



Some biostratigraphic problems of the Cambrian in the Holy Cross and Nida areas of Poland

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No Vendian or lowermost Lower Cambrian deposits have yet been encountered in the Holy Cross Mts. and Nida Trough. The Cambrian of the Holy Cross Mts. is represented by Lower, Middle and Upper Cambrian deposits, containing both macro- and microfossils. The Lower Cambrian begins with deposits containing a non-trilobite fauna that does not allow precise age determination. The overlying Cambrian deposits are subdivided on the basis of trilobite faunas. Unfortunately, the species are often endemic, and correlation with the Scandinavian biostratigraphic scheme is limited.

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INTRODUCTION

The biostratigraphy of the Cambrian of the Holy Cross Mountains is based upon trilobites represented by Scandinavian-type and endemic species. Apart from trilobites and abundant trace fossils there are also foraminifers, coelenterates, worms, brachiopods, gastropods, echinoderms and acritarchs.

The acritarch assemblages found here define acritarch zones correlative with the trilobite zones. Sporadically occurring index species aid biostratigraphic resolution (Poaryski *et al.*, 1981; Martin and Dean, 1981, 1988; Lendzion *et al.*, 1983; Vanguetaine and Van Looy, 1983; Kowalczewski *et al.*, 1987; Volkova, 1990; Jankauskas and Lendzion, 1992).

Cambrian trilobites from the Holy Cross Mts. indicate connections with the Atlantic-Baltic Subprovince and, sometimes, with the Atlantic-Mediterranean Subprovince, while the Cambrian biota as a whole possessed distinctive regional characteristics (Orłowski, 1964a, b, 1967, 1968b, c, 1974, 1975, 1985a, b, 1988a, b; Bednarczyk *et al.*, 1965). The Cambrian from Scandinavia is the reference section for the Atlantic-Baltic Subprovince.

Polish Cambrian deposits are best explored in the Holy Cross Mts. Trilobite zones and subzones have been defined (Tomczykowa, 1968; Orłowski, 1974, 1975, 1985b, 1988a, b,

1992a–c; Orłowski and Mizerski, 1995a, b), though correlation is locally problematic. Some of the zones are well documented, while others are defined by endemic species and rare taxa or even single species; the latter may have poorly delineated boundaries.

HISTORICAL SUMMARY

The first studies on the Cambrian deposits of the Holy Cross Mts. were by Gürich (1892), who recognised the Scandinavian-type trilobites *Agnostus gibbus* Linnarsson, *A. fallax* Linnarsson, *Liostracus linnarssoni* Brögger and *Paradoxides* cf. *tessini* Brongniart (according to contemporary synonymy) in the Pieprzowe Mts. and assigned these deposits to the Middle Cambrian, correlating them with the *Paradoxides tessini* (= *P. paradoxissimus*) Beds of Scandinavia. His conclusions still stand. *Solenopleura munsteri* (Strand) and *S. cf. canaliculata* (Angelin) were subsequently recognised by Orłowski (1964a, b, 1985b) (Fig. 1). Gürich (1896) also first noted the occurrence of Upper Cambrian deposits in the vicinity of M. chojce.

Later investigations in the Holy Cross Mts. were conducted by Czarnocki (1919–1950) and Samsonowicz (1916–1959) and these outlined the stratigraphy of the Cambrian deposits of the Holy Cross Mts. Since 1957 the Cambrian deposits have

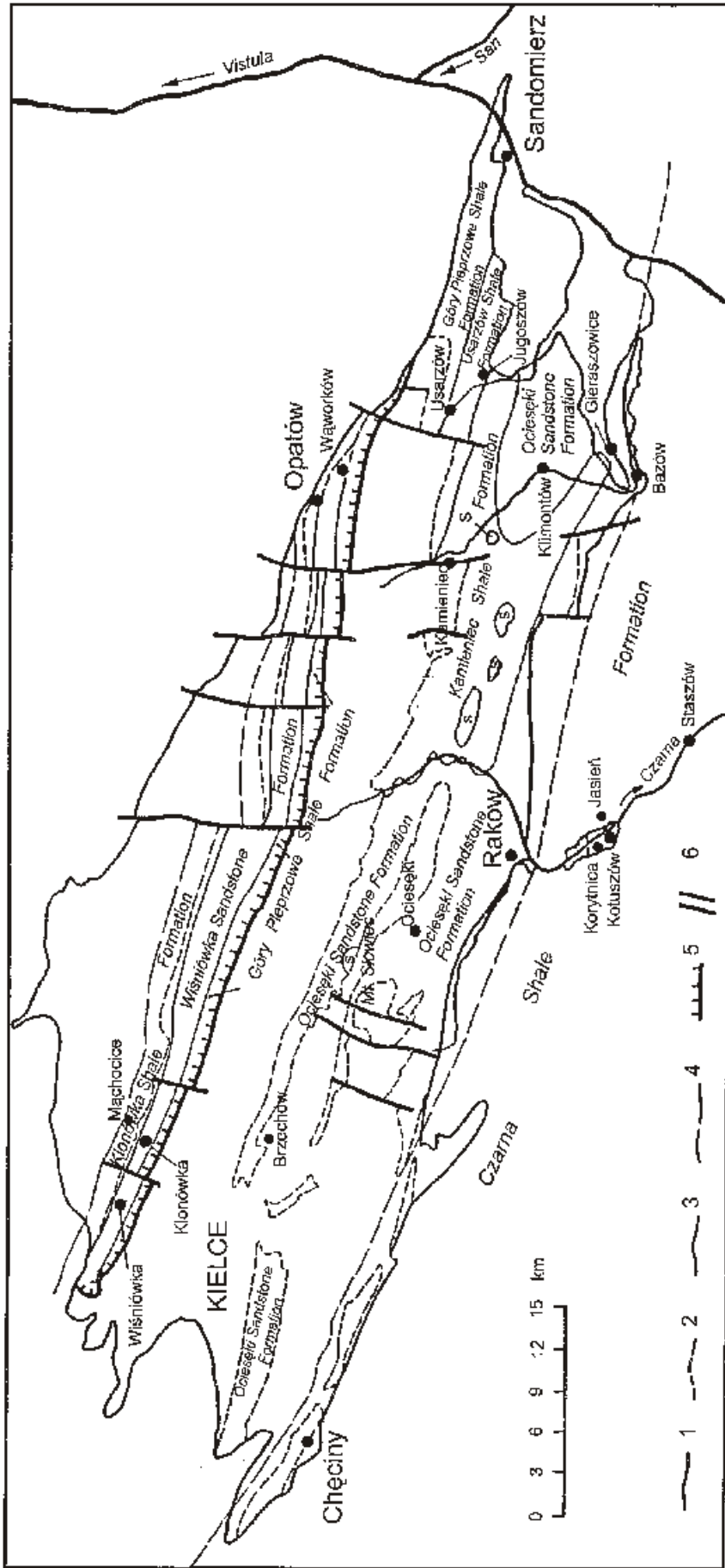


Fig. 1. Geographic distribution of lithostratigraphic formations of the Cambrian and uppermost Precambrian in the Holy Cross Mts. (after Orłowski, 1975)

1 — limits of Palaeozoic core of the Holy Cross massif; 2 — limits of Cambrian exposures; 3 — boundaries of formations, supposed; 4 — boundaries of formations, stated; 5 — the Holy Cross thrust; 6 — important faults; S — the Stowiec Sandstone Formation

been studied by Orłowski who described new trilobite, brachiopod and eocrinoid species and further elaborated the litho- and biostratigraphic subdivision of the Cambrian.

The stratigraphy of the uppermost Cambrian and the problem of the Cambrian/Ordovician boundary in Łysogóry were analysed by Tomczykowa (1968) who described new Upper Cambrian trilobites and distinguished two subzones in the top part of the *Peltura* Zone, and four subzones in the *Parabolina* Zone (a zone introduced later by Orłowski, 1975). These subzones correspond to the four subzones of the uppermost Cambrian *Acerocare* Zone in Scandinavia.

Analysis of acritarchs by Vidal (in: Po aryski *et al.*, 1981) allowed revision of the age of deposits previously assumed to be Precambrian. Thus, rocks from Kotuszów and the Nida Trough (J drzejów IG 1 and W gleszyn IG 1 boreholes) are not Precambrian in age but may rather be correlated with the *Holmia* Zone.

The stratigraphic scheme of the Cambrian system in the Holy Cross Mts., established by Orłowski (1975, 1992a–c), has been criticised by Kowalczewski (1995). He questioned the stratigraphical value of ichnozones introduced by Orłowski in the Middle and Upper Cambrian and argued that age of some lithostratigraphical units, as determined by acritarchs, is different than indicated by trilobites. In his comment Orłowski (1997) rejected the criticism pointing out that stratigraphical significance of acritarchs might be overestimated. In this paper more arguments are presented that call for revision of the Cambrian stratigraphy in the Holy Cross Mts.

LOWER CAMBRIAN

The oldest sedimentary rocks in the southernmost Holy Cross area and the Nida Trough were until recently considered to be Upper Precambrian (Jaworowski *et al.*, 1967; Jurkiewicz and Kowalczewski, 1968; Deczkowski and Tomczyk, 1969; Jurkiewicz, 1975, 1980), partly on the basis of acritarchs studied by Michniak (1959) and Jagielska (1963, 1965; akowa and Jagielska, 1970). Those authors used the acritarch taxonomy and biostratigraphy of Timofeev (pers. comm.), which have however been questioned by Volkova, Jankauskas and Kirjanov (pers. comm.) The conclusions of Michniak and Jagielska were later revised by Vidal (in: Po aryski *et al.*, 1981), Moczyłowska (1985 and in: Lendzion *et al.*, 1983; Kowalczewski *et al.*, 1987) and Szczepanik (1988, 1993a, b, 1996) who recognised the *Holmia* Zone in these deposits.

Kowalski (1983) came to stratigraphical conclusions based on material of doubtful organic affiliation; his descriptions do not provide reliable evidence for his recognition of the *Sabellidites* Zone. Kowalski (1983) also recognised stratigraphically useful acritarchs such as *Baltisphaeridium ornatum* Volkova [= *Skiagia ornata* (Volkova) Downie] and *Tasmanites bobrowskae* Wa y ska; these are not known to occur together with *Sabellidites cambriensis* Yanishevski.

The acritarch assemblages indicate an age not older than the *Holmia* Zone (Lendzion *et al.*, 1983; Moczyłowska, 1985; Kowalczewski *et al.*, 1987). Kowalski's (1983) conclusions were incorrect, but inspired, among others, Orłowski's biostratigraphic studies of the lowermost Cambrian in the Holy Cross Mts.

Table 1

Stratigraphical scheme of the Cambrian system in Scandinavia, applied in this paper after Bergström *et al.* (1982)

Series	Zone
Upper Cambrian	<i>Acerocare</i> <i>Peltura</i> <i>Leptoplastus</i> and <i>Eurycare</i> <i>Parabolina spinulosa</i> <i>Olenus</i> and <i>Agnostus</i> (<i>Homagnostus</i>) <i>obesus</i> <i>Agnostus pisiformis</i>
Middle Cambrian	<i>Lejopyge laevigata</i> <i>Erratojincella</i> (<i>Solenopleura</i>) <i>brachymetopa</i> <i>Ptychagnostus lundgreni</i> and <i>Goniagnostus nathorsti</i> <i>Ptychagnostus punctuosus</i> <i>Hypagnostus parviroens</i> <i>Tomagnostus fissus</i> <i>Ptychagnostus gibbus</i> <i>Eccaparadoxides pinus</i> <i>Eccaparadoxides insularis</i>
Lower Cambrian	<i>Proampyx linnarssoni</i> <i>Holmia kjerulfi</i> Group Zone barren interval <i>Schmidtellus mickwitzi</i> — <i>Mobergella</i> <i>Platysolenites antiquissimus</i> <i>Sabellidites cambriensis</i>

As has been already stated by Kowalczewski (1995) there is little substantial evidences, either, for placing the Osiek Sandstone Formation at the base of the Cambrian in the Holy Cross area (Fig. 1) (cf. Orłowski, 1981–1992; Mizerski *et al.*, 1986; Orłowski and Mizerski, 1995b). This interpretation cannot be inferred from the stratal succession in the eponymous Osiek 141 borehole (Lendzion, 1995). These unfossiliferous sandstones overlie the claystones and mudstones of the Czarna Shale Formation in which Moczyłowska (1985) found *Baltisphaeridium compressum* Volkova [= *Skiagia compressa* (Volkova) Downie]. This species shows that these deposits are not older than the *Holmia* Zone, and thus the Osiek Sandstones, overlying an erosional surface, are certainly younger. Kowalczewski (1990, 1995) suggested they may even be Middle Cambrian.

The succeeding zones of the lowermost Lower Cambrian — the *Hyolites-Allatheca* and *Coleoloides* Zones, distinguished by Orłowski (1987), were included to the Czarna Shale Formation. They were earlier combined as the *Platysolenites* Zone (Orłowski, 1981, 1985a). The *Hyolites-Allatheca* Zone is represented by the endemic species *Allatheca kotuszowi* Orłowski et Waksmundzki and *Hyolites czarna*e Orłowski et Waksmundzki which do not constrain the age of deposits. The genera *Allatheca* and *Hyolites* have broad stratigraphical ranges (Lower Cambrian-Permian). Their occurrence in the southernmost Cambrian exposures is no proof that these are the oldest Cambrian rocks. These rocks were dated as sub-*Holmia* on the basis of *Platysolenites antiquissimus* Eichwald, found by Michniak and Rozanov (1969) at an exposure between Kotuszów and Jasie , and may correlate with the Lontov horizon of Eastern Europe and the *Platysolenites* Zone of Eastern Poland. However, it appears that *Platysolenites* specimens also occur in younger Lower Cambrian rocks in Eastern Europe,

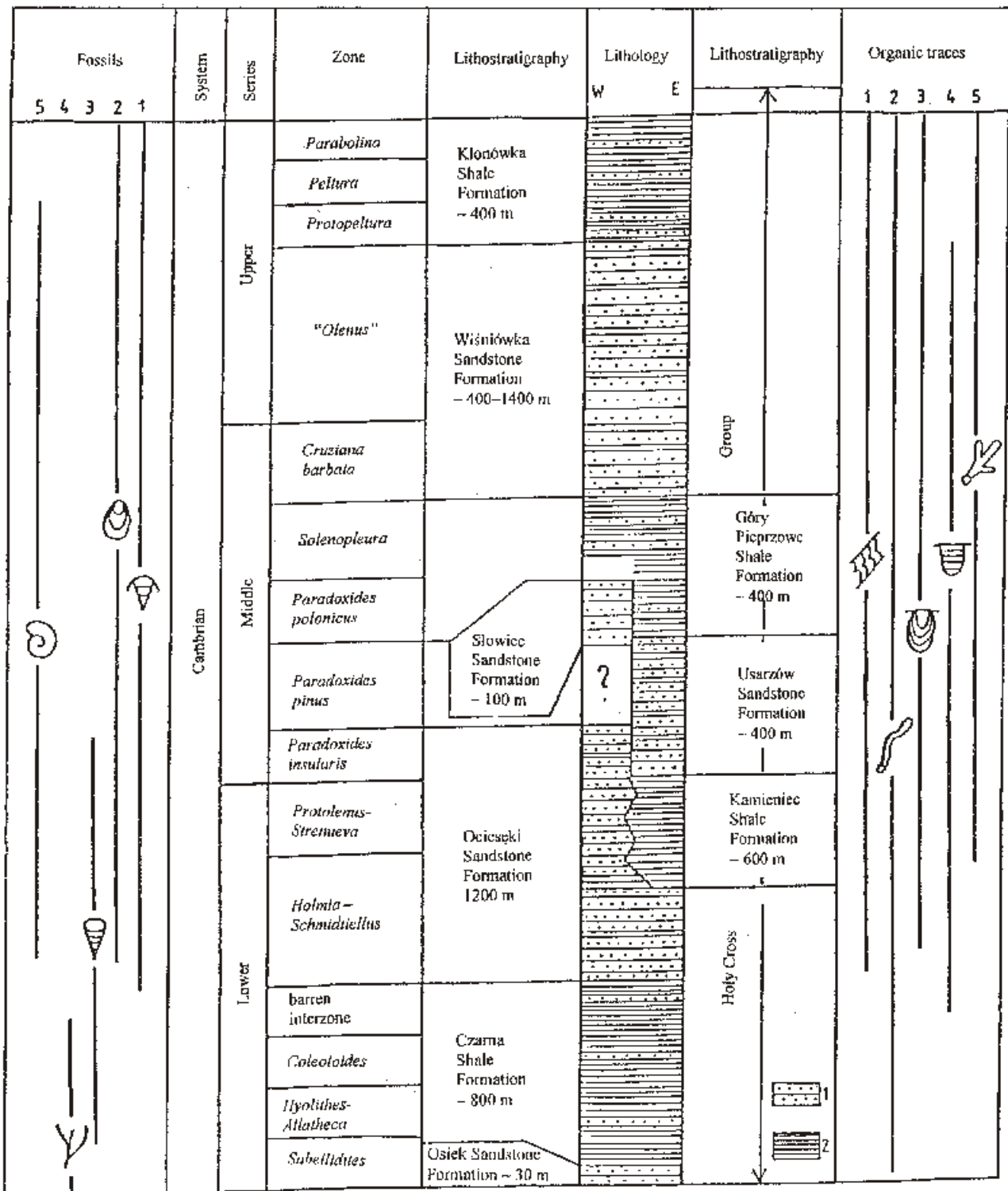


Fig. 2. Stratigraphic divisions of the Cambrian in the Holy Cross Mts. with ranges of selected fossils and trace fossils (after Orłowski, 1992c)

1 — sandstones, 2 — shales; **fossils**: 1 — trilobites, 2 — brachiopods, 3 — hyolithid, 4 — algae, 5 — gastropods; **organic traces**: 1 — trilobite traces, 2 — Planolites, 3 — Diplocraterion, 4 — Bergaueria, 5 — Palaeophycos

Scandinavia, Great Britain and California (Firby-Durham, 1977; Rozanov, 1983; Bergström and Gee, 1985). In Eastern Europe this species occurs also in the Talsi and Vergale horizons, and in Scandinavia in the *Mobergella-Schmidtellus mickwitzi* Zone. Deposits from the Kotuszów-Jasie exposures

should probably be correlated with the last zone, as is also indicated by acritarchs identified by Vidal (in: Po aryski *et al.*, 1981) and Moczyłowska (in: Lenzion *et al.*, 1983; Kowalczewski *et al.*, 1987). The presence of *Lophosphaeridium tentativum* Volkova, *Micrhystridium*

tornatum Volkova [= *Asteridium tornatum* (Volkova) Moczydłowska] and *Baltisphaeridium orbiculare* Volkova [= *Skiagia orbiculare* (Volkova) Downie], together with other abundant species, might suggest correlation with the lower part of the *Holmia-Schmidtellus* Zone (at the Kotuszów exposures and in the Bazów IG 1, Korytnica 1 and Korytnica 2 boreholes).

These data suggests that the basis for the recognition of the *Sabellidites*, *Hyalites-Allatheca* and *Coleoloides* Zones in the Cambrian of the Holy Cross Mts. is rather weak.

In the upper Lower Cambrian, Orłowski distinguished the *Holmia-Schmidtellus* and *Protolenus-Strenuaeva* Zones (Orłowski, 1987, 1988a, b, 1992a–c). The former is documented by endemic species making detailed correlation impossible; it roughly corresponds to the *Holmia inusitata* and *Holmia kjerulfi* Zones established in Scandinavia.

The *Protolenus-Strenuaeva* Zone is documented by two cosmopolitan species *Serrodiscus speciosus* (Ford) and *Cobboldites comleyensis* (Cobbold) cited by Czarnocki (1927), Samsonowicz (1956, 1959a, b, 1960, 1962) and Orłowski (1968a, 1975), as well as by endemic species represented by *Strettonia cobboldi* Orłowski et Bednarczyk, *Protolenus* (*P.*) *czarnocki* Orłowski et Bednarczyk, *P.* (*P.*) *expectans* Orłowski, *P.* (*L.*) *glabellus* Orłowski, *Ellipsocephalus sanctacrucensis* (Samsonowicz), *E. simplex* Orłowski, *E. kiaeri* (Samsonowicz), *Elatius integer* Orłowski, *Strenuaeva orlowinensis* Samsonowicz, *Micmacca* (*Acanthomicmacca*) *klimontowi* Orłowski and *Serrodiscus primarius* Orłowski.

There is some evidence that this assemblage should be augmented by *Protolenus bodzanti* Bednarczyk, *P. medius* Bednarczyk and *Jakutus kielcensis* Bednarczyk, found at Brzechów and assigned by Bednarczyk (1970) and Orłowski (1985b) to the lower Middle Cambrian, because these species occur in the exposure together with *Eccaparadoxides oelandicus* (Sjögren). I do not question the identification of this Middle Cambrian trilobite but I doubt whether it occurs together with *Protolenus* species in the same piece of rock. As far as I know, the *Protolenus* and *Eccaparadoxides* specimens come from talus, so there is no substantial reason to change the earlier conclusions of Czarnocki (1927) suggesting an early Cambrian age for the strata from Brzechów. This idea was already put forward by Masiak and yli ska (1994).

The Middle Cambrian species *Eccaparadoxides oelandicus* (Sjögren), even if occurs *in situ*, does not constitute evidence against the presence of the *Protolenus* Zone in the exposure. A continuous transition from Lower to Middle Cambrian deposits, similar to that suggested in the vicinity of Jugoszów-Usarzów and probably on the northern slope of Słowiec Mt., Ocieski Range, and in the Zamczysko Range (Orłowski, 1964a, b, 1975, 1988a, b, 1992a–c; Mizerski *et al.*, 1986), is possible here. An additional argument suggesting the occurrence of the *Protolenus* Zone in Brzechów may be the presence of *Jakutus kielcensis* Bednarczyk. The typical Siberian genus *Jakutus* is mainly of upper Lower Cambrian distribution and occurs in association with Protolenidae taxa (Suvorova, 1983; Egorova *et al.*, 1983).

It should be stressed that rare specimens of the typical Lower Cambrian genus *Protolenus* can occur also in the lower-

most Middle Cambrian. Such occurrences have been sporadically reported from Middle Cambrian deposits of the Holy Cross Mts. (Orłowski, 1964a, b, 1985b), Frankenwald and Lower Lausitz-Doberlug (Sdzuy, 1957, 1964).

MIDDLE CAMBRIAN

The Middle Cambrian fauna of the Holy Cross Mts. shows affinities to that from Scandinavia. This should be reflected in the biostratigraphy, though Orłowski continues to include the *Paradoxides insularis* and *Paradoxides pinus* Zones (Fig. 2) into his biostratigraphic scheme of the lower Middle Cambrian, though these taxa are now referred to as *Eccaparadoxides insularis* and *E. pinus* (Bergström and Levi-Setti, 1978; Table 1).

Higher, in the Middle Cambrian section, Orłowski (1975) distinguished the *Paradoxides polonicus* Zone, based on endemic species of *Paradoxides*. Apart from abundant *Paradoxides* specimens, there are also *Ptychagnostus gibbus* (Linnarsson), *Solenopleura munsteri* (Strand), *S. linnarssoni* (Brögger) and *Peronopsis fallax* (Linnarsson) that indicate connections between the *Paradoxides polonicus* Zone and some of the trilobite zones of the *Paradoxides paradoxissimus* Superzone in Scandinavia.

The age of deposits overlying the *Paradoxides polonicus* Zone is poorly constrained. The subdivision of this part of the Middle Cambrian section into the *Solenopleura* and *Cruziana barbata* Zones (Fig. 2), proposed by Orłowski (1988a, b, 1992a–c; Orłowski and Mizerski, 1995a, b), is based on scant palaeontological data. The *Solenopleura* Zone is documented merely by one specimen of *Solenopleura* cf. *canaliculata* (Angelin) indicating that the zone may correspond to the *Solenopleura brachymetopa* Zone of the *Paradoxides forchhammeri* Superzone of Scandinavia (Westergard, 1946).

The *Cruziana barbata* (or *Cruziana*) Zone spans the uppermost Middle Cambrian deposits, so it would correspond to the *Lejopyge laevigata* Zone of Scandinavia (Westergard, 1946) on the evidence of acritarchs identified by Szczepanik (in: Studencki, 1994). The trace fossil zone of *Cruziana barbata* should not strictly be included within the trilobite biostratigraphic scheme (Lendzion, 1995). Moreover, according to Seilacher (1970) the ichnospecies *Cruziana barbata* is not limited to the upper part of the Middle Cambrian (see also Kowalczewski's remarks, 1995). Current knowledge of the uppermost Middle Cambrian indicates that it is better to leave this part of the section unnamed.

UPPER CAMBRIAN

The Upper Cambrian of the Holy Cross area was subdivided by Orłowski (1975) into four trilobite zones of, from bottom to top: "*Olenus*", *Protopeltura*, *Peltura*, *Parabolina* (Fig. 2), which can be correlated with six Scandinavian zones. The reduction in the number of zones compared with the Scandinavian stratotype profile might have been due to a lack of exposures and incomplete drillcores through Upper Cambrian

strata. Orłowski indicated that the Upper Cambrian fauna record is fragmentary, with unfossiliferous intervals.

The “*Olenus*” Zone, which according to Orłowski (1975) spans the Scandinavian *Agnostus pisiformis* and *Olenus* + *Homagnostus obesus* Zones and the lower part of the *Parabolina spinulosa* Zone, is poorly documented. Endemic species, associated with this zone and found mostly at the W worków exposure and described by Orłowski (1968*b*, *c*), are represented by “*Olenus*” *rarus* Orłowski, *Protopeltura olenusorum* Orłowski, *P. sp.*, *Orusia* cf. *lenticularis* (Wahlenberg), *Acrotreta multa* Orłowski, *Obolus* sp. and *Cambrocrinus regularis* Orłowski. All these species, excluding *Acrotreta multa* Orłowski, occur (Orłowski, 1967, 1968*b*, *c*) within the Scandinavian *Olenus* + *Homagnostus obesus* Zones and the lower part of the *Parabolina spinulosa* Zone. Therefore, there is little evidence that the *Olenus* Zone of the Holy Cross area spans also the *Agnostus pisiformis* Zone of Scandinavia.

The species “*Olenus*” *rarus* Orłowski, cited by Orłowski (1992*a–c*; Orłowski and Mizerski, 1995*a*) from the Wi niówka Du a quarry, is not precisely localised. A specimen found there and tentatively identified as “*Olenus*” *rarus* Orłowski is not proof of the *Olenus* Zone, whereas the zonal name in the Upper Cambrian biostratigraphic scheme should not be put in quotation-marks (see also Lenzion, 1995). The “*Olenus*” Zone was established on the abundance of “*Olenus*” *rarus* Orłowski occurring in sandstones exposed at W worków and assigned to the Wi niówka Sandstone Formation (Orłowski, 1975).

The *Protopeltura* Zone was distinguished and correlated by Orłowski (1975) with the top of the *Parabolina spinulosa* Zone and with the *Leptoplastus* Zone from Scandinavia. This zone in the Holy Cross Mts., however, contains no fauna at all and thus there seems little basis for placing such a zone in the Upper Cambrian stratigraphic scheme.

The uppermost zones of *Peltura* and *Parabolina* (Tomczykowa, 1968; Orłowski, 1968*b*, *c*) are the best-documented. The former corresponds only to the middle and upper parts of the *Peltura* Zone from the stratotype Scandinavian section, i.e. to the *Peltura minor* and *Peltura scarabaeoides* Subzones. No equivalent of the lower subzone in Scandinavia, of *Protopeltura praecursor*, have been found. The position of the lower boundary of the *Peltura* Zone is also unknown.

The *Parabolina* Zone is evidently the equivalent of the *Acerocare* Zone of Scandinavia. Tomczykowa (1968) distinguished four subzones within this interval of (from bottom to top): *Parabolina latilimbata*, *Beltella rotundata*, *P. bukowiana* and *P. acanthura*; these correspond to the four subzones of the *Acerocare* Zone established by Westergard (1922) and Henningsmoen (1957) in Scandinavian profiles (Table 1).

GENERAL CONCLUSIONS FROM THE INTERREGIONAL COMPARISON OF CAMBRIAN MACROFAUNA

Cambrian trilobites from the Holy Cross Mts., neighbouring platformal areas of Poland and the Upper Silesian

Foredeep, are related to Scandinavian trilobites characteristic of the Atlantic-Baltic Subprovince (= Baltica). This subprovince communicated with other areas of the Atlantic Province and beyond. Species of the genera *Schmidtellus*, *Holmia*, *Kjerulfia*, *Strenuaeva* and *Ellipsocephalus*, occurring in the *Holmia-Schmidtellus* Zone of the Holy Cross Mts. and Upper Silesia as well as in the *Holmia* Zone of the East European Craton, indicate strong relations with the Baltic-Scanian part of the platform and with the foreland of the Scandinavian Caledonides. The presence of the genus *Postfallotaspis* in the Holy Cross Mts., related to the Moroccan genus *Fallotaspis*, shows that trilobites from the Atlantic-Mediterranean Subprovince (= Gondwana) migrated into the area of Poland. The cosmopolitan genus *Fallotaspis* was very widespread. Its abundance enables distinction of the *Fallotaspis* Zone in the lower part of the Lower Cambrian of Morocco, California, Nevada, Canada and McKenzie Mts. as well as in the Atdaban Zone of the Siberian Platform (Fritz, 1976; Repina, 1976; Nelson, 1978). Single specimens of *Fallotaspis* have been found in Lower Cambrian deposits of the Polish part of the East European Craton (Lenzion, 1978), Sweden (Ahlberg, 1984) and in England (Cowie *et al.*, 1972).

The interval spanning the uppermost Lower Cambrian (*Protolenus-Strenuaeva* Zone) to the top of the Upper Cambrian (*Parabolina* Zone) is only represented in Poland in the Holy Cross Mts. and — in the *Protolenus* Zone — in the East European Craton. Trilobites migrated into these areas from the area present-day Spain and Morocco via Lausitz (Görlitz Syncline) and Frankenwald, and with England — via Normandy. Such a conclusion can be inferred mainly from the presence of *Protolenus*, *Lusatiops* (in the vicinity of Görlitz) and *Serrodiscus* (Hupé, 1960; Sdzuy, 1960, 1962, 1964; Rushton, 1966; Cowie *et al.*, 1972; Orłowski, 1974, 1985*a*; Lenzion, 1983*a*, *b*; Geyer and Elicki, 1995). Communication with areas west of Poland also existed later, although contact between the Atlantic-Baltic and North Atlantic Subprovinces (= Baltica and Laurentia) were established since Middle Cambrian times. Common and closely related taxa of the Paradoxidae and Agnostidae occurred in the Holy Cross Mts., platform areas of Poland, Scandinavia, England and Newfoundland (Hutchinson, 1962; Rushton, 1966; Orłowski, 1964*a*, 1985*b*; Cowie *et al.*, 1972; Bergström and Levi-Setti, 1978; Lenzion, 1983*a*, *b*; Martin and Dean, 1988). Many representatives of these families are cosmopolitan forms, and the index species from Scandinavia define the Middle Cambrian zones showing analogous or similar ranges even outside this province in Kazakhstan and Australia. In the Siberian Platform and Western Mongolia they are represented by only a few species (Dumicz *et al.*, 1970; Daily and Jago, 1975; Öpik, 1979; Ergaliev, 1980; Lazarenko and Repina, 1983). The Middle Cambrian trilobite assemblage of the Holy Cross Mts., dominated by endemic species of the genera Paradoxidae and Ellipsocephalidae, does not indicate a separate ecologic niche because the coeval forms of *Kingaspis*, *Solenopleura* and *Solenopleurina* show that the Holy Cross area was situated within a zone where the typical Atlantic-Baltic fauna mixed with an Atlantic-Mediterranean one.

The Upper Cambrian of Łysogóry and the platform area is represented by taxa of the families Olenidae and Agnostidae also occurring in Upper Cambrian deposits of Scandinavia,

England and Newfoundland. There is no evidence of connection with other areas.

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