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Conodont stratigraphy of the Upper Devonian in the Janczyce I borehole section, eastern Holy Cross Mts.

Biostratigraphic analyses of the Janczyce I borehole section, a unique key section for regional correlations in the southern (Kielce) region of the Holy Cross Mts. area, allow placement of important lithostratigraphic boundaries within a framework of the Upper Devonian standard conodont zonation. The lowermost dated deposits (the Detrital Limestone Unit) belong to the *jamieae* Zone while the uppermost ones (the Black Shale and Limestone Unit) were ascribed to the Lower-Upper *expansa* Zones. The studies revealed a stratigraphic gap or condensation within an entirely shelf-basinal depositional system, spanning at least the Famennian Upper through Uppermost *marginifera* Zones. Two characteristic cephalopod-bearing levels are present within a monotonous basinal sequence, i.e., the tentaculitoid microcoquina (*linguiformis* Zone) and the cephalopod limestones from Janczyce (Middle *crepida* Zone). The above named levels revealed a potential for precise time-correlation on at least a sub-regional scale, the first one being most probably the local equivalent of the widespread Upper Kellwasserkalk horizon.

INTRODUCTION

The Janczyce I borehole section represents a unique continuous record of the epicontinental Middle through Upper Devonian carbonates more than one kilometre thick. The lithological succession of that fully cored well is representative not only for the eastern part of the Holy Cross Mts. area (southern Poland) but also for the whole southern (Kielce) region of that area. The latter region (Fig. 1) is distinctive for its facies-palaeogeographical development including growth of the Eifelian to Givetian carbonate platform and the Frasnian carbonate buildups (M. Narkiewicz, 1988). The informal lithostratigraphic subdivision of the described section has been established by M. Narkiewicz and I. Olkowicz-Paprocka (1983; slightly modified by M. Narkiewicz, 1991). The first paper cited also discusses the regional significance of the distinguished units and compares them to the earlier stratigraphic divisions in the Holy Cross Mts. area, mostly that by J. Samsonowicz (1917, 1934).

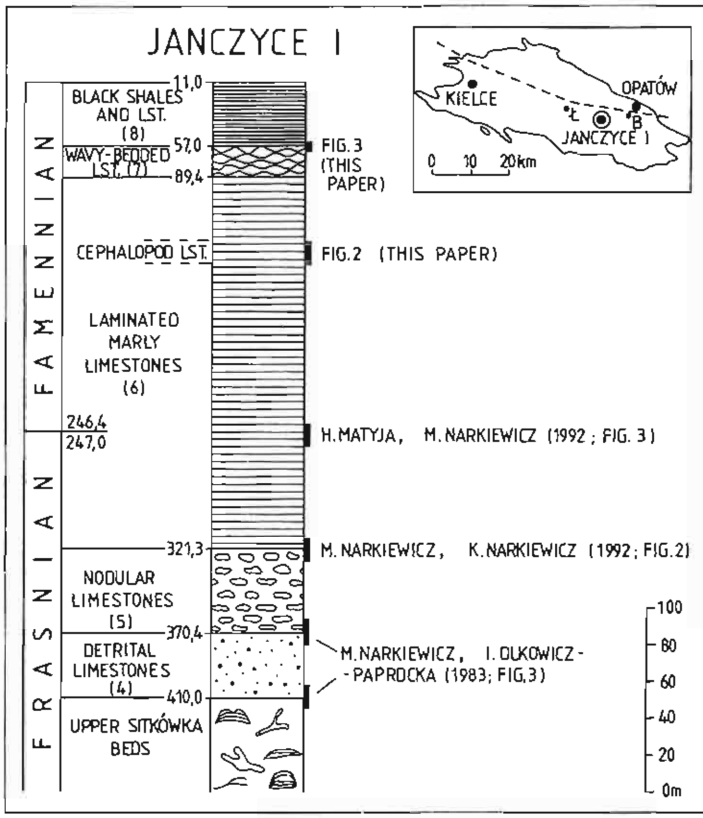

Fig. 1. Generalized Upper Devonian stratigraphy in the Janczyce I borehole section

Location of the section is shown on the map in the upper right, with the broken line marking the northern limit of the Kielce region (Ł — Łagów; B — Bratków; both localities mentioned in the text); vertical bars on the right side of the graphical column represent the location of the intervals described in more detail in the cited papers; all depths are given in metres; lithostratigraphy after M. Narkiewicz and I. Olkowicz-Paprocka (1983), and M. Narkiewicz *et al.* (1990)

Schemat stratygrafii górnego dewonu w profilu otworu wiertniczego Janczyce I

Położenie badanego profilu oraz odsłonięć wzmiankowanych w tekście (Ł — Łagów, B — Bratków) przedstawiono na mapie w prawym górnym rogu wraz z przebiegiem północnej granicy regionu kieleckiego, zaznaczonym linią przerywaną; z prawej strony profilu zaznaczono odcinki dokładniej opisane w cytowanych pracach; wszystkie głębokości podano w metrach; litostratygrafia według M. Narkiewicza i I. Olkowicz-Paprockiej (1983) oraz M. Narkiewicza i in. (1990)

In this paper we present a synthesis of the detailed biostratigraphic studies related to the Upper Devonian part of the Janczyce I section (Figs. 1–3). The emphasis will be put here on dating the boundaries of the lithostratigraphic units of formation or member rank. In addition we will discuss the age of the important cephalopod limestone horizons occurring within the Famennian Laminated Marly Limestone Unit. Along with conodonts, other organic groups will be taken into account, mostly corals and foraminifers.

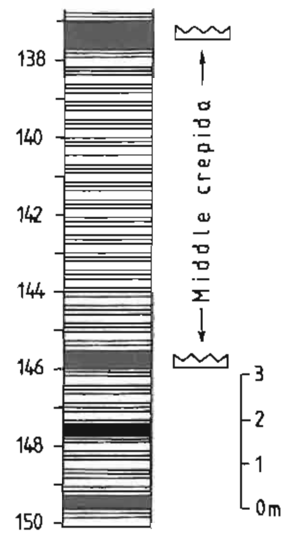

Fig. 2

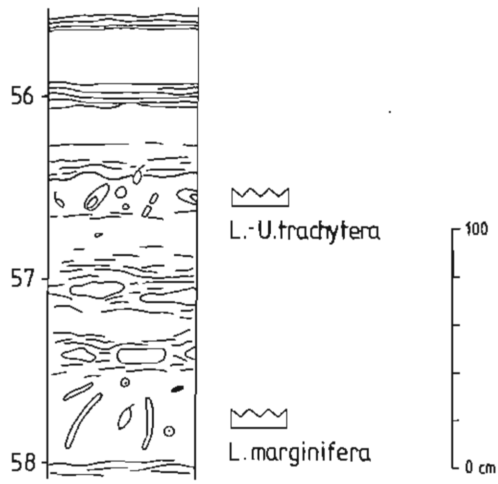

Fig. 3

Fig. 2. Details of the interval with the cephalopod limestone horizons (black) within the upper part of the Laminated Marly Limestone Unit (see Fig. 1 for location)

Horizontal pattern is for dark bituminous marly limestones with even horizontal lamination; also shown is the location and age of the conodont samples (compare Tab. 2); depths in metres (note that they do not follow the thickness scale because of a tectonic dip)

Odcinek profilu z poziomami wapieni głowonogowych (czarne) w górnej części jednostki laminowanych wapieni marglistych (lokalizacja na fig. 1)

Linie poziome oznaczają ciemne, bitumiczne wapienie margliste z regularną laminacją poziomą; przedstawiono również położenie i oznaczenia wiekowe próbek konodontowych (por. tab. 2); głębokości podane w metrach nie odpowiadają skali miąższości z powodu uwzględnienia upadów tektonicznych

Fig. 3. Details of the boundary between the Wavy-Bedded Limestone Unit and the Black Shale and Limestone Unit (see Fig. 1 for location)

Other explanations see Fig. 2

Szczegóły wykształcenia litologicznego granicy między jednostką wapieni falistych a czarnych łupków i wapieni (lokalizacja na fig. 1)

Objaśnienia jak na fig. 2

Acknowledgements. Corals from the Janczyce I borehole have been studied by Dr. T. Wrzołek (Silesian University, Sosnowiec) who kindly offered the unpublished results of his work. The authors are grateful to A. Prejbisz, M. Sc. (Institute of Geological Sciences PAN in Warsaw), for processing of many conodont samples and to E. Starnawska, M. Sc. (the same Institute) for taking the SEM photomicrographs of conodonts.

PREVIOUS STRATIGRAPHIC WORK

The first conodonts found in the Janczyce I borehole were described by M. Nehring-Lefeld (1979, unpublished report) from a few samples in the Famennian portion of the section (see M. Narkiewicz, I. Olkowicz-Paprocka, 1983). The specimens found in the Laminated Marly Limestone Unit (i.e., *Palmatolepis termini* Sannemann) pointed to the lower part of the Famennian Stage for this particular unit. In turn, a single sample representing the Wavy-Bedded Limestone Unit has been ascribed to the lower or middle part of the Famennian based mostly on the presence of *Pal. glabra* (Ulrich et Bassler). Conodont investigations of the Upper Sitkówka Beds performed by J. Kłossowski appeared unsuccessful.

Subsequent papers were devoted to selected intervals of the section. H. Matyja and M. Narkiewicz (1992*a*, *b*) established a detailed conodont biostratigraphy at the Frasnian/Famennian boundary while M. Narkiewicz and K. Narkiewicz (1992) investigated conodonts from the boundary interval between the Nodular Limestone Unit and the Laminated Marly Limestone Unit (compare Fig. 1). Moreover, T. Wrzołek (unpublished data) studied rugose corals from the interval spanning the upper part of the Sitkówka Beds through the Nodular Limestone Unit. Lastly, the thin-section study of Middle to Upper Devonian algae and foraminifers should be mentioned (H. Ozonkowa, 1980, unpublished report).

LITHOSTRATIGRAPHIC BOUNDARIES AND CONODONT ZONATION

The present biostratigraphic analysis of the Devonian deposits in the Janczyce I borehole section is based mainly on conodonts. It is neccessary to stress, however, that the attention has been focused on dating the boundaries of lithostratigraphic units rather than on detailed characterization of a succession of conodont zones (Fig. 4). The studies were based on 53 conodont samples of average weight 0.5–1.0 kg. Thirty three positive samples yielded a total number of 1629 specimens (Tab. 1 , 2). They were attributed to 89 taxa of species and subspecies rank belonging to 13 form-genera. The most important and interesting species are illustrated on Plates I–V.

The distribution of conodonts is very irregular. Almost all conodont yields from the succession are sparse to moderately abundant (several to several dozen specimens per sample) as would be expected in a shelf-basinal setting. A significant rise in the abundance of conodonts (up to several hundred specimens per one sample) is noted in the cephalopod limestone horizons within the Laminated Marly Limestone Unit. In our conodont studies we referred to the recent taxonomic and biostratigraphic concepts by W. Ziegler and C. A. Sandberg and their co-authors (C. A. Sandberg, W. Ziegler, 1973; W. Ziegler, C. A. Sandberg, 1984, 1990; C. A. Sandberg *et al.*, 1992).

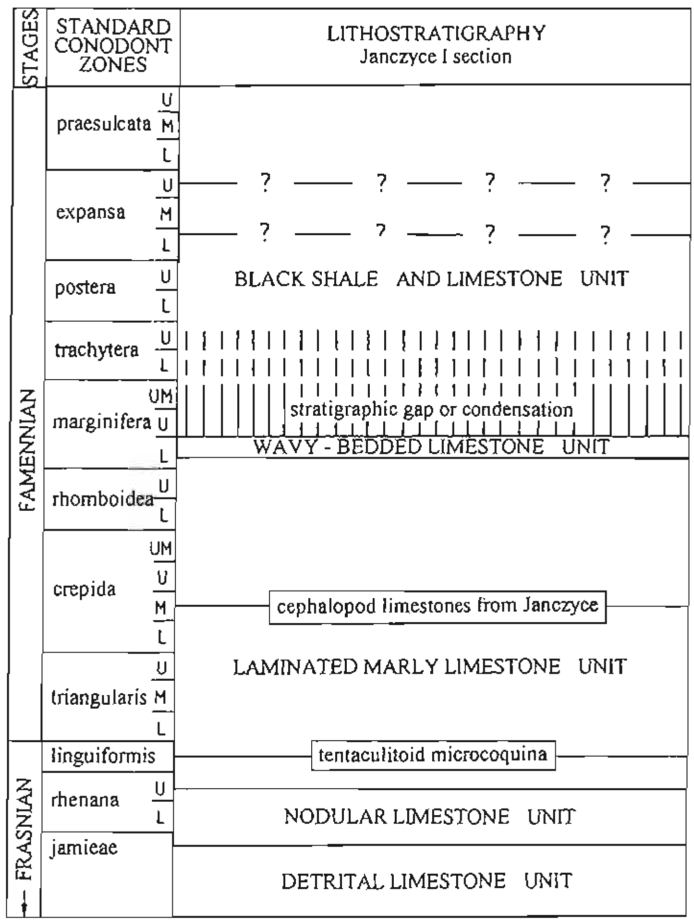

Fig. 4. The lithostratigraphic division of the Upper Devonian strata in the Janczyce I borehole section, eastern part of the Holy Cross Mts. against the standard conodont zonation; conodont zonation after C. A. Sandberg, W. Ziegler (1973), W. Ziegler, C. A. Sandberg (1984, 1990)

Zones: L — Lower, M — Middle, U — Upper, UM — uppermost

Podział litostratygraficzny górnego dewonu w profilu Janczyce I (wschodnia część Gór Świętokrzyskich) na tle standardowej zonacji konodontowej; poziomy konodontowe według C. A. Sandberga, W. Zieglera (1973), W. Zieglera, C. A. Sandberga (1984, 1990)

Poziomy: L — dolny, M — środkowy, U — górny, UM — najwyższy

DETRITAL LIMESTONE UNIT

The lower boundary of this unit was illustrated in an earlier paper (M. Narkiewicz, I. Olkowicz-Paprocka, 1983, Fig. 3B). It runs within the facies transition from the underlying stromatoporoid-coral limestones ascribed to the Kowala Formation by M. Narkiewicz *et al.*

Distribution and frequency of the Frasnian platform

Conodonts	Conodont zones						
	JA				?	RE_1?	
	depth [m]						
	374.6	373.3	369.5	368.6	361.5	347.0	337.7
Polygnathus brevilaminus Branson et Mehl, 1934*a*	–	–	–	–	–	–	–
Ancyrodella curvata (Branson et Mehl, 1934*a*)	–	–	–	–	–	–	–
Ancyroides asymmetricus (Ulrich et Bassler, 1926)	–	–	–	–	–	–	–
Palmatolepis gigas gigas Miller et Youngquist, 1947	–	–	–	–	–	–	–
Palmatolepis gigas extensa Ziegler et Sandberg, 1990	–	–	–	–	–	–	–
Palmatolepis gigas paragigas Ziegler et Sandberg, 1990	–	–	–	–	–	–	–
Palmatolepis rhenana rhenana Bischoff, 1956	–	–	–	–	–	–	–
Palmatolepis rotunda Ziegler et Sandberg, 1990	–	–	–	–	–	–	–
Palmatolepis subrecta Miller et Youngquist, 1947	–	–	–	–	–	–	–
Palmatolepis spp.	–	–	–	–	1	–	–
Icriodus symmetricus Branson et Mehl, 1934*a*	–	–	–	–	–	1	–
Palmatolepis rhenana nasuta Müller, 1956	–	–	–	–	–	9	–
Icriodus expansus Branson et Mehl, 1938	2	–	–	–	–	–	–
Icriodus praealternatus Sandberg , Ziegler et Dreesen 1992	1	2	13	–	–	19	2
Icriodus subterminus Youngquist, 1947	–	1	–	5	–	–	2
Polygnathus aequalis Klapper et Lane, 1975	1	7	4	1	–	–	–
Polygnathus alatus Huddle, 1934	3	–	8	1	–	–	–
Polygnathus decorosus Stauffer, 1938	–	–	1	–	–	1	–
Polygnathus pacificus Savage et Funai, 1980	–	2	–	7	–	22	–
Polygnathus cf. *pennatus* Hinde, 1879	–	1	–	–	–	–	–
Polygnathus pollocki Druce, 1976	–	1	–	–	–	–	–
Polygnathus timanicus Ovnatanova, 1969	–	1	–	–	–	–	–
Polygnathus webbi Stauffer, 1938	–	–	1	1	–	8	–
Ancyrodella sp. (juvenile specimen)	–	–	1	–	–	–	–
Ancyrognathus triangularis Youngquist, 1945	–	–	1	–	–	1	–
Palmatolepis ederi Ziegler et Sandberg, 1990	–	–	1	–	–	–	–
Palmatolepis hassi Müller et Müller, 1957	3	–	2	3	–	–	2
Palmatolepis jamieae Ziegler et Sandberg, 1990	–	2	–	1	–	1	–
Palmatolepis simpla Ziegler et Sandberg, 1990	–	1	–	–	–	–	–
TOTAL PLATFORM ELEMENTS	10	18	32	19	1	62	6

Conodonts zones: JA — *jamieae*, RE — *rhenana* (RE_1 — Lower, RE_2 — Upper), LI — *linguiformis*

(1990). The latter unit is represented in its uppermost part by the Upper Sitkówka Beds (*op.cit.*) embracing a spatially restricted reefal development of the Kowala Formation, which postdated a widespread biostromal platform of Middle Devonian age. This reefal part of the formation is characterized by generally lighter-coloured carbonates and a considerable proportion of detrital limestones containing large redeposited skeletal fragments within

Table 1

conodonts in the Janczyce I section

Conodont zones											
RE_2										LI?	
depth [m]											
331.4	326.3	318.5	309.5	305.0	294.2	289.3	287.7	280.6	275.8	269.4	254.1
–	–	–	1	–	–	–	–	–	–	–	–
–	–	–		–	–	–	2	–	–	–	–
–	–	–		–	–	–	–	–	1	–	–
–	–	4		–	–	–	–	–	–	–	–
–	–	–		–	–	–	2	–	–	–	–
–	–	–		–	–	–	–	–	1	–	–
–	–	–		–	–	–	8	–	–	–	1
–	–	–		–	–	–	3	–	–	–	–
1	–	–		–	3	3	4	–	1	3	1
–	1	–	1	–	3	3	–	–	–	–	–
–	–	–		–	–	–	–	–	–	–	–
4	–	1		–	–	2	8	1	7	–	–
–	–	–		–	–	–	–	–	–	–	–
5	5	2		–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	1	3	–	–	2	–	–	3	–	–
–	–	–	–	–	–	–	–	–	–	–	–
2	–	2	1	–	–	–	–	–	–	–	–
2	–	–	1	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
1	6	2	2	–	–	1	–		2	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–		–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	1	1	2	–	13	–	–	3	2	–
–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
15	12	13	10	2	6	24	27	1	18	5	2

generally *in situ* biostromal calcilutites. Typical is also the presence of renalcid algae, megalodontid bivalves as well as *Sphaerocodium* algal structures.

The Detrital Limestone represents a retrograding proximal reef-talus deposit, probably uppermost foreslope facies onlapping upon the *in situ* reefal facies of the Sitkówka Beds.

Several tens of conodont samples from the above deposits appeared barren (J. Kłossowski, 1980, personal communication). The investigations of foraminifers and algae suggest a Frasnian age for the interval above 441.5–447.7 m (H. Ozonkowa, 1980, unpublished report). In turn, according to T. Wrzołek (personal communication) the rugose corals point to an Upper Frasnian age (*Frechastrea smithi* Zone) down to a depth of at least 430.2 m (compare Fig. 2 in M. Narkiewicz, I. Olkowicz-Paprocka, 1983 for a location in the section).

Conodonts have been found only in two of seven investigated samples (depth 374.6 and 373.3 m; see Tab. 1). The top of the Detrital Limestone Unit has been determined as belonging to the Frasnian *jamieae* Zone. The *jamieae* Zone was recognized in the uppermost part of the unit (depth 373.3 m) due to the presence of the zonal indicator, *Palmatolepis jamieae* Ziegler et Sandberg (Pl. I, Fig. 3; compare also W. Ziegler, C. A. Sandberg, 1990), as well as in the lowermost part of the overlying Nodular Limestone Unit (see below).

NODULAR LIMESTONE UNIT

The lower boundary of the unit coincides with a vertical facies transition from the biodetrital proximal fore-reef deposition to the onlapping darker coloured wackestones and packstones with a decreased proportion of organic skeletons. The latter sediments represent a more distal upper slope environment with at least intermittent (storm-generated?) water turbulence and close to a transition between the aerobic and dysaerobic zone (M. Narkiewicz, K. Narkiewicz, 1992).

Conodonts have been found within the whole thickness of the investigated unit. They are sparse to moderately abundant (Tab. 1). The age of the lowermost part of the Nodular Limestone Unit has been determined as *jamieae* Zone by the presence of *Palmatolepis ederi* Ziegler et Sandberg (depth 369.5 m) and *Pal. jamieae* Ziegler et Sandberg (depth 368.6 m), and by the absence of *Pal. rhenana nasuta* Müller which marks the lower limit of the Lower *rhenana* Zone (Fig. 4; compare W. Ziegler, C. A. Sandberg, 1990). These two important species were found in addition to many polygnathids (i.e., *Polygnathus aequalis* Klapper et Lane, *Pol. alatus* Huddle, *Pol. decorosus* Stauffer, *Pol. pacificus* Savage et Funai and *Pol. webbi* Stauffer) and icriodids (i.e., *Icriodus praealternatus* Sandberg, Ziegler et Dreesen and *I. subterminus* Youngquist).

Relatively numerous conodonts were found in the samples from depths 347.0 and 337.7 m situated in the middle part of the unit. The presence of *Palmatolepis rhenana nasuta* Müller (Pl. I, Fig. 4) and, at the same time, the absence of conodonts of the Upper *rhenana* Zone indicate the Lower *rhenana* Zone (W. Ziegler, C. A. Sandberg, 1990). *Pal. rhenana nasuta* Müller has been found together with numerous *Icriodus praealternatus* Sandberg, Ziegler et Dreesen and *Polygnathus pacificus* Savage et Funai (Tab. 1).

The age of the uppermost investigated samples (depths 331.4 and 326.3 m) can be narrowed to the lower part of the Upper *rhenana* Zone taking into account ranges of *Icriodus praealternatus* Sandberg, Ziegler et Dreesen and *Palmatolepis subrecta* Miller et Youngquist. *I. praealternatus* Sandberg, Ziegler et Dreesen disappears just above the base of the Upper *rhenana* Zone, whereas *Pal. subrecta* Miller et Youngquist first occurs at the base of this zone (W. Ziegler, C. A. Sandberg, 1990).

M. Narkiewicz and K. Narkiewicz (1992) dated the top of the Nodular Limestone Unit (depth 321.3–321.5 m) as the upper part of the Upper *rhenana* Zone (*op.cit.*, p. 287–289 and Tab. 1), taking into account the ranges of *Icriodus alternatus helmsi* Sandberg et

Dreesen and *Ancyrodella lobata* Branson et Mehl. At present it is known, however, that *I. alternatus helmsi* Sandberg et Dreesen first appeared at or just after the beginning of the Upper *rhenana* Zone (C. A. Sandberg *et al.*, 1992, Tab. 2 and 4) and not within the upper half of the Upper *rhenana* Zone as has been suggested previously by W. Ziegler and C. A. Sandberg (1990).

LAMINATED MARLY LIMESTONE UNIT

The Laminated Marly Limestone Unit is composed of a monotonous sequence of dark grey to black bituminous marly lime mudstones and marls. The skeletal abundance is generally low and restricted to small pelagic forms including tentaculitoids, radiolaria, foraminifers, entomozoid ostracodes, and rare brachiopods.

The base of the unit records an onlap of the middle slope to off-reef basin facies (M. Narkiewicz, K. Narkiewicz, 1992). According to the interpretation in the cited paper, the Late Devonian shelf basin was characterized by aphotic and anaerobic conditions below storm wave-base, i.e., with water depths exceeding 100 m.

The lower part of the Laminated Marly Limestone Unit was analysed in detail by M. Narkiewicz and K. Narkiewicz (1992). Unfortunately, only conodonts with relatively wide stratigraphic ranges were found in the lowermost samples from the depth interval 313.7–320.6 m (see Tab. 1 in M. Narkiewicz, K. Narkicwicz *op.cit.*). According to the suggestion of the cited authors, they represent an age interval not exceeding the upper part of the Upper *rhenana* to *linguiformis* Zones. For the aims of the present paper, an additional conodont sample was collected (318.5 m). Here, the co-occurrence of *Icriodus praealternatus* Sandberg, Ziegler et Dreesen (Pl. I, Fig. 2) and *Palmatolepis gigas gigas* Miller et Youngquist (Pl. I, Fig. 8) points to the lower part of the Upper *rhenana* Zone (W. Ziegler, C. A. Sandberg, 1990; C. A. Sandberg *et al.*, 1992). The ranges of conodonts found by M. Narkiewicz and K. Narkiewicz (1992) have been restudied in order to achieve a consistency with more recent data (C. A. Sandbcrg *et al.*, 1992). As a consequence, the earlier stratigraphic conclusion has been revised. The basal part of the Laminated Marly Limestone Unit is now dcfinitely dated as the lower part of the Upper *rhenana* Zone. The Upper *rhenana* Zone is present up to a depth of 275.8 m (Tab. 1).

The Lower or lowermost Middle *crepida* Zone has been identified at depth 154.3 m (Tab. 2) based on the first occurrence of *Palmatolepis wolskae* Ovnatanova (Pl. II, Fig. 7), *Pal. minuta loba* Helms (Pl. II, Fig. 5), *Pal. quadrantinodosalobata* Sannemann and *Ancyrolepis cruciformis* Ziegler (Pl. II, Fig. 6) at the base of the Lower *crepida* Zone and the last occurrence of *Palmatolepis triangularis* Sannemann→ *Pal. quadrantinodosalobata* Sannemann and *Ancyrolepis cruciformis* Ziegler slightly above the base of the Middle *crepida* Zone (W. Ziegler, C. A. Sandberg, 1990).

The samples, located below the top of the described unit (depths 110.7 and 105.1 m) are dated as the Lower *rhomboidea* Zone based on the co-occurrence of *Palmatolepis rhomboidea* Sannemann (Pl. IV, Fig. 2), *Pal. poolei* Sandberg et Ziegler (Pl. IV, Fig. 4), *Pal. subperlobata* Branson et Mchl, *Pal.* cf. *regularis* Cooper, *Icriodus alternatus alternatus* Branson et Mehl (Pl. IV, Fig. 1) and *Polygnathus bouckaerti* Dreesen et Dusar (Pl. IV, Fig. 5). First of the above species is restricted to the lowermost part of the Lower *rhomboidea*

Distribution and frequency of the Famennian platform

Conodonts	Conodont zones	
	CR_1?	CR_1 / CR_2
	depth [m]	
	208.7	154.3
1	2	3
Palmatolepis rugosa rugosa Branson et Mehl, 1934*a*	–	–
Polygnathus styriacus Ziegler, 1957	–	–
Polygnathus granulosus Branson et Mehl, 1934*a*	–	–
Polygnathus szulczewskii Matyja, 1974	–	–
Palmatolepis rugoso trachytera Ziegler, 1960	–	–
Mehlina strigosa (Branson et Mehl, 1934*a*)	–	–
Branmehla werneri (Ziegler, 1962)	–	–
Polygnothus fallax Helms et Wolska, 1967	–	–
Polygnathus glaber glaber Ulrich et Bassler, 1926	–	–
Polygnathus glaber medius Helms et Wolska, 1967	–	–
Polygnathus ex gr. *nodocostatus* Branson et Mehl, 1934*a*	–	–
Polygnathus nodoundatus Helms, 1959	–	–
Polygnathus pomeranicus Matyja, 1993	–	–
Polylophodonta confluens (Ulrich et Bassler, 1926)	–	–
Palmatolepis glabra lepta Ziegler et Huddle, 1969	–	–
Palmatolepis gracilis gracilis Branson et Mehl, 1934*a*	–	–
Palmatolepis marginifera marginifero Helms, 1959	–	–
Palmatolepis perlobata (gerontic, bizzare specimen) Ulrich et Bassler, 1926	–	–
Palmatolepis quadrantinodosa quadrantinodosa Branson et Mehl, 1934*a*	–	–
Palmatolepis quadrantinodosa inflexa Müller, 1956	–	–
Palmatolepis quadrantinodosa inflexa → *Palmatolepis marginifera*	–	–
Palmatolepis quadrantinodosa inflexoidea Ziegler, 1962	–	–
Palmatolepis stoppeli Sandberg et Ziegler, 1973	–	–
Palmatolepis sp. (juvenile specimen)	–	–
Alternognathus pseudostrigosus (Dreesen et Dusar, 1974)	–	–
Mehlina gradata Youngquist, 1945	–	–
Polygnathus bouckaerti Dreesen et Dusar, 1974	–	–
Polygnathus nodocostatus nodocostatus Branson et Mehl, 1934*a*	–	–
Polygnathus procerus → *Polygnathus glaber*	–	–
Palmatolepis glabra acuta Helms, 1963	–	–
Palmatolepis glabra pectinata Ziegler, 1962	–	–
Palmatolepis glabra prima Ziegler et Huddle, 1969	–	–
Palmatolepis perlobata perlobata Ulrich et Bassler, 1926	–	–
Palmatolepis perlobata schindewolfi Müller, 1956	–	–
Palmatolepis poolei Sandberg et Ziegler, 1973	–	–
Palmatolepis rhomboidea Sannemann, 1955*o*	–	–
Icriodus alternatus alternatus Branson et Mehl, 1934*a*	–	12
"*Icriodus*" *cornutus* Sannemann, 1955*a*	–	–

Table 2

conodonts in the Janczyce I section

Conodont zones											
CR_2		RO_1		MR_1				TA		PO — EX_1	EX
depth [m]											
145.7	137.2	110.7	105.1	89.5	89.2	77.5	58.0 -57.5	56.5	55.2	14.8	13.6
4	5	6	7	8	9	10	11	12	13	14	15
–	–	–	–	–	–	–	–	–	–	–	1
–	–	–	–	–	–	–	–	–	–	1	–
–	–	–		–	–	–	–	2	–	–	–
–	–	–	–	–	–	–	–	5	–	–	–
–	–	–	–	–	–	–	–	1	–	–	–
–	–	–	–	–	–	5	4	–	–	–	–
–	–	–	–	–	–	–	1	–	–	1	–
–	–	–	–	–	–	2	–	–	–	–	–
–	–	–	–	–	16	–	–	–	–	–	–
–	–	–	–	6	–	1	4	–	–	–	–
–	–	–	–	2	–	–	–	–	–	–	–
–	–	–	–	1	–	–	–	–	–	–	–
–	–	–	–	–	–	–	1	–	–	–	–
–	–	–	–	–	6	–	1	–	–	–	–
–	–	–	–	23	52	–	8	9	8	–	–
–	–	–	–	–	3	–	1	1	–	5	2
–	–	–	–	–	–	1	5	–	–	–	–
–	–	–	–	–	–	–	1	–	–	–	–
–	–	–	–	–	14	1	–	–	–	–	–
–	–	–	–	3	28	–	–	–	–	–	–
–	–	–	–	–	2	–	–	–	–	–	–
–	–	–	–	–	6	–	4	–	–	–	–
–	–	–	–	1	–	–	–	–	–	–	–
–	–	–	–	–	–	–	1	–	–	–	–
–	–	–	–	1	3	4	3	–	–	–	–
–	–	–	3	–	–	–	–	–	–	–	–
–	–	1	–	–	–	–	–	–	–	–	–
–	–	1	–	–	1	1	1	–	–	–	–
–	–	3	9	–	–	–	–	–	–	–	–
–	–	–	13	–	–	–	–	–	–	–	–
–	–	–	17	3	14	–	6	–	–	–	–
–	–	8	61	1	–	–	22	–	–	–	–
–	–	1	–	–	–	–	–	–	–	–	–
–	–	–	1	1	16	3	3	–	1	2	–
–	–	1	–	–	–	–	–	–	–	–	–
–	–	–	4	3	2	–	–	–	–	–	–
–	–	2	9	–	–	–	–	–	–	–	–
–	2	–	–	–	–	–	–	–	–	–	–

1	2	3
Pelekysgnathus planus Sannemann, 1955*a*	–	–
Mehlina spp.	–	–
Polygnathus brevilaminus Branson et Mehl, 1934*a*	–	9
Polygnathus communis communis Branson et Mehl, 1934*b*	–	–
Polygnathus delenitor Drygant, 1986	–	–
Polygnathus lauriformis Dreesen et Dusar, 1974	–	–
Polygnathus procerus Sannemann 1955*a*	–	9
Ancyrolepis cruciformis Ziegler, 1959	–	2
Palmatolepis circularis Szulczewski, 1971	–	–
Palmatolepis crepida Sannemann, 1955*b*	–	–
Palmatolepis crepida → *Palmatolepis termini*	–	–
Palmatolepis minuta minuta Branson et Mehl, 1934*a*	–	13
Palmatolepis minuta loba Helms, 1963	–	14
Palmatolepis minuta wolskae Szulczewski, 1971	–	–
Palmatolepis cf. *regularis* Cooper, 1931	–	–
Palmatolepis quadrantinodosalobata Sannemann, 1955*a*	1	5
Palmatolepis subperlobata Branson et Mehl, 1934*a*	–	–
Palmatolepis tenuipunctata Sannemann, 1955*b*	–	12
Palmatolepis tenuipunctata → *Palmatolepis glabra prima*	–	–
Palmatolepis termini Sannemann, 1955*b*	–	–
Palmatolepis triangularis → *Palmatolepis crepida*	–	7
Palmatolepis triangularis → *Palmatolepis perlobata*	–	–
Palmatolepis triangularis → *Palmatolepis quadrantinodosalobata*	–	3
Palmatolepis wolskae Ovnatanova, 1969	–	14
Palmatolepis wolskae → *Palmatolepis subperlobata*	–	–
TOTAL PLATFORM ELEMENTS	1	100

Conodont zones: CR — *crepida* (CR_1 — Lower, CR_2 — Upper), RO_1 — Lower *rhomboidea*, MR_1 — Lower

Zone, while the last occurrence of *Pal. subperlobata* Branson et Mehl is noted within this zone and *Pol. bouckaerti* Dreesen et Dusar first appeared at the base of the zone (C. A. Sandberg, W. Ziegler, 1973; R. Dreesen, M. Dusar, 1974). The top of the Laminated Marly Limestone Unit (89.5 m) belongs to the lowermost part of the Lower *marginifera* Zone on the basis of co-occurrence of *Palmatolepis rhomboidea* Sannemann (Pl. IV, Fig. 3), *Pal. stoppeli* Sandberg et Ziegler (Pl. IV, Fig. 11), *Pal. quadrantinodosa inflexa* Müller, *Polygnathus glaber medius* Helms et Wolska and *Pol. nodoundatus* Helms (Tab. 2). The highest range of the first three species is up to the top of the Lower *marginifera* Zone, whereas the last two forms first occurred at the base of the zone.

The monotonous sequence of marly lime mudstones and marls of the Laminated Marly Limestone Unit is punctuated by a few limestone interbeds with a common to abundant skeletal content often including cephalopods, and displaying relatively high conodont frequency. Two occurrences of the above skeletal wackestones deserve special attention and are described below in more detail: the microcoquina at the Frasnian/Famennian boundary and the cephalopod limestone horizons in the upper part of the analysed lithostratigraphic unit.

Tab. 2 continued

4	5	6	7	8	9	10	11	12	13	14	15
19	9	–	–	–	–	–	–	–	–	–	–
–	3	–	–	–	–	–	–	–	–	–	–
1	2	–	–	–	–	–	–	–	–	–	–
–	2	–	–	–	–	–	–	7	–	–	–
–	38	–	–	–	–	–	–	–	–	–	–
–	2	–	–	–	–	–	–	–	–	–	–
18	3	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
11	–	–	–	–	–	–	–	–	–	–	–
1	17	–	–	–	–	–	–	–	–	–	–
40	–	–	–	–	–	–	–	–	–	–	–
86	28	20	23	6	16	2	4	–	–	–	–
3	1	5	3	–	–	–	–	–	–	–	–
10	12	–	4	–	–	–	–	–	–	–	–
1	–	1	–	–	–	–	–	–	–	–	–
32	20	–	–	–	–	–	–	–	–	–	–
11	4	2	2	–	–	–	–	–	–	–	–
144	99	–	–	–	–	–	–	–	–	–	–
5	–	–	–	–	–	–	–	–	–	–	–
2	3	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–
14	–	–	–	–	–	–	–	–	–	–	–
23	–	–	–	–	–	–	–	–	–	–	–
5	–	–	–	–	–	–	–	–	–	–	–
14	–	–	–	–	–	–	–	–	–	–	–
440	245	45	149	51	179	20	70	25	9	9	3

marginifera, TA — *trachytera*, PO — *postera*, EX — *expansa* (EX_1 — Lower)

Microcoquina at the Frasnian/Famennian boundary. Within the depth interval 246.6–248.21 m, i.e., close to the Frasnian/Famennian boundary, H. Matyja and M. Narkiewicz (1992*b*) observed some phenomena connected with a reduction in the rate of carbonate sedimentation (hardgrounds and/or decrease in carbonate/clay ratio) as well as a presence of the characteristic bed of tentaculitoid microcoquina (21 cm thick) with abundant conodonts and less numerous cephalopods and brachiopods. The age of the latter bed was determined as the *linguiformis* Zone.

The time-equivalent of the tentaculitoid coquina from the Janczyce I borehole section is the Manticoceras Limestone from the Płucki section near Łagów, studied by Z. Wolska (1967) and H. Makowski (1971). This bituminous limestone, about 60 cm thick, contains abundant cephalopods, as well as numerous conodonts. Z. Wolska (1967) found here a rich conodont assemblage, i.e. *Ancyrodella curvata* (Branson et Mehl), *Ancyrognathus asymmetricus* (Ulrich et Bassler), *Icriodus alternatus* Branson et Mehl, *Palmatolepis linguiformis* Müller, *Pal. subrecta* Miller et Youngquist, *Pal. triangularis* Sannemann, *Polygnathus brevilaminus* Branson et Mehl, *Pol. webbi* Stauffer and *Pol. procerus* Sannemann. Among the conodonts typical of the Frasnian *linguiformis* Zone, including the nominal species in particular, some species occurring in the Famennian *triangularis* Zone were found. Their co-occurrence might suggest stratigraphic condensation. More recently, the Płucki section has been restudied by G. Racki (1993), who located the Frasnian/Famennian boundary near the top of the cephalopod limestone bed, described by him as a peculiar tentaculitoid-cephalopod-bivalve coquina.

The tentaculitoid coquina from the Janczyce I borehole section, as well as the cephalopod limestone horizon from the Płucki section correspond to the Upper Kellwasserkalk horizon, well known and widely distributed in Europe (compare C. A. Sandberg *et al.*, 1988; H. Matyja, M. Narkiewicz, 1992*b*).

Cephalopod limestones from Janczyce. Cephalopod remains have been found within the whole interval of the uppermost ca. 60 m of the Laminated Marly Limestone Unit. However, a much narrower depth interval between 137 and 150 m contains micritic limestone intercalations with abundant cephalopods and less frequent crinoid remains (Fig. 2). The cephalopod wackestones display minor clay admixture while at the same time they are enriched in finely crystalline pyrite replacing both skeletons and carbonate matrix. In some cases pyritization is clearly related to hardground development.

The two uppermost cephalopod limestone horizons (Fig. 2) contain rich and diverse conodonts (Tab. 2). The presence of *Palmatolepis crepida* Sannemann, *Pal. circularis* Szulczewski (Pl. III, Fig. 11), typical morphotypes of *Pal. termini* Sannemann, *Pal. minuta wolskae* Szulczewski and forms intermediate between *Pal. triangularis* Sannemann and *Pal. quadrantinodosalobata* Sannemann (Pl. III, Fig. 7) at a depth of 145.7 m allow for the determination of the Middle *crepida* Zone (compare W. Ziegler, C. A. Sandberg, 1990). In the same sample, however, there are numerous forms intermediate between *Pal. tenuipunctata* Sannemann and *Pal. glabra prima* Ziegler et Huddle (Tab. 2). Their occurrence might suggest proximity to the Upper *crepida* Zone. The younger cephalopod limestone horizon (depth 137.2 m) is characterized by an association of typical morphotypes of *Pal. termini* Sannemann (Pl. III, Fig. 1), *Pal. crepida* Sannemann (Pl. III, Fig. 4), *Pal. minuta wolskae* Szulczewski, *Polygnathus lauriformis* Dreesen et Dusar (Pl. III, Fig. 8), *Pol. brevilaminus* Branson et Mehl, *Pol. delenitor* Drygant (Pl. III, Figs. 5, 6), and *Pelekysgnathus planus* Sannemann (Pl. III, Figs. 9, 10). These taxa still characterize the Middle *crepida* Zone. The possible equivalent of the above cephalopod limestone intercalations has been studied by Z. Wolska (1967) and H. Makowski (1976) in the artificial exposures located a few hundreds metres from the Janczyce I borehole. According to H. Makowski (personal communication) the exposed limestone intercalations display lensoid geometry and considerable thickness (more than 1 m) while their lithology and biota are highly comparable to the above described beds. Z. Wolska (1967) found in the "cephalopod limestones from Janczyce" a rich conodont assemblage pointing, according to her, to the *crepida* Zone. The re-evaluation of the microfauna by the present authors allows for a further narrowing of the age interval probably to the Middle *crepida* Zone, taking into account the presence of typical forms of *Palmatolepis termini* Sannemann. It must be added, however, that Z. Wolska (*op.cit.*) determined in her samples a representative of the *Palmatolepis glabra* Group (illustrated as *Pal. glabra glabra* Ulrich et Bassler, her Pl. VII, Fig. 8) which elsewhere appears with the beginning of the Upper *crepida* Zone (W. Ziegler, C. A. Sandberg, 1990).

WAVY-BEDDED LIMESTONE UNIT

The unit in question is characterized by the presence of dark marly limestones displaying wavy or nodular textures, and with sparse to common remains of cephalopods, brachiopods and crinoids.

The conodont sample situated at the base of the Wavy-Bedded Limestone Unit (depth 89.2 m) has been dated as the Lower *marginifera* Zone on the basis of the co-occurrence of *Palmatolepis rhomboidea* Sannemann, *Pal. quadrantinodosa quadrantinodosa* Branson et Mehl (Pl. IV, Fig. 10), *Pal. quadrantinodosa inflexa* Müller (Pl. IV, Figs. 6, 9), *Pal. quadrantinodosa inflexoidea* Ziegler (Pl. IV, Fig. 8), and *Pal. glabra lepta* Ziegler et Huddle (Tab. 2). The highest range of the first four species is up to the top of the Lower *marginifera* Zone, whereas the latest form first occurred at the base of the Zone (W. Ziegler, C. A. Sandberg, 1984). Thus, taking into account the above analysed age of the upper part of the Laminated Marly Limestone Unit, the base of the Wavy-Bedded Limestone Unit runs within the Lower *marginifera* Zone (Fig. 4).

The top of the described unit (depth 57.5 m) still belongs to the Lower *marginifera* Zone, taking into account the ranges of *Palmatolepis marginifera marginifera* Helms (Pl. V, Fig. 4), *Polygnathus pomeranicus* Matyja, *Branmehla werneri* (Ziegler) (Pl. V, Fig. 2) and *Mehlina strigosa* (Branson et Mehl), as well as *Pal. quadrantinodosa inflexoidea* Ziegler (Pl. V, Fig. 3) and *Pol. glaber medius* Helms et Wolska (compare W. Ziegler, C. A. Sandberg, 1984; H. Matyja, 1993).

BLACK SHALE AND LIMESTONE UNIT

The uppermost Devonian lithostratigraphic unit distinguished in the Janczyce I borehole section is composed of black marly shales with subordinate thin- and regularly-bedded lime mudstones. The latter are almost black and contain a considerable clay admixture. Biotic components consist mostly of compacted brachiopod and bivalve shells.

The lowermost conodont sample, situated 0.5 m above the base of the unit (depth 56.5 m), has been dated as the *trachytera* Zone based on the presence of *Palmatolepis rugosa trachytera* Ziegler (Pl. V, Fig. 6) and *Pal. glabra lepta* Ziegler et Huddle (Tab. 2). *Pal. rugosa trachytera* Ziegler first appears at the base of the Lower *trachytera* Zone, whereas *Pal. glabra lepta* Ziegler et Huddle terminates within the Upper *trachytera* Zone (W. Ziegler, C. A. Sandberg, 1984).

It is important to recall that the topmost part of the Wavy-Bedded Limestone Unit, situated at depth 57.5 m, belongs to the Lower *marginifera* Zone, whereas the lowermost part of the Black Shale and Limestone Unit, situated only 1 m higher at depth 56.5 m, already belongs to the *trachytera* Zone (Fig. 4). There is a 1 m interval of uncertainty regarding the nature of the gap in the biostratigraphic record comprising at least the Upper and Uppermost *marginifera* Zones. The conodont data suggest the existence either of a condensed section or a hiatus within the critical interval.

Detailed lithological observations (Fig. 3) reveal that the lower sample (depth 57.5 m) represents grey bioturbated wackestones with brachiopods, crinoids and less abundant cephalopod fragments. In turn, the upper sample (56.5 m) is located in a skeletal-wackestone bed with common cephalopods, crinoids and brachiopods, rich in finely disseminated pyrite, and topped by a hardground surface. The critical interval between both the limestone beds is composed of nodules and irregular beds of lime wackestone to mudstone embedded in black calcareous shales to marls. Thus, although there is some evidence of decreased sedimentation rate around the critical interval (pyritization, nodules, bioturbation), it does not in fact, reveal, any signatures of discontinuous sedimentation (a hardground surface is developed slightly higher). Therefore, it is more probable that our conodont data represent a condensed section rather than hiatus.

The possible time-equivalent of this condensed interval from the Janczyce I section are the cephalopod limestones from the Dule section, studied by Z. Wolska (1967). Unfortunately, the published biostratigraphic data from the above section have low precision. Moreover, it seems that they were probably based on several rock samples derived from two beds of dark limestones about 1.8 and 1.3 m thick, respectively, and finally identified as a single conodont sample (compare Z. Wolska, *op.cit.*, p. 369). Among the conodonts typical of the Lower and Upper *marginifera* Zones which dominate in this "assemblage", there were found some species, ranges of which are limited to older and younger conodont zones. The highest known range of *Palmatolepis tenuipunctata* Sannemann limited to the Uppermost *crepida* Zone (W. Ziegler, C. A. Sandberg, 1990). *Palmatolepis minuta loba* Helms and *Pal. subperlobata* Branson et Mehl extend to the top of the Lower *rhomboidea* Zone (C. A. Sandberg, W. Ziegler, 1973). *Polygnathus triphyllatus* (Ziegler) and *Pol. rhomboideus* Ulrich et Bassler are known only from the Lower *marginifera* Zone, whereas *Scaphignathus velifer* Helms, *Spathognathus inornatus* Branson et Mehl (= *Branmehla inornata*), *S. bohlenanus* Helms (= *Branmehla bohlenana*) and *Pol. subserratus* Branson et Mehl (= *Alternognathus regularis* Ziegler et Sandberg) already appear beginning at the base of the Uppermost *marginifera* Zone (compare H. Matyja, 1993). Finally, *Palmatolepis rugosa trachytera* Ziegler marks the beginning of the Lower *trachytera* Zone (W. Ziegler, C. A. Sandberg, 1984). The "co-occurrence" of the above taxa in a single assemblage, suggests the presence of a condensed sequence within the cephalopod limestones in the Dule section. In the light of the available data it is difficult to determine, however, a time-span for this phenomenon, as well as the "internal organization" of this condensed sequence. If all taxonomic decisions of Z. Wolska (1967) are correct, it is possible that these two beds of cephalopod limestone might comprise at least 7 standard conodont zones, from the *crepida* up to the *trachytera* Zone, although it is difficult to preclude presence of some stratigraphic gaps within this condensed sequence. If the aforementioned supposition is true, the two beds of cephalopod limestone from the Dule section may represent a strongly condesed time-equivalent of deposits from the Janczyce I section, beginning with the cephalopod limestones from Janczyce at the base, dated as the Middle *crepida* Zone, up to the condensed interval within the *marginifera* and *trachytera* Zones at the top. However, more biostratigraphic and microfacies analysis is needed to clarify this problem.

The top of the Black Shale and Limestone Unit in the Janczyce I section is erosional and Upper Devonian sediments are overlain here by Quaternary deposits. The youngest dated deposits of the unit, within the depth interval 13.6 –14.8 m (Tab. 2), belong to the *postera* and/or *expansa* conodont Zone(s). The presence of *Polygnathus styriacus* Ziegler (Pl. V, Fig. 7) and *Branmehla werneri* (Ziegler) at a depth of 14.8 m suggests an age interval from the *postera* to Lower *expansa* Zone (C. A. Sandberg, W. Ziegler, 1979; W. Ziegler, C. A. Sandberg, 1984), whereas *Palmatolepis rugosa rugosa* Branson et Mehl (Pl. V, Fig. 9) found at depth 13.6 m documents the *expansa* Zone but without its uppermost part (W. Ziegler, C. A. Sandberg, 1984).

The outcrop equivalents of the described unit were reported by J. Samsonowicz from the presently non-existing exposures in Bratków village near Opatów. They were ascribed by the cited author to the cephalopod Laevigites Zone (= Cymaclymenia Stufe), which may represent the conodont postera Zones together with the expansa Zones but without their uppermost part.

SUMMARY OF THE RESULTS

Given the exceptionally wide range and completeness of the stratigraphic record and also the quality of the core, the Janczyce I borehole may be regarded as a unique key section for regional correlations in the southern (Kielce) region of the Holy Cross area (Fig. 1). The results of the present studies enable more refined correlations with the Upper Devonian part of the studied section due to placing several important lithostratigraphic boundaries within a precise framework of the standard conodont zonation (Fig. 4). The lowermost dated deposits represent the upper part of the Detrital Limestone Unit and were assigned to the *jamieae* Zone of a middle part of the Frasnian Stage. In view of a lack of conodonts it was impossible to constrain the age of the Upper Sitkówka Beds (Fig. 1) which probably represent lower Frasnian as suggested by rugose corals, foraminifers and algae determinations. The uppermost part of the studied section belong to the Lower through Upper *expansa* Zones, more precise dating being impossible at the moment.

The present studies revealed a stratigraphic gap or, more probably, condensation spanning at least the Upper through Uppermost *marginifera* Zones (Fig. 3). Interstingly, the above phenomenon occurs within an entirely shelf-basinal depositional system in contrast to often reported hiatuses and/or condensations related to drowned coral-stromatoporoid platforms or buildups (e.g., M. Szulczewski, 1978). The regionally widespread range of the phenomenon in question is suggested by a critical revaluation of the conodont data reported by Z. Wolska (1967) from the Łagów area to the west of the Janczyce I borehole. Also, two characteristic cephalopod-bearing levels or intervals within a monotonous basinal sequence have been dated and correlated with their outcrop equivalents near the Janczyce and Łagów villages. These are: (1) the tentaculitoid microcoquina (*linguiformis* Zone), a probable equivalent of the Upper Kellwasserkalk horizon, and (2) the cephalopod limestones from Janczyce (Middle *crepida* Zone). These levels revealed a potential for precise time-correlations on at a least sub-regional scale.

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Hanna MATYJA, Marek NARKIEWICZ

STRATYGRAFIA KONODONTOWA GÓRNEGO DEWONU W PROFILU JANCZYCE I (WSCHODNIA CZĘŚĆ GÓR ŚWIĘTOKRZYSKICH)

Streszczenie

Przedmiotem opracowania jest analiza biostratygraficzna osadów górnodewońskich w profilu otworu wiertniczego Janczyce I, usytuowanego we wschodniej części Gór Świętokrzyskich. Profil ten, ze względu na pełny zapis stratygraficzny (środkowy-górny dewon), może być traktowany jako kluczowy i stanowić podstawę wszelkich korelacji regionalnych w południowym (kieleckim) regionie obszaru świętokrzyskiego. Nieformalny podział litostratygraficzny profilu Janczyce I został ustalony przez M. Narkiewicza i I. Olkowicz-Paprocką (1983).

W artykule zaprezentowano syntezę szczegółowych badań biostratygraficznych osadów górnodewońskich, zwracając jednak bardziej uwagę na datowania granic jednostek litostratygraficznych o randze formacji lub ogniw niż na charakterystykę kolejnych poziomów konodontowych (fig. 4). Najniższe datowane za pomocą konodontów osady, reprezentujące górną część wapieni detrytycznych, zaliczono do frańskiego poziomu *jamieae*. Osady starsze, należące w tym profilu do górnych warstw sitkówczańskich (fig. 1), pozbawione są konodontów. Na podstawie wstępnego opracowania koralowców *Rugosa* (T. Wrzołek, informacja ustna) oraz otwornic i glonów (H. Ozonkowa, 1980, materiały archiwalne) można je przypuszczalnie zaliczyć do niższego franu. Wapienie gruzłowe, leżące ponad wapieniami detrytycznymi, datowane są w części spągowej na poziom *jamieae*, zaś w części stropowej na dolną część górnego poziomu *rhenana* (górna część franu). Następna, młodsza jednostka litostratygraficzna — laminowane wapienie margliste — zawiera się między dolną częścią górnego poziomu *rhenana* a najniższą częścią dolnego poziomu *marginifera*. Wyżej leżące wapienie faliste mieszczą się całkowicie w obrębie dolnego poziomu *marginifera*. Czarne łupki i wapienie datowane są w części spągowej na poziom *trachytera*. Strop tej jednostki jest jednak erozyjnie ścięty i przykryty osadami czwartorzędowymi. Najmłodsze datowane partie profilu, biegnące w obrębie jednostki czarnych łupków i wapieni, należą do górnofameńskiego, bliżej nieokreślonego poziomu *expansa* (fig. 4).

Wykazano obecność luki stratygraficznej lub, co bardziej prawdopodobne, kondensacji stratygraficznej, przypadającej co najmniej na górny i najwyższy poziom *marginifera*, a być może i na część poziomu *trachytera* (fig. 3 i 4), usytuowanej na pograniczu dwóch jednostek litostratygraficznych: wapieni falistych oraz czarnych łupków i wapieni. Luki i kondensacje stratygraficzne w Górach Świętokrzyskich są powszechne w osadach pokrywających zatopione platformy węglanowe lub budowle organiczne (por. M. Szulczewski, 1978). W badanym przypadku zjawiska te występują w obrębie głębszego środowiska depozycyjnego, jakim jest basen szelfowy. Ponadlokalny zasięg tego zjawiska wydają się sugerować dane uzyskane z przeglądu uaktualnionych zasięgów stratygraficznych konodontów, pochodzących z profilu Dule koło Łagowa, badanych tam przez Z. Wolską (1967).

W monotonnej sekwencji basenowej (jednostka laminowanych wapieni marglistych) stwierdzono dwa charakterystyczne poziomy lub interwały wapieni z głowonogami: (1) mikromuszlowiec tentakulitoidowy, datowany na poziom *linguiformis*, będący odpowiednikiem wiekowym powszechnie znanego w Europie górnego poziomu Kellwasserkalk (por. H. Matyja, M. Narkiewicz, 1992) oraz (2) interwał z kilkoma warstwami wapienia głowonogowego, datowany na środkowy poziom *crepida* (fig. 2). Oba poziomy (interwały) głowonogowe wyróżnione w profilu Janczyce I skorelowano z ich odpowiednikami wiekowymi, znanymi z naturalnych odsłonięć ze wschodniej części Gór Świętokrzyskich. Mikromuszlowiec tentakulitoidowy może być korelowany z wapieniem mantikocerasowym z profilu Płucki koło Łagowa, badanego przez Z. Wolską (1967) oraz G. Rackiego (1993), a wapienie głowonogowe z wapieniem z Janczyc, znanym z odsłonięcia usytuowanego tylko kilkaset metrów od otworu wiertniczego, a badanego przez Z. Wolską (1967) oraz H. Makowskiego (1976).

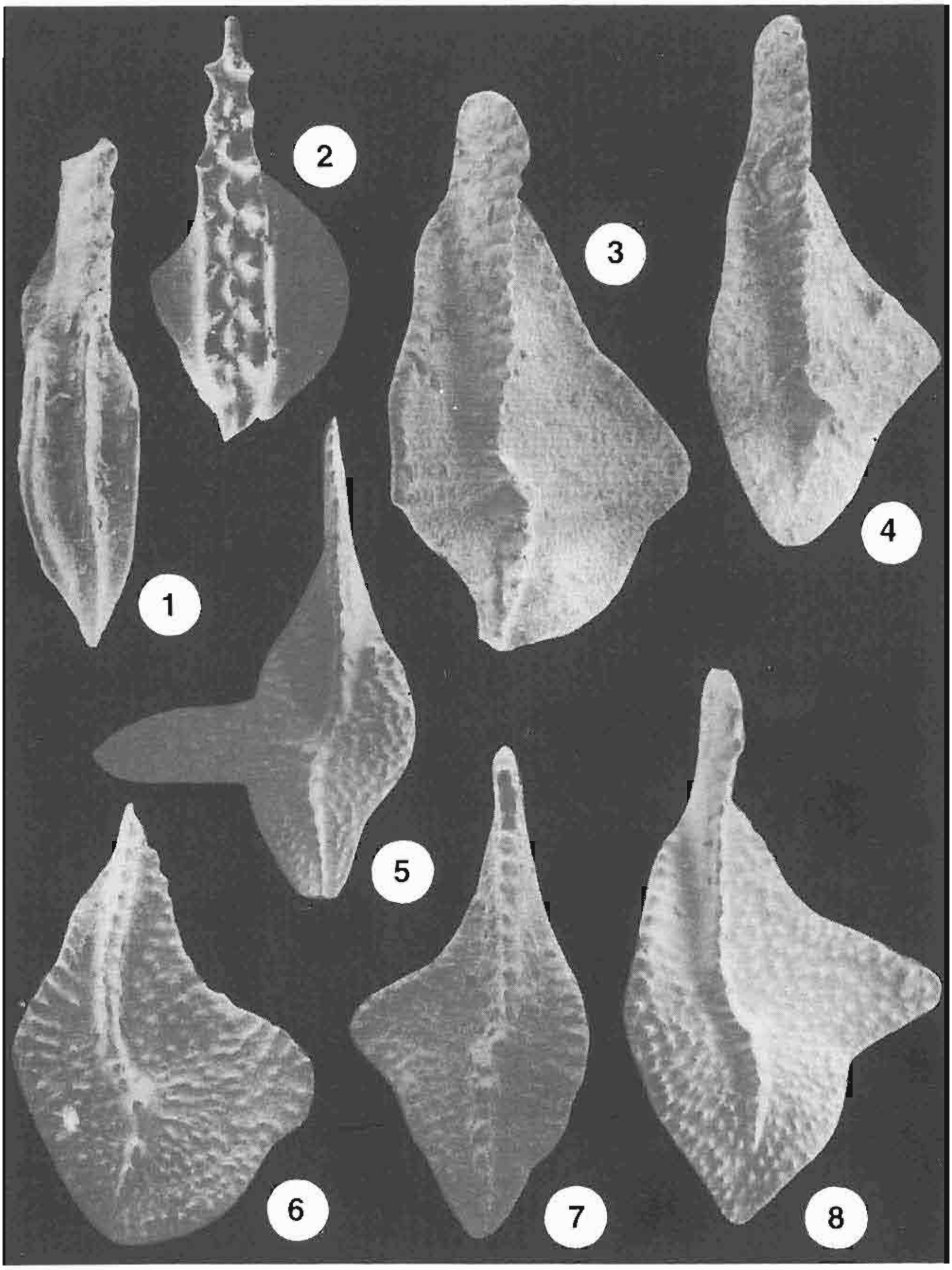
Wymienione poziomy głowonogowe i poziom kondensacji (lub luki) stratygraficznej wydają się być potencjalnymi poziomami korelacyjnymi, przynajmniej na skalę subregionalną.

PLATE I

Fig. 1. *Polygnathus pacificus* Savage et Funai, 1980
SMF 440, x 80
Fig. 2. *Icriodus praealternatus* Sandberg, Ziegler et Dreesen, 1992
SMF 494, x 90
Fig. 3. *Palmatolepis jamieae* Ziegler et Sandberg, 1990
SMF 447, x 100
Fig. 4. *Palmatolepis rhenana nasuta* Müller, 1956
SMF 442, x 100
Fig. 5. *Palmatolepis rhenana rhenana* Bishoff, 1956
SMF 757, x 35
Fig. 6. *Palmatolepis rotunda* Ziegler et Sandberg, 1990
SMF 767, x 70
Fig. 7. *Palmatolepis gigas extensa* Ziegler et Sandberg, 1990
SMF 760, x 50
Fig. 8. *Palmatolepis gigas gigas* Miller et Youngquist, 1947
SMF 491, x 60

Figs. 1, 3 — the *jamieae* Zone, top of the Detrital Limestone Unit, depth 373.3 m; Figs. 2, 8 — the Upper *rhenana* Zone, base of the Laminated Marly Limestone Unit, depth 318.5 m; Fig. 4 — the Lower *rhenana* Zone, the Nodular Limestone Unit, depth 347.7 m; Figs. 5–7 — the Upper *rhenana* Zone, the Laminated Marly Limestone Unit, depth 287.7 m; upper views

Fig. 1, 3 — poziom *jamieae*, strop jednostki wapieni detrytycznych, głęb. 373,3 m; fig. 2, 8 — górny poziom *rhenana*, spąg jednostki laminowanych wapieni marglistych, głęb. 318,5 m; fig. 4 — dolny poziom *rhenana*, jednostka wapieni gruzłowych, głęb. 347,7 m; fig. 5–7 — górny poziom *rhenana*, jednostka laminowanych wapieni marglistych, głęb. 287,7 m; widok górnej powierzchni platformy



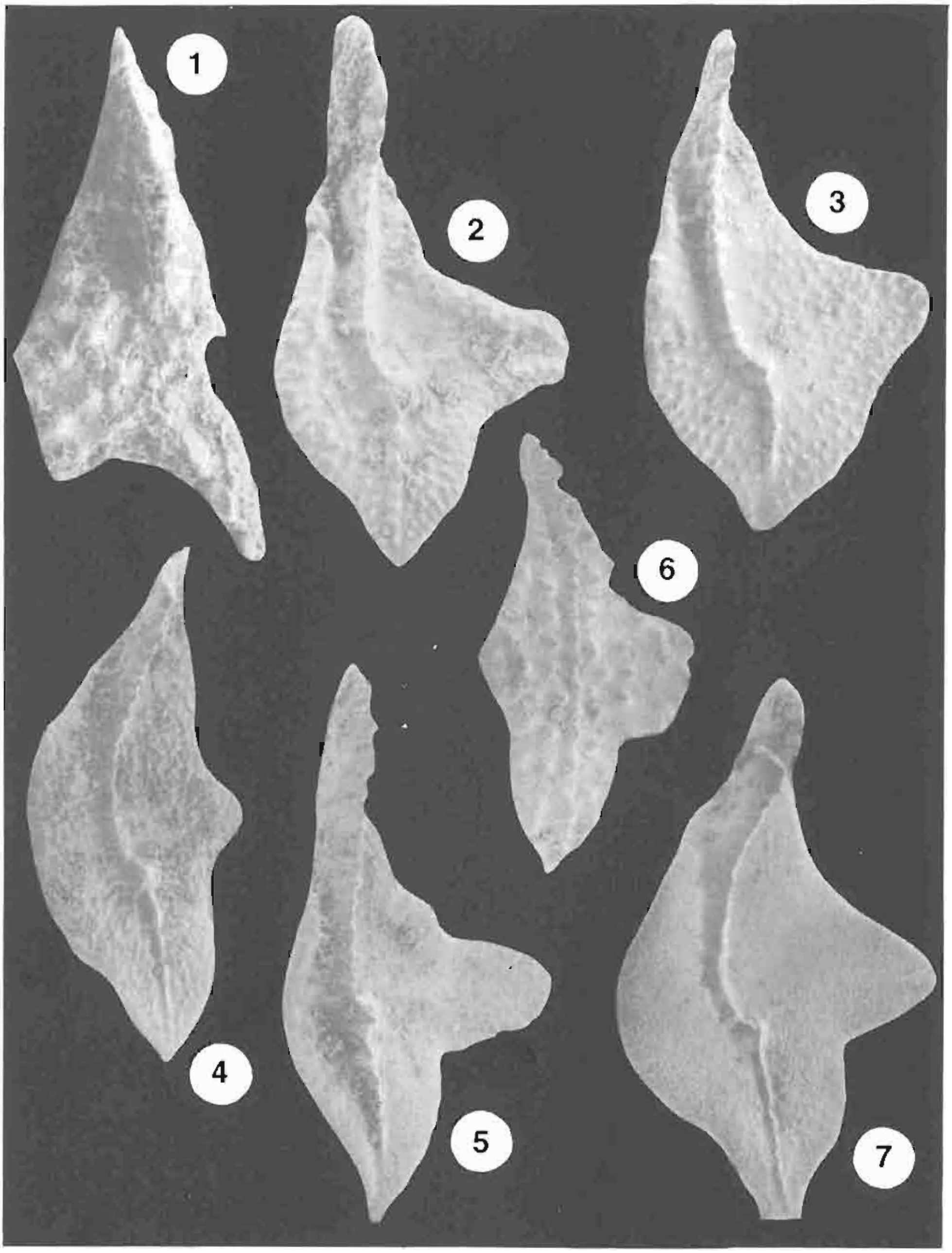
Hanna MATYJA, Marek NARKIEWICZ — Conodont stratigraphy of the Upper Devonian in the Janczyce I borehole section, eastern Holy Cross Mts.

PLATE II

Fig. 1. *Ancyrognathus asymmetricus* (Ulrich et Bassler, 1926)
SMF 519, x 80
Fig. 2. *Palmatolepis gigas paragigas* Ziegler et Sandberg, 1990
SMF 517, x 50
Fig. 3. *Palmatolepis subrecta* Miller et Youngquist, 1947
SMF 513, x 50
Fig. 4. *Palmatolepis triangularis* Sannemann, 1955*a* → *Palmatolepis crepida* Sannemann, 1955*b*
SMF 560, x 50
Fig. 5. *Palmatolepis minuta loba* Helms, 1963
SMF 555, x 90
Fig. 6. *Ancyrolepis cruciformis* Ziegler, 1959
SMF 549, x 100
Fig. 7. *Palmatolepis wolskae* Ovnatanova, 1969
SMF 554, x 60

Figs. 1–3 — the Upper *rhenana* Zone, the Laminated Marly Limestone Unit, depth 275.8 m; Figs. 4–7 — the Lower or lowermost Middle *crepida* Zone, the Laminated Marly Limestone Unit, depth 154.3 m; upper views

Fig. 1–3 — górny poziom *rhenana*, jednostka laminowanyeh wapieni marglistych, głęb. 275,8 m; fig. 4–7 — dolny lub najniższy środkowy poziom *crepida*, jednostka laminowanych wapieni marglistych, głęb. 154,3 m; widok górnej powierzchni platformy



Hanna MATYJA, Marek NARKIEWICZ — Conodont stratigraphy of the Upper Devonian in the Janczyce I borehole section, eastern Holy Cross Mts.

PLATE III

Fig. 1. *Palmatolepis termini* Sannemann, 1955*b*, typical morphotype
SMF 705, x 100, depth 137.2 m

Figs. 2, 3. *Palmatolepis termini* Sannemann, 1955*b* → *Palmatolepis crepida* Sannemann, 1955*b*
Fig. 2 — SMF 713, x 85; Fig. 3 — SMF 715, x 85; depth 145.7 m

Fig. 4. *Palmatolepis crepida* Sannemann, 1955*b*
SMF 708, x 35, depth 137.2 m

Figs. 5, 6. *Polygnathus delenitor* Drygant, 1986
Fig. 5 — lower view (widok platformy od strony dolnej), SMF 691, x 95; Fig. 6 — SMF 697, x 95; depth 137.2 m

Fig. 7. *Palmatolepis quadrantinodosalobata* Sannemann, 1955*a*
SMF 584, x 50, depth 145.7 m

Fig. 8. *Polygnathus lauriformis* Dreesen et Dusar, 1974
SMF 593, x 80, depth 137.2 m

Figs. 9, 10. *Pelekysgnathus planus* Sannemann, 1955*a*
Fig. 9 — SMF 632, x 150; Fig. 10 — side view (widok platformy z boku), SMF 634, x 150; depth 137.2 m

Fig. 11. *Palmatolepis circularis* Szulczewski, 1971
SMF 576, x 90, depth 145.7 m

Figs. 1–11 — the Middle *crepida* Zone, cephalopod limestones from Janczyce; upper views, unless otherwise stated

Fig. 1–11 — środkowy poziom *crepida*, wapienie głowonogowe z Janczyc; widok górny powierzchni platformy z wyjątkiem wskazanych

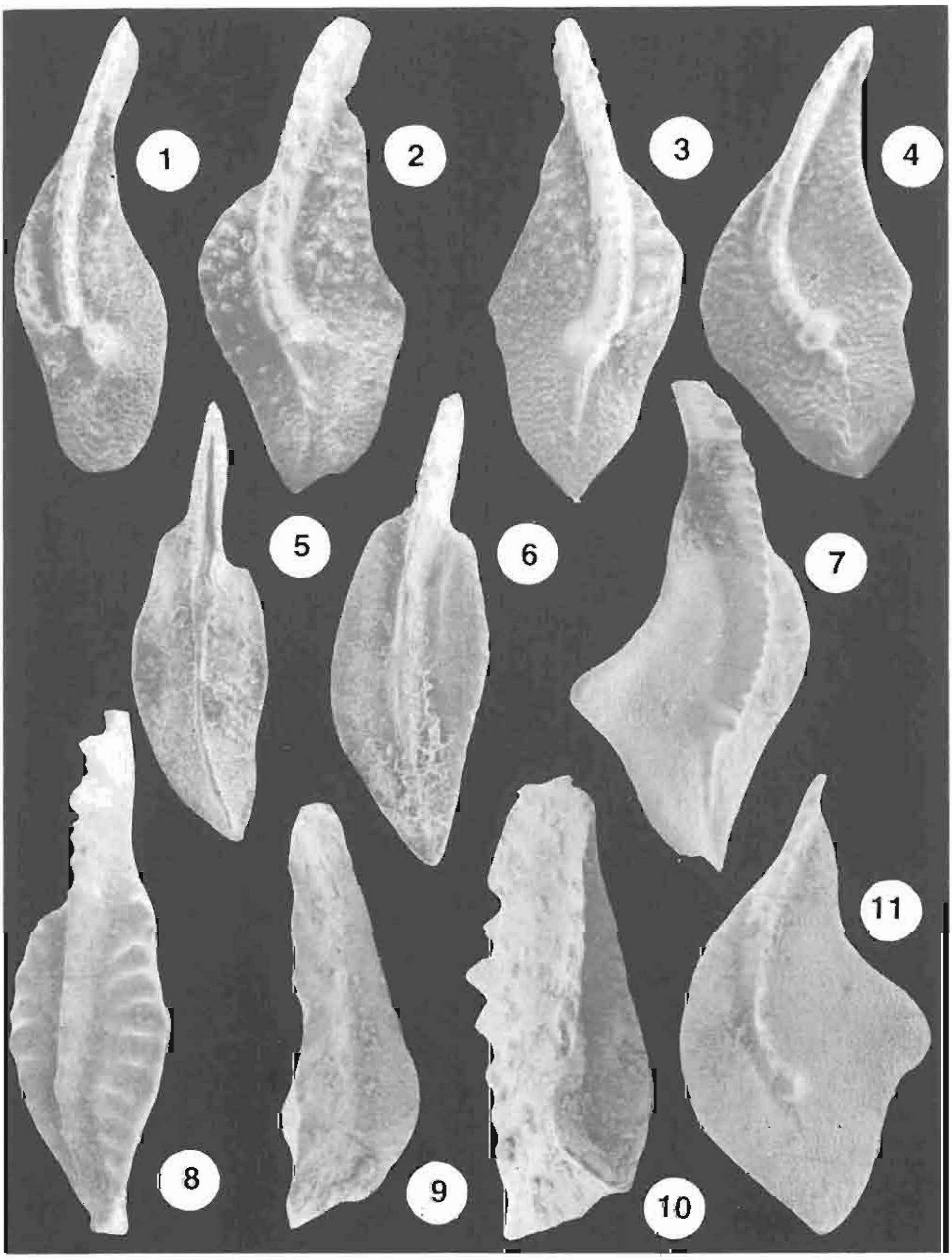


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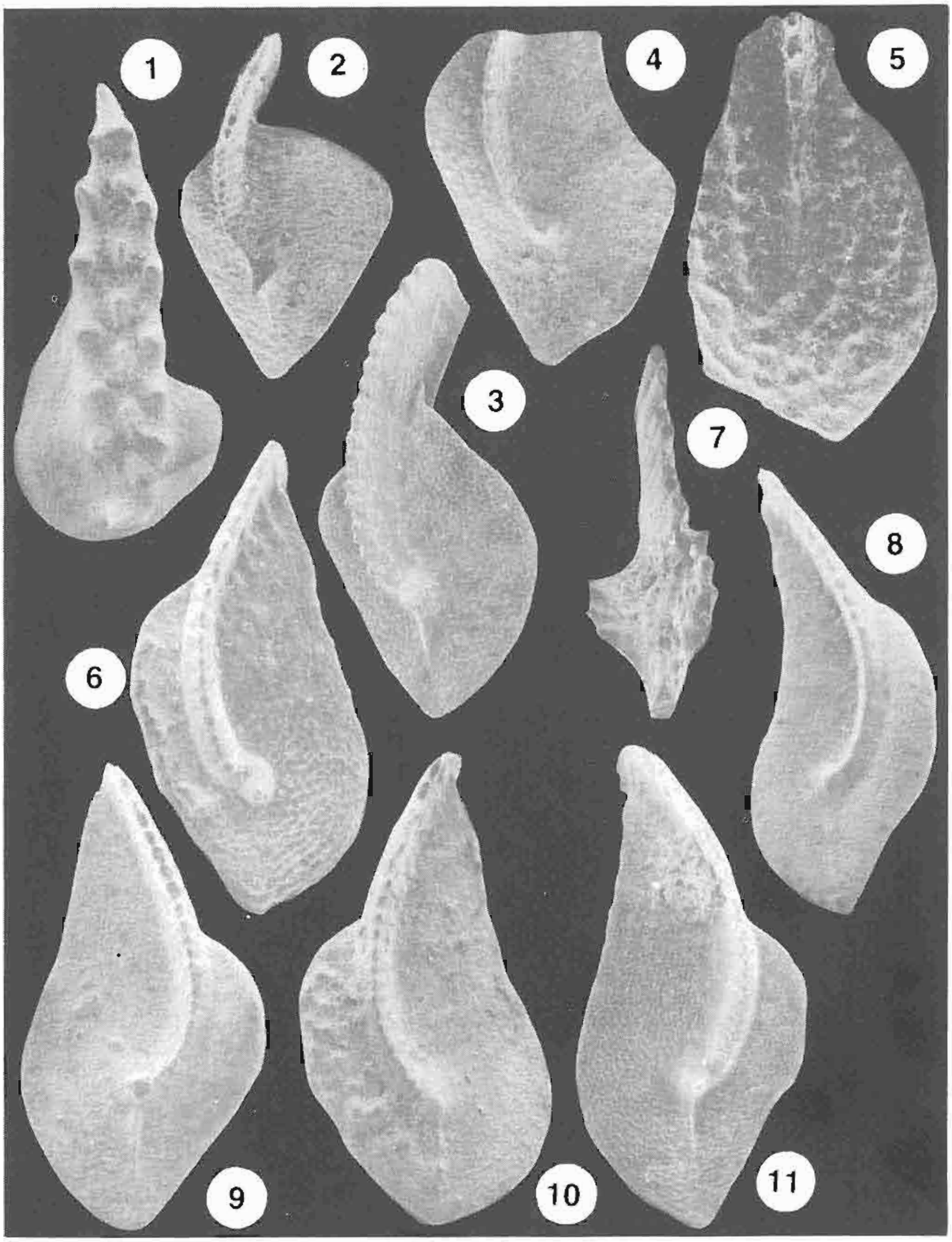
PLATE IV

Fig. 1. *Icriodus alternatus alternatus* Branson et Mehl, 1934*a*
SMF 752, x 80, depth 105.1 m
Figs. 2, 3. *Palmatolepis rhomboidea* Sannemann, 1955*a*
Fig. 2 — SMF 751, x 130, depth 105.1 m; Fig. 3 — SMF 749, x 110, depth 89.5 m
Fig. 4. *Palmatolepis poolei* Sandberg et Ziegler, 1973
SMF 753, x 64, depth 110.7 m
Fig. 5. *Polygnathus bouckaerti* Dreesen et Dusar, 1974
SMF 754, x 90, depth 110.7 m
Fig. 6. *Palmatolepis quadrantinodosa inflexa* Müller, 1956 → *Palmatolepis marginifera* Helms, 1959
SMF 745, x 135, depth 89.2 m
Fig. 7. *Alternognathus pseudostrigosus* (Dreesen et Dusar, 1974)
SMF 748, x 110, depth 89.2 m
Fig. 8. *Palmatolepis quadrantinodosa inflexoidea* Ziegler, 1962
SMF 743, x 70, depth 89.2 m
Fig. 9. *Palmatolepis quadrantinodosa inflexa* Müller, 1956
SMF 744, x 70, depth 89.2 m
Fig. 10. *Palmatolepis quadrantinodosa quadrantinodosa* Branson et Mehl, 1934*a*
SMF 742, x 80, depth 89.2 m
Fig. 11. *Palmatolepis stoppeli* Sandberg et Ziegler, 1973
SMF 750, x 90, depth 89.5 m

Figs. 1, 2, 4, 5 — the Lower *rhomboidea* Zone, the Laminated Marly Limestone Unit; Figs. 3, 11 — the Lower *marginifera* Zone, the Laminated Marly Limestone Unit; Figs. 6–10 — the Lower *marginifera* Zone, the Wavy Bedded Limestone Unit; upper views

Fig. 1, 2, 4, 5 — dolny poziom *rhomboidea*, jednostka laminowanych wapieni marglistych; fig. 3, 11 — dolny poziom *marginifera*, jednostka laminowanych wapieni marglistych; fig. 6–10 — dolny poziom *marginifera*, jednostka wapieni falistych; widok górnej powierzchni platformy



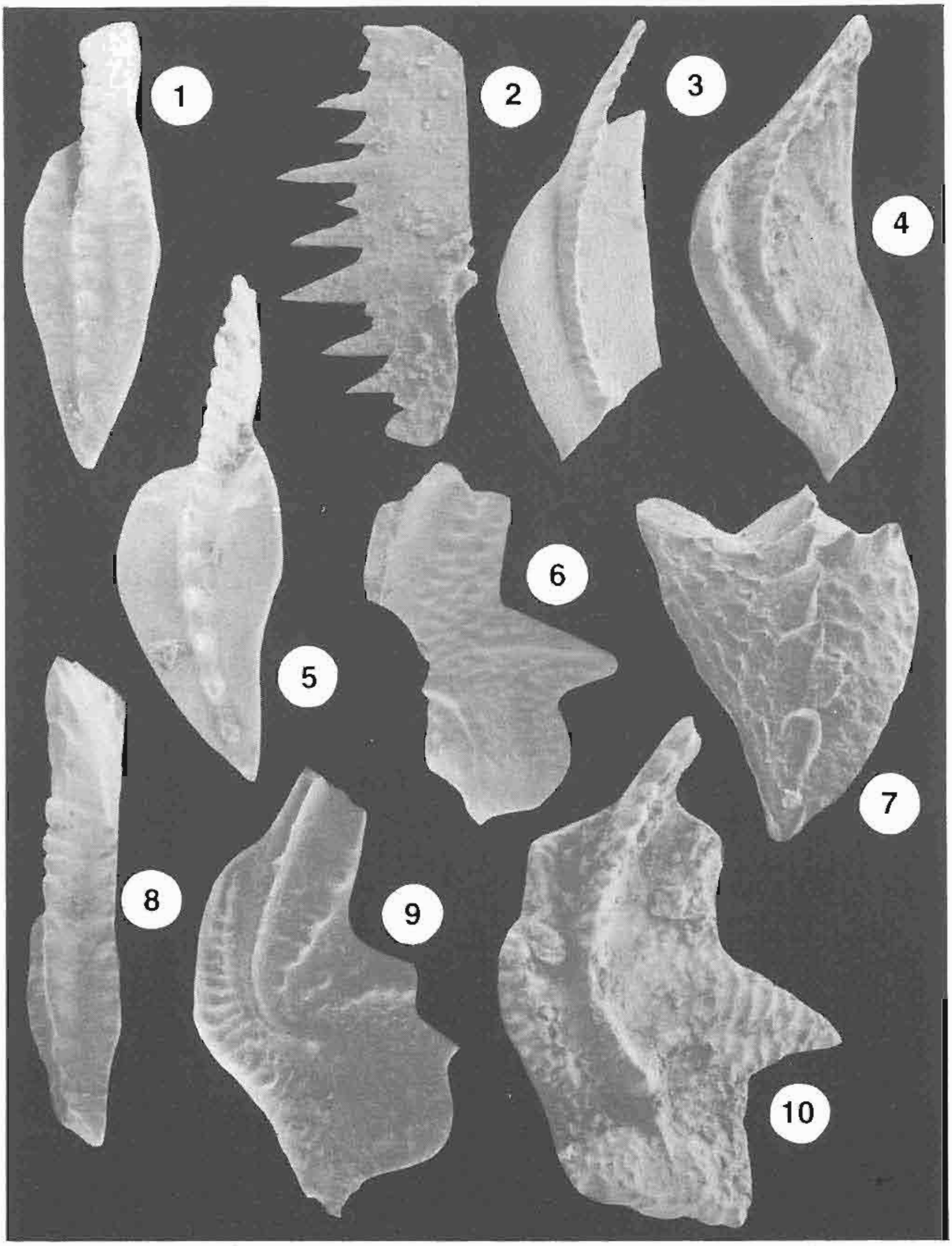
Hanna MATYJA, Marek NARKIEWICZ — Conodont stratigraphy of the Upper Devonian in the Janezyee I borehole section, eastern Holy Cross Mts.

PLATE V

Fig. 1. *Polygnathus fallax* Helms et Wolska, 1967
SMF 597, x 70, depth 77.5 m
Fig. 2. *Branmehla werneri* (Ziegler, 1962)
Side view (widok platformy z boku), SMF 604, x 200, depth 57.5–58.0 m
Fig. 3. *Palmatolepis quadrantinodosa inflexoidea* Ziegler, 1962
SMF 611, x 60, depth 57.5–58.0 m
Fig. 4. *Palmatolepis marginifera marginifera* Helms, 1959
SMF 622, x 90, depth 57.5–58.0 m
Fig. 5. *Polygnathus glaber medius* Helms et Wolska, 1967
SMF 596, x 70, depth 77.5 m
Fig. 6. *Palmatolepis rugosa trachytera* Ziegler, 1960
SMF 557, x 40, depth 56.5 m
Fig. 7. *Polygnathus stryriacus* Ziegler, 1957
SMF 735, x 140, depth 14.8 m
Fig. 8. *Alternognathus pseudostrigosus* Dreesen et Dusar, 1974
SMF 606, x 70, depth 57.5–58.0 m
Fig. 9. *Palmatolepis rugosa rugosa* Branson et Mehl, 1934*a*
SMF 734, x 50, depth 13.6 m
Fig. 10. *Palmatalepis perlobata* Ulrich et Bassler, 1926, gerontic bizzare specimen
SMF 625, x 60, depth 57.5–58.0 m

Figs. 1–5, 8, 10 — the Lower *marginifera* Zone, the Wavy-Bedded Limestone Unit; Fig. 6 — the *trachytera* Zone, the Black Shale and Limestone Unit; Fig. 7 — the *postera* and/or Lower *expansa* Zone, the Black Shale and Limestone Unit; Fig. 9 — the *expansa* Zone, the Blaek Shale and Limestone Unit; upper views, unless otherwise stated

Fig. 1–5, 8, 10 — dolny poziom *marginifera*, jednostka wapieni falistych; fig. 6 — poziom *trachytera*, jednostka czarnych łupków i wapieni; fig. 7 — poziom *postera* i/lub dolny poziom *expansa*, jednostka ezarnych łupków i wapieni; fig. 9 — poziom *expanso*, jednostka czarnych łupków i wapieni; widok górnej powierzchni platformy z wyjątkiem wskazanych



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