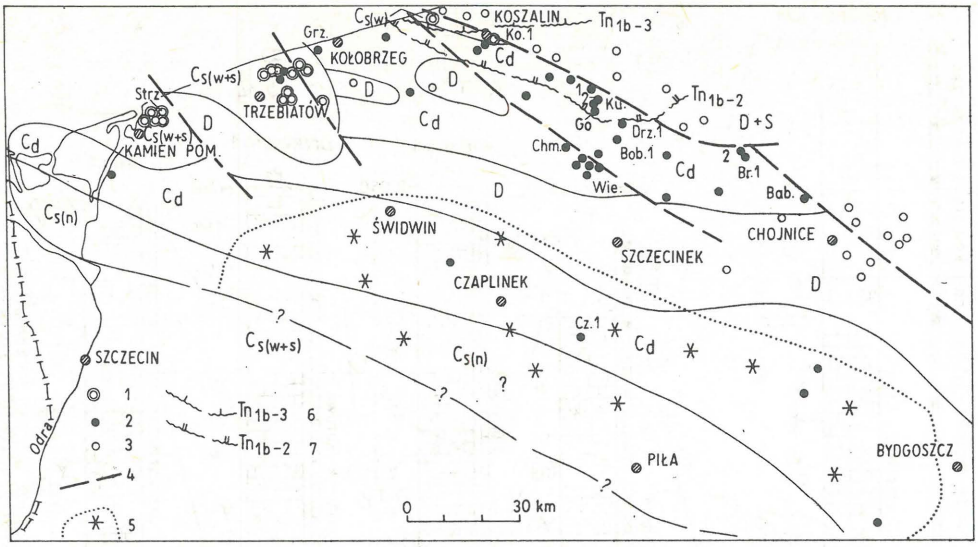
The Nadarzyce complex also rests on rocks of the Chmielno supercomplex but in areas situated further to SW. It comprises an almost 250 m packet of claystones, calcareous in lower part. The rocks were dated at the Upper Visean.

The Łobżonka complex has been found in central and south-eastern parts of area of distribution of the Dinantian. It comprises clay-siltstone rocks with intercalations of quartz, sometimes calcareous wackes. There were also found numerous tuffite horizons. The rocks are overlain by oolite limestones of the Kurów complex or rock younger than the Carboniferous. Their base was still not penetrated by drillings but the thickness may be estimated at several hundred meters. The rocks were assigned to lower Visean and Tournaisian.

The available data on lithology of the Dinantian in Pomerania and the stratigraphic ones indicate that its sedimentation was differentiated and varying in time. The above described Dinantian section of Pomerania essentially differs from that of the Lublin region, characterized by paralic Upper Visean strata resting directly on pre-Carboniferous strata, although both Pomeranian and Lublin basins were situated at the margin of the same East-European Precambrian Platform.

Silesian

Rocks assigned to the Silesian discordantly overlay the Dinantian and often older ones. Rocks undoubtedly belonging to the Upper Carboniferous are known from the Trzebiatów – Kamień Pomorski and Sarbinowo – Koszalin areas. Whereas rocks of the red beds association, occurring in the Świdwin – Bydgoszcz area are treated as the Upper Silesian or, which is more widely accepted, Lower Permian. Because of differences in lithological development between the three areas, they are separately discussed below.



Ryc. 1. Szkic podpermskich wychodni karbonu.

Fig. 1. Sketch map of Permian subcrops of the Carboniferous.

Otwory wiertnicze, w których stwierdzono: 1 – karbon górny, 2 – karbon dolny (dinant), 3 – utwory starsze od karbonu, 4 – wybrane uskoki, 5 – obszary występowania utworów czerwonego spągowca, zaliczane przez autora do wyższego silezu, 6 – granica obszaru podlegającego denudacji w trakcie turneju, 7 – granica obszaru podlegającego denudacji w niższym turneju, Bab – Babilon 1, Bob – Bobolice 1, Br – Brda, Chm – Chmielno, Cz 1 – Czaplinek IG-1, Drz – Drzewiany 1, Go – Gozd, Grz – Grzybowo, Ko – Koszalin IG-1, Ku – Kurowo, Strz – Strzeżewo, Wie – Wierzchowo, D – dewon, Cd – dinant, Cs(n) – namur, Cs(w–s) – westfal i stefan, Cs(w) – westfal.

Boreholes encountering: 1 – Upper Carboniferous, 2 – Lower Carboniferous (Dinantian), 3 – rocks older than Carboniferous, 4 – selected faults, 5 – areas of occurrence of Rotliegendes rocks regarded as Upper Silesian by the present author, 6 – boundaries of area subjected to denudation in Tournaisian, 7 – boundaries of area subjected to denudation in Early Tournaisian; Bab – borehole Babilon 1, Bob – Bobolice 1, Br – Brda, Chm – Chmielno, Cz 1 – Czaplinek IG-1, Drz – Drzewiany 1, Go – Gozd, Grz – Grzybowo, Ko – Koszalin IG-1, Ku – Kurowo, Strz – Strzeżewo, Wie – Wierzchowo; D – Devonian, Cd – Dinantian, Cs(n) – Namurian, Cs(w–s) – Westphalian and Stephanian, Cs(w) – Westphalian.

THE TRZEBIATÓW–KAMIEŃ POMORSKI AREA

In this area, strata assigned to the Silesian are up to 700 m thick but individual sections are markedly varying in the preserved thickness due to advanced epigenetic erosion. They rest either on the Dinantian or Devonian and, similarly as in Rügen Id. (16), are overlain by intrusive rocks of Rotliegendes conglomerates built of pebbles of the latter. Three formations are differentiated in the section of Silesian strata here (from the base upwards): Wolin, Rega and Dziwna formations.

The Wolin formation comprises lower part of the section and its recorded thickness is varying from 44 to 282 m. It is characterized by cyclic sedimentation. Six cyclothems 30–70 m thick were recognized in the most complete of the studied sections – Strzeżewo section. The number and thickness of cyclothems decrease towards north-east, where finally only the top cyclothems are found.

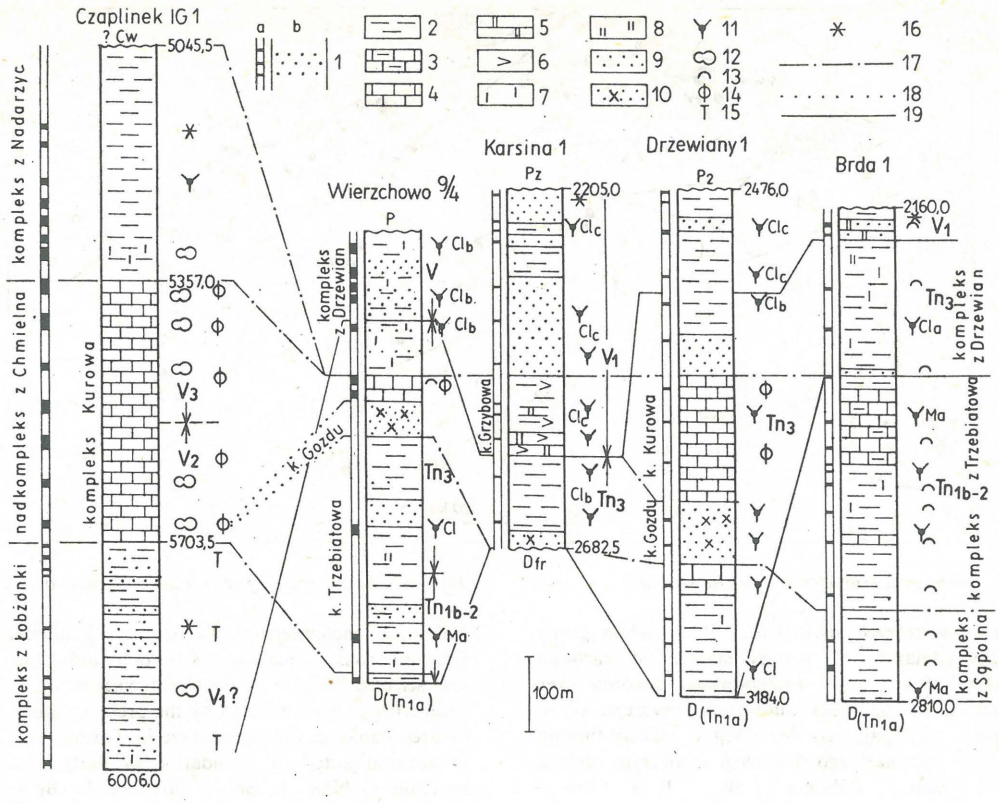
The Wolin formation begins with 20 m packet of sandstones. Higher cyclothems are built of siltstone-clay rocks and sandstones whilst the lower also display limestones. Colour of rocks changes from grey and dark-grey in lower part of the section to mottled, mainly brownish in the upper part. Plant remains are here represented by both aerial and subaerial (stigmaria) portions of plants. Moreover, thin laminae of coals were found here.

Sandstones of the Wolin formation belong to quartz wackes and arenites with small admixture of feldspars and debris of siliceous rocks and micas. In their matrix, illite and kaolinite are accompanied by carbonates, sulfates and, in a higher part of the section, marked admixture of ferruginous matter.

Aerial portions of plants found in the above strata – (*Paripteris/Neuropteris*) *gigantea* (*Sternberg*) – are generally indicative of the Silesian. Palynological analyses of samples from middle part of the section (H. Kmiecik, unpubl. report) showed their Westphalian C age: mixed assemblages with *Florinites* sp. sp., *Vestispora fenestrata* (Kosanke et Brok.) and *V. costata* Balwie (Bhardawaj). On the basis of correlations with Rügen sections (2, 5, 18), the Wolin formation is dated at the Westphalian A – lower Westphalian C and treated as an equvalent of the beds from Hiddensee, Wick, Löhme and Jasmund.

The Rega formation comprises a higher part of the section, 130–170 m thick and characterized by an increased share of sandstones and presence of innumerous conglomerate horizons. Sandstone layers are varying in thickness (up to 30 m at the most) whereas siltstone-clay intercalations are generally thin. The latter sometimes display appendices and stigmaria and aerial portions of plants: e.g. horsetail stems, leaves of ferns such as *Pecopteris polymorpha*. Rocks of the Rega formation are mottled, red-brown to cherry-brown in colour, with grey or green spots, except for sandstones which are sometimes light-grey. The latter are represented by fine- to medium-grained quartz arenites and wackes, resembling those of the underlying formation in petrographic composition. Quartz (sometimes with regeneration rims) is the major rock-forming component and the share of debris of siliceous rocks and feldspars (sometimes corroded) is here subordinate. Matrix is varying from clay and ferruginous to siliceous, calcite (presumably related to alteration of feldspars) and sulfatic.

The paleontological record is here limited to the above cited *Pecopteris polymorpha* as palynological analyses showed the presence of innumerous *Lycospora* sp. and *Sporonites* sp. and Acritarcha assemblage without bio-



Ryc. 2. Zestawienie wybranych profilów otworów wiertniczych z osadami dinantu.

1 – profile: a – miejsca pobrania rdzeni, b – litologia, 2 – iłowce i mułowce, 3 – wapienie margliste, 4 – wapienie, 5 – dolomity, 6 – anhydryty, 7 – wapnistość osadu, 8 – dolomityczność osadu, 9 – piaskowce kwarcowe, 10 – piaskowce arkozowe i lityczne, 11 – stwierdzona mikroflora, 12 – mikrofauna, 13 – makrofauna, 14 – oolity, 15 – tufity, 16 – czerwona barwa osadu. Granice jednostek litostratygraficznych: 17 – między kompleksami, 18 – w obrębie nadkompleksu z Chmielna, 19 – granice pięter. Wydzielone zespoły miosporowe na podstawie pracy E. Turnau (20): Ma – *Dictyotriletes major*, Cl – *Prolycospora claytoni* (a, b, c – podzony).

Fig. 2. Comparison of selected borehole columns of the Dinantian.

1 – columns: a – cored intervals, b – lithology, 2 – claystones and siltstones, 3 – marly limestones, 4 – limestones, 5 – dolomites, 6 – anhydrites, 7 – calciferous rocks, 8 – presence of dolomite, 9 – quartz sandstones, 10 – arcosic and lithic sandstones, 11 – record of microflora, 12 – microfauna, 13 – macrofauna, 14 – ooids, 15 – tuffites, 16 – red colour of rocks. Boundaries of lithostratigraphic units: 17 – between complexes, 18 – within Chmielno supercomplex, 19 – stage boundaries. Miospore assemblages differentiated after E. Turnau (20): Ma – Dictyotriletes major, Cl – Prolycospora claytoni (a, b, c – subzones).

stratigraphic value. Taking into account sedimentary continuity with underlying formation and analogy with reference to the Rügen sections, the formation is interpreted as of the Upper Westphalian (higher Westphalian C and D?). Upper boundary seems to be diachroneous. The strata are correlated with the Dornbusch Beds and presumably a part of the Trent Beds.

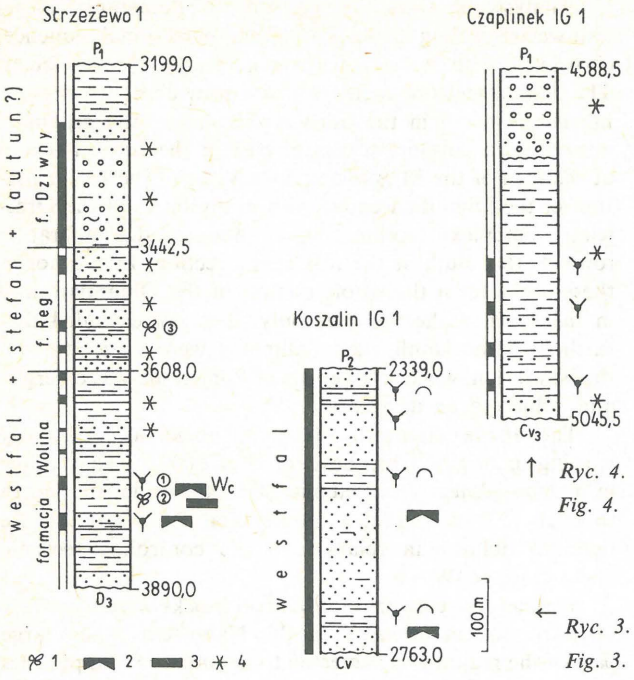
The Dziwna formation comprises the uppermost part of the Silesian in the vicinities of Trzebiatów and Kamień Pomorski. It is up to 240 m thick and built of complex of brown-red siltstone rocks with marked share of sandstones and conglomerate horizons.

Sandstones of that formation belong to quartz wackes and arenites and, in part, lithic wackes. Quartz, often with authigenic rims, is the major component here but rock debris occurs in somewhat larger amounts than in lower formations. Besides fragments of siliceous rocks, here occurs debris of intrusive ones. Kaolinitized and sometimes sericitized and carbonatized feldspars are fairly rare. Matrix appears similar as in underlying formations.

No organic remains were found here, except for fragments of *Annularia* sp. and *Calamites* sp. reported by K. Korejwo. Microphytoplankton is here innumerous whereas both pollen and spores are missing. The correlations with the Rügen sections (5, 18) made possible assignation of these rocks to the uppermost Westphalian and Stephanian. However, it is not excluded that the uppermost strata belong to the Autunian. The Dziwna formation is correlated with upper part of the Trent and Rambine and Mönchgut Beds.

THE KOSZALIN AREA

In the vicinities of Koszalin, a packet of sandy rocks with claystone intercalations with coally bands, assigned to the Silesian, have been found beneath the Permian in two boreholes only. The strata are up to 400 m thick. Sandstones are represented by quartz wackes and arenites with content of rock debris and feldspars usually below 1%. Cement is formed of clay mass as well as ferruginous matter and sulfates. The clay intercalations yield horizons with linguloid fauna and pectens: *Lingula mytiloides* Sowerby, *L. elliptica* Phillips, *Pterinopecten* cf. *speciosus* Jackson as well as *Anthraconia* cf. *prolifera* var. *valida* Waterlot and *Schisodus antiqua* Hind. Spore analyses (3) showed the presence of redeposited Dinantian specimens and those indicative of the Westphalian, including *Florinites mediapudens*. This made possible assignation of the strata to the Westphalian. They may represent an equivalent of the Wolin Formation in the Trzebiatów – Kamień Pomorski area.



Ryc. 3. Profile silezu z części nadmorskiej obszaru Strzeżewo (strefa Trzebiatów – Kamień Pomorski) i Koszalin (strefa Koszalina).

Objaśnienia jak na ryc. 2, ponadto: 1 – występowanie flory, 2 – obecność stygmarii, 3 – obecność węgli, 4 – pstra barwa osadu (1 – miejsce stwierdzenia zespołu sporowego z *Florites* spp. oraz *Vestispora fenestrata* i *Schopfipollenites* sp. (H. Kmiecik), 2 – miejsce stwierdzenia przez K. Korejwo *Paripteris (Neuropteris) gigantea*, 3 – miejsce stwierdzenia przez T. Migierową *Paripteris polymorpha*.

Fig. 3. Silesian sections in coastal part of the Strzeżewo (Trzebiatów – Kamień Pomorski zone) and Koszalin (Koszalin zone) areas.

1 – record of flora, 2 – presence of stigmaria, 3 – presence of coals, 4 – mottled colour of rocks; 1 – record of spore assemblage with Florites spp. and Vestispora fenestrata and Schopfipollenites sp. (H. Kmiecik), 2 – records of Paripteris (Neuropteris) gigantea by K. Korejwo, 3 – records of Paripteris polymorpha by T. Migierowa; other explanations as given in Fig. 2.

Ryc. 4. Profil osadów „czerwonego spągowca", w którym stwierdzono występowanie zespołów sporowych silezu z Thymospora sp.

Fig. 4. Sections of "Rotliegendes" rocks found to yield Silesian spore assemblage with Thymospora sp.

THE ŚWIDWIN – BYDGOSZCZ (CENTRAL) AREA

Spore assemblages found in strata of the Drawsko formation (grey siltstones and sandstones) in central and south-western Pomerania show that this formation, assigned to the Rotliegendes (14 – 15) may comprise some Upper Carboniferous rocks. Taking this into account I supposed (22) that sedimentation of the red beds association started in the Late Silesian (Westphalian) to continue in Permian. In result of formation of a wedge of red rocks, marine ingressions coming from western Europe to south-eastern Poland became cut off in the Late Carboniferous. This seens to be shown by the youngest marine horizons in the Lublin region, dated at the turn of the Westphalian A and B (equivalents of the Katarzyna horizon). Silesian rocks of Pomerania, interpreted as above, will also comprise intrusive rock covers. Upper Carboniferous volcanism were not known from marginal part of the East-European Platform until the last years. Recent drillings made in area between Warsaw and Toruń revealed an intense volcanic event which preceded sedimentation of the Westphalian. It has been responsible for origin of trachytes and rhyolites and pyroclastic material is present throughout the Westphalian section. I do not treat the question of Silesian age of a part of rock packets hirtherto assigned to the Lower Permian as solved but rather a hypothesis for further studies.

SYNTHETIC SECTION OF THE CARBONIFEROUS

The above discussed lithostratigraphic units comprise the whole section of the Carboniferous. The results of stratigraphic studies, given in discussions on individual lithostratigraphic units, clearly show diachroneous nature of the latter. It should be also noted that the stratigraphic subdivision is based on plant and faunal remains varying in value so the units cannot be treated as of the same rank. Macrofauna is rather innumerous, being mainly represented by bivalves and brachiopods. Goniatitids are occiasional here and usually so poorly preserved that specific identification is impossible. Macrofloral remains are also innumerous and of limited stratigraphic value so the stratigraphic data based on results on microfaunistic and palynological analyses (8, 10, 20, 22) are most numerous. Of the microfossils, most important are here conodonts which made possible delineation of the Devonian-Carboniferous boundary and identification of the Tournaisian (12). Identifications of foraminifers in thin sections made possible dating limestones of the Kurów complex which often do not yield any macrofaunal remains. The results of palynological analyses (3, 11, 19 – 20) also appeared highly important here.

The differences in biostratigraphic methods used in studies on the Carboniferous of Pomerania, accurate correlations are not always possible and the subdivision accepted in the stratigraphic table often represents the results of attempts to average the data.

Lower boundary of the Carboniferous was accepted in accordance with resolutions of the II Congress on Carboniferous Stratigraphy, i.e. at the base of the *Gattendorfia* stage. Thus some intervals of the sections, representing equivalents of the lowermost Tournaisian (Tn1a) and assigned to the Carboniferous by K. Korejwo (8, 10), are excluded from that system here.

The presence of the Tournaisian is evidenced is several sections on the basis of spore assemblages, conodonts and ostracods. A gap in sedimentation, corresponding to lower Tournaisian (Tn1b-2), has been found in the Koszalin area. At that time, strata of the Sąpolno complex and, in part, Chmielno supercomplex were originating in areas further to the south. In the Late Tournaisian (Tn3), the Chmielno supercomplex and some parts of the Drzewiany complex were formed in the north, and at least a part of the Łobżonka complex in central Pomerania. The sedimentation of strata of the Drzewiany complex was continuing in the Visean in the north whereas in the south the Visean is represented by top parts of the Łobżonka complex, Kurów complex and the top of the Nadarzyce complex.

Strata assignable to the Namurian are still not known in this region and the oldest Upper Carboniferous strata recognized here on the basis of palynological data are of

the Westphalian age. The Westphalian here comprises the strata from the Kamień Pomorski area (Wolin, Rega and, partly, Dziwna formations) and Koszalin as well as red clastic rocks from the Szubin – Bydgoszcz zone. The Stephanian age assumed for a part of the Dziwna formation and red clastic rocks in central Pomerania is still not based on biostratigraphic data.

The above discussed section of the Carboniferous in Pomerania is clearly bipartite. Its lower part, belonging to the Dinantian, comprises strata ranging in age from the Tournaisian to Upper Visean, and the upper (Silesian) – strata assigned to the Westphalian and Stephanian. They are separated by a stratigraphic gap corresponding to the Namurian. The gap is traceable in area NE of the Kamień Pomorski – Bydgoszcz line.

SOME REMARKS ON SEDIMENTARY ENVIRONMENT AND BASIN MORPHOLOGY

In Pomerania, Carboniferous strata are represented by platform formations formed in relatively mobile area. The area was characterized by increased rate of subsidence and sedimentation, except for some erosional events. It was situated in far foreland of the Variscan geosyncline, entering the area of the East-European Precambrian Platform.

Sedimentary basin of the Dinantian represented a continuation of the Late Devonian one. An infraformational gap is traceable in northern part of the studied area and uplifts of individual blocks resulted in local angular unconformities. Upper Devonian strata are already regressive in character. Similarly as the Dinantian, they are terrigenous in the north or carbonates clearly displyiang traces of advanced shallowing. The movements were accompanied by volcanic phenomena, the results of which include pyroclastic material in rocks of the Chmielno supercomplex or diabase dykes or sills (?) cutting the rocks.

The above discussed rock complexes clearly show shallow-water character of sedimentation. The analysis of facies distribution in the Dinantian showed that strata occurring in the north have originated close to coastal line. It should be noted here that the present NE boundary of distribution of Dinantian strata is related to pre-Zechstein epigenetic erosion. In the coastal area, where the boundary coincides with a fault zone, the section clearly displays gaps and increase in content of sand at the Devonian-Carboniferous boundary whereas the sections of Devonian-Carboniferous passage beds are continuous and developed in clay-marly facies further to SE (e.g. Brda area). As it was noted by E. Turnau (20), we are often dealing with a hiatus or advanced condensation. Red clays, common in the Tournaisian in northern part of the region well reflect the course of denudation processes in neighbouring land areas. Red continental strata are also known from the Devonian-Carboniferous boundary in the borehole columns in western Lithuania and Latvia.

The differentiated movements of basement blocks resulted in differences in character of sedimentation in individual parts of the basin. Rocks of the Gozd complex have originated in offshore shoals whereas those of the oolitic facies proper of the Kurów complex appear related to shoals situated further from the coast. Debris of igneous rocks and ooids were transported by bottom currents to basins separating the above shoals in which clay-marly sedimentation was taking place. This resulted in origin of rocks of the mixed oolite facies (Trzebiechów complex).

Analysis of Dinantian sections of Pomerania shows that we are dealing there with normal regressional sequence, connected with transition from neritic to littoral facies. The oolite limestone facies of the Kurów complex, prevailing in the north in the Early Tournaisian, was gradually migrating to develop in central part of the studied region at the turn of the Middle and Late Visean. The sedimentation of the Dinantian ended with sandy rocks of the Drzewiany complex, representing a sandy wedge migrating towards the south at the top of the section. In the north, these rocks form the whole section of the Dinantian, and in the south – the top part only. It is not excluded that further to the south such sediments were originating in the Namurian, when a large part of Pomerania was emerged and subjected to denudation.

The above discussed Dinantian rocks are markedly varying in original thickness (of over 300 m). They range in paleothickness from about 300 – 400 m in the north to over 1200 m in central Pomerania. Paleoisopachs are oriented oblique in relation to the controlled tectonic lines, close to W – E.

Vertical movements of individual blocks were markedly differentiated in intensity in the Namurian, when large part of the region was subjected to denudation. Amplitudes of the movements, calculated on the basis of extent of erosion of Dinantian rocks, range from 100 – 200 m to over 1,000 m.

The Erzgebirgian phase in the Variscan geosyncline has been followed by downwarping of the foreland and a beginning of a new sedimentary cycle in Pomerania. The cycle began with sedimentation of coal-bearing association replaced in the Late Westphalian by that of red clastic rocks. The onset of sedimentation of the latter was, however, contemporaneous with the appearance of coal-bearing strata in some parts of Pomerania. This was due to origin of the wedge of red rocks, responsible for cutting off connections between the Lublin Basin and Carboniferous sea of western Europe. A new stage in volcanic activity, typical of the Early Permian, began in the Late Silesian.

LITERATURA

1. Dadlez R. – Podpermskie kompleksy skalne w strefie Koszalin – Chojnice. Kwart. Geol. 1978, nr 2.
2. Döring H. – Sporstratigraphische Untersuchungen im Bereich des Silez ("Graue Folge") aus dem Raum Nordhiddensee. Z. Geol. Wiss. 1975, H. 3, nr 7.
3. Górecka T., Parka Z. – Stratygrafia osadów karbonu – otworu wiertniczego Koszalin IG-1 na podstawie badań palinologicznych. Pr. Nauk. Inst. Górn. Pol. Wr. 1980 nr 35, Studia i Materiały 1980 nr 16.
4. Heflik W., Muszyński M. – Diabazy z wiercenia Kurowo 2 koło Koszalina. Kwart. Geol. 1973 nr 3.
5. Hirschmann G., Hoth K., Kleber F. – Die lithostratigraphische Gliederung des oberkarbons im Bereich der Inseln Rügen und Hiddensee. Z. Geol. Wiss. 1975 Bd. 3, H. 7.
6. Hoffman N., Lindert W., et all. – Zum Unterkarbon – Vorkomen auf den Insel Rügen und Hiddensee. Ibidem.
7. Korejwo K. – Stratigraphy and paleogeography of the Namurian in the Polish Lowlands. Acta Geol. Pol. 1969, t. 19 nr 4.
8. Korejwo K. – The Carboniferous of the Chojnice area (Western Pomerania). Ibidem 1976 t. 26 nr 4.

9. Korejwo K. – Charakterystyka litologiczna i rozwój paleotektoniczny karbonu w rejonie Wierzchowa (Pomorze Zachodnie). Ibidem 1977 t. 27 nr 4.
10. Korejwo K. – Biostratigraphy of the Carboniferous sediments from the Wierzchowo area (Western Pomerania). Ibidem 1978 t. 28 nr 4.
11. Krawczyńska-Grocholska H. – Z badań palinologicznych karbonu północno-zachodniej Polski. Prz. Geol. 1975 nr 1.
12. Matyja H. – Biostratigraphy of the Devonian-Carboniferous passage beds from some selected profiles of NW Poland. Acta Geol. Pol. 1976 t. 26 nr 4.
13. Muszyński M. – Charakterystyka mineralogiczno-petrograficzna karbońskich skał osadowych niecki pomorskiej (okolice Bobolic). Pr. Miner. Kom. Nauk Mineral. PAN Oddz. Kraków 1976 t. 48.
14. Pokorski J. – The Rotliegendes of the Polish Lowland. Prz. Geol. 1976 nr 6.
15. Pokorski J. – Propozycja formalnego podziału litostratygraficznego czerwonego spągowca na Niżu Polskim. Kwart. Geol. 1981 nr 1.
16. Rost W., Schimansky W. – Übersicht über das Oberkarbon und das Rotliegende im Nordteil der DDR. Ber. Deutsch. Ges. Geol. Wiss. A. Geol. Paläont. 1967 Bd. 12 H. 3–4.
17. Schmidt K., Franke D. – Stand und Probleme der Karbonforschung in der Deutschen Demokratischen Republik T. I – Unterkarbon. Z. Geol. Wiss. 1975 Jh. 3, H. 7.
18. Schmidt K., Franke D. – Zur lithologisch-faziellen Entwicklung des Präpermes im Nordteil der DDR. Z. Angew. Geol. 1976 nr 11.
19. Turnau E. – Microflora of the Famennian and Tournaisian deposits from boreholes of Northern Poland. Acta Geol. Pol. 1975 t. 25 nr 4.
20. Turnau E. – Korelacja utworów górnego dewonu i karbonu Pomorza Zachodniego w oparciu o badania sporowe. Rocz. P. T. Geol. 1979 t. 49 nr 3–4.
21. Żelichowski A.M. – Karbon [W:] Ropo- i gazonośność obszaru nadbałtyckiego między Świnoujściem a Darłowem na tle budowy geologicznej. Cz. I – Budowa geologiczna pod red. R. Dadleza. Pr. Geostr. Inst. Geol. 1971.
22. Żelichowski A.M. – Karbon [W:] Budowa geologiczna wału pomorskiego i jego podłoża, pod red. A. Raczyńskiej. Pr. Inst. Geol. (w druku).

STRESZCZENIE

W wyniku prowadzonych prac wiertniczych, uzyskano w ciągu ostatnich 20 lat kilkadziesiąt profilów wiertniczych osiągających utwory karbonu. Na ich podstawie stwierdzono występowanie utworów dinantu i silezu. W wyniku badań stratygraficznych (3, 7, 8, 9, 10, 11, 12, 19, 20 i 22) udokumentowano obecność turneju, wizenu oraz westfalu. Osadów namuru, wbrew pierwotnym przypuszczeniom (7, 21), nie stwierdzono. Wydzielenia osadów stefanu dokonano w nawiązaniu do opracowań pochodzących z NRD. Badania petrograficzne (4, 13, 22) wskazują na zróżnicowanie charakteru skał zarówno węglanowych, jak i klastycznych.

Silne zróżnicowanie litologiczne, a także trudności w badaniach biostratygraficznych skłoniły do wprowadzenia dla osadów karbonu Pomorza Zachodniego lokalnych podziałów litostratygraficznych (1, 9, 22). Wydzielane jednostki litostratygraficzne mają charakter jednostek nieformalnych dla dinantu. Przyjęta nazwa kompleks w zasadzie odpowiada randze formacji, a wydzielony nadkompleks – grupie.

W obrębie osadów dinantu wydzielono następujące jednostki: kompleks z Sąpólna, nadkompleks z Chmielna, kompleksy z Drzewian, Nadarzyc i Łobżonki.

Kompleks z Sąpólna stanowi najniższą jednostkę litostratygraficzną, w całości należącą do dinantu. Reprezentowany jest on przez pakiet skalny o zwiększonym zaileniu osadów i zaniku sedymentacji węglanowej. Spoczywa on na utworach kompleksu z Człuchowa (górnego famenu, a po części turneju) lub na starszych osadach. Jest to jednostka diahroniczna rozwinięta w turneju (od dolnego do górnego).

Nadkompleks z Chmielna, występujący na znacznym obszarze ponad osadami kompleksu z Sąpólna stanowi jednostkę samoistną. Odznacza się charakterystycznym składem litologicznym: liczne piaskowce i zlepieńce, typu wak arkozowych i litycznych, rzadziej kwarcowych, powszechne wapienie oolitowe, onkoidowe, a także obecność anhydrytu. Zmiany facjalne i następstwo facji pozwoliło na wydzielenie w jego obrębie mniejszych jednostek – kompleksów, których nazewnictwo wzięto za R. Dadlezem (1), niekiedy je modyfikując. **Kompleks z Kurowa** stanowią w przewadze wapienie reprezentujące fację oolitową właściwą. Tworzą je wapienie oolitowe i onkoidowe o grubości od kilkunastu do blisko 400 m. Obok peloidów, intra- i bioklastów występuje także mikryt i sparyt oraz kwarc, skalenie i siarczany. **Kompleks z Gozdu** zwany też **kompleksem z Wierzchowa** (1) w większości tworzą waki arkozowe, niekiedy lityczne piaskowce i zlepieńce. Obok licznych skaleni spotykane są okruchy i ziarna trachitów, ryolitów, szkliwa wulkanicznego i kwarcu. **Kompleks z Grzybowa** utworzony jest ze skał mułowcowo-ilastych, zawierających przewarstwienia i soczewki anhydrytu. Natomiast osady ilasto-mułowcowe z nielicznymi ooidami i przewarstwieniami piaskowców typu wak kwarcowych wydzielono jako **kompleks z Trzebiechowa**. Miąższość utworów nadkompleksu z Chmielna osiąga 400 m. Wiek tych utworów przypada na turnej (w części N) i ku południowi przechodzą one do wizenu.

Kompleks z Drzewian, są to w przewadze utwory piaskowców (do 400 m) o typie wak i arenitów kwarcowych, spoczywające na osadach nadkompleksu z Chmielna lub bezpośrednio na starszym paleozoiku. Datowany jest on na turnej i wizen. Kompleks ten rozwinięty jest w N części obszaru.

Kompleks z Nadarzyc występuje w południowej części Pomorza bezpośrednio nad wapieniami kompleksu z Kurowa. Reprezentują go iłowce liczące ok. 250 m. Datowany jest on na wyższy wizen górny.

Kompleks z Łobżonki ma podobne rozprzestrzenienie jak poprzednio wymieniony i złożony jest z mułowców i iłowców z przewarstwieniami wak kwarcowych. Spotykane są w nim poziomy tufitowe. Podścielają one utwory kompleksu z Kurowa lub wychodzą bezpośrednio pod młodszymi osadami. Datowania wskazują na niższy wizen i turnej. Zazębianie się tych kompleksów przedstawiono na ryc. 2.

Osady silezu występują w trzech obszarach, wykazując znaczne zróżnicowanie. W strefie Trzebiatów–Kamień Pomorski (ryc. 1, 3), wśród osadów zaliczonych do silezu wydzielono trzy formacje, od dołu: Wolina, Regi i Dziwny. Odznaczają się one zmiennymi proporcjami skał ilasto-mułowcowych i piaszczysto-zlepieńcowych. W najwyższej pojawiają się okruchy skał wulkanicznych (Dziwny). Na podstawie badań palinologicznych udokumentowano, że wyższa część formacji Wolina należy do westfalu C.

Reprezentuje ona asocjację węglonośną, w stropie formacji Wolina mamy do czynienia z zamianą jej na asocjację skał czerwonych. Ślady roślin struktur korzeniowych, jak i części naziemnych, spotykane są także i w wyższych formacjach. Korelacja wydzielonych formacji z terenem NRD przedstawiona jest w tabeli.

Osady silezu w okolicach Koszalina reprezentowane są przez liczące do 400 m osady asocjacji węglonośnej złożone z piaskowców i iłowców szarych. Spotykane są nieliczne złogi węglowe. W poziomach ilastych występują dość liczne małże i ramienionogi. Osady te zaliczone są do westfalu, choć wiek ten bywa kwestionowany (20, 21) i osady te traktowane są w części jako dinanckie (w profilu Koszalina IG-1).

W obrębie utworów zaliczanych do czerwonego spągowca (14, 15) T. Górecka stwierdziła występowanie zespołów sporowych sugerujących przynależność ich do silezu (ryc. 4). Zasięg tych utworów przedstawiono na ryc. 1. Autor rozpatrując rozmieszczenie asocjacji węglonośnej w NE Polsce doszedł do wniosku, że jest całkiem prawdopodobne, że utwory czerwonego spągowca w części należeć mogą do wyższego silezu. Przedstawione powyżej cechy osadów karbonu, wskazują że utworzone zostały w warunkach platformowych, na stosunkowo mobilnym obszarze.

Basen dinantu stanowił kontynuację basenu dewońskiego, w części obszaru (na N) z zaznaczoną luką śródformacyjną. Rozwój osadów dinantu znaczy etap regresywny tego basenu i postępujące spłycanie zbiornika. Na namur przypadł etap całkowitego wypiętrzenia i strzaskania blokowego. Ruchom tym towarzyszył wulkanizm, czego dowodzą omówione wyżej poziomy tufitowe i dajki diabazów (4). Sedymentacja silezu rozpoczęta została po zgradowaniu znacznych pakietów dinantu (silez niekiedy spoczywa na dewonie). Kolejne ugięcie obszaru nastąpiło po etapie fałdowań kruszcogórskich w geosynklinie. Rozpoczęło się formowanie asocjacji węglonośnej ku górze i obocznie zastępowanej przez asocjację skał czerwonych. Na ten okres przypadł też nowy epizod wulkaniczny, trwający do dolnego permu.

РЕЗЮМЕ

Буровыми работами проведенными в Поморью было обнаружено нахождение отложений, которые на основании фаунистических, флористических и палинологических исследований причислены к карбону. Здесь удокументировано распространение отложений турнейского, визейского и вестфальского ярусов. На основании аналогии с северной частью ГДР принято нахождение отложений стефанского яруса. В исследованных разрезах не обнаружено присутствие осадков намюрского яруса. Отложения динанта были обнаружены на территории значительной части Западного Поморья. Они представлены разными осадками фации блиской к угольному известняку, образовавшейся в платформенных условиях. Разрез динанта соответствует регрессивному этапу девонского морского бассейна. В его северной части преобладают терригенические отложения частично образовавшиеся в литоральной зоне; к югу они проходят в неритические осадки. На севере местно выступает перерыв в седиментации на переломе девона и динанта. Осадки динанта характеризуются большой литофациальной разностью. Выделен ряд неформальных литостратиграфических комплексов имеющих диахронические границы. Эти комплексы следующие: комплекс из Сомпульна сложенный уплотненными глинами, иногда с известняками, турнейского возраста. Надкомплекс из Хмельника, включающий турнейский и визейский ярусы, состоит из меньших комплексов: Гозда — сложенного песчаниками типа аркозных и литических вакк, Курова — оолитовыми известняками, Гжибова — глинисто-алевролитического с ангидритами, Тшебехова — глинисто-известкового с песчаниками типа аренитов и кварцевых вакк. Ограниченную дальность имеет глинистый комплекс Надажиц. В северной части широко распространен комплекс из Джевян, сложенный главным образом кварцевыми песчаниками.

Осадки силеза были обнаружены в районе Тшебятова—Каменя Поморского и Кошалина. В районе Тшебятова—Каменя Поморского выделены три формации Волина, Реги и Дзивны. Из самой нижней формации — Волина были получены группы спор высшего силеза, из формации Реги — только *Paripteris polymorpha*. Самая верхняя формация Дзивны не содержит органических остатков. В районе Кошалина песчаники с прослойками уплотненных глин, содержащие горизонты с фауной лингуль и двустворчатых моллюсков, на основании проведенных исследований были причислены к вестфальскому ярусу.

В статье представлен гипотез об возможности причисления к силезу части разрезов красных пород, причисляемых до сих пор к красному лежню.