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Lower Cambrian trilobites from Upper Silesia (Goczałkowice borehole)

ABSTRACT: A new area of Cambrian deposits, obtained in boreholes has recently been discovered in Upper Silesia (SW Poland). Lower Cambrian trilobites: *Schmidtiellus panowi* (Samsonowicz), *Strenuaeva primaeva* (Brögger) and *Ellipsocephalus nordenskjoeldi* Linnarsson were found in the Goczałkowice *IG-1* borehole. These trilobites are here concisely described and their stratigraphical position briefly discussed. A correlation of the Lower Cambrian deposits in Poland is also presented.

INTRODUCTION

Several borings which have recently been made by the Geological Survey of Poland in Upper Silesia, not only pierced the Coal Measures, the Lower Carboniferous and Devonian carbonates, but also reached detrital rocks of the older Paleozoic and the Precambrian basement. The stratigraphic position of the unfossiliferous detrital deposits was subject of divergent interpretation. The first well preserved Lower Cambrian trilobites and brachiopods were found in the Goczałkowice borehole (Fig. 1).

Acknowledgements. The writer's thanks are extended to the management of the Upper Silesia Station of the Geological Survey of Poland in Sosnowiec for their permission to elaborate the fauna and for making fossil collections available. His gratitude is also due to A. Kotas, M. Sc. for handing over a collection of trilobites and explaining the geological sequence of this borehole.

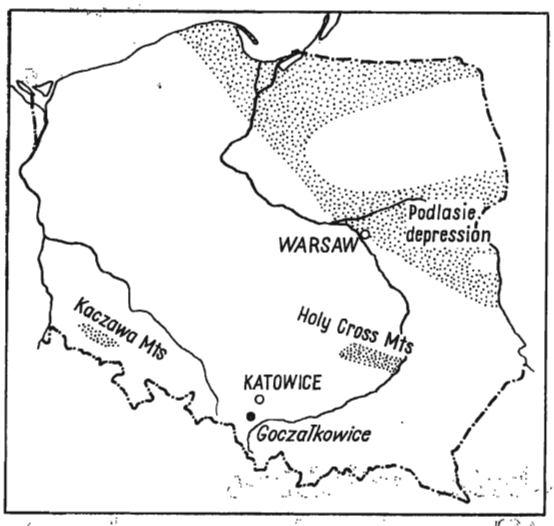


Fig. 1. Occurrence of the hitherto recognized Lower Cambrian deposits in Poland: surface exposures in the Holy Cross Mts and in Kaczawa Mts, as well as subsurface occurrence on the Fenno-Sarmatian Shield (the Podlasie depression including) and in the Goczałkowice borehole in Upper Silesia

GEOLOGICAL SETTING

The Goczałkowice *IG-1* borehole is situated about 4 km south of Pszczyna. Its general profile, presented by Kotas (1973), is briefly repeated here (Fig. 2).

The Precambrian crystalline basement (depth range: 3253.5 m to 3170.6 m) is composed of conglomerates, sandstones and shales, highly metamorphic and displaying symptoms of cataclasis and mylonitization; all the series is strongly folded.

In the area of Upper Silesia, the Precambrian crystalline basement is as a rule overlain by detrital deposits, but in the Goczałkowice borehole there occurs a diabase sill (reaching down to a depth of 3129.2 m) which makes the contact between the basement and the detrital rocks rather indistinct.

The overlying detrital deposits start with poorly sorted conglomerates containing pebbles varying in size (many of them reach two to three cm in diameter, some being even 5 cm in size). The upper part of deposits consists of varigrained, rusty-pink sandstones (down to a depth of 3039 m), regarded by Kotas (1973) as land deposits; these are referable as of Upper Precambrian (Vendian) age.

The Cambrian makes up a marine sedimentary cycle with a distinctly visible widely spread marine transgression and a gradual transition from extremely shallow-water to deeper deposits. The presence of bioglyphs of the *Scolithos* type is connected with the nearshore facies. Their abundance is typical of the shallow-water, transgressive Cambrian deposits, for example, from the platform area of NE Poland (Lendzion 1972), and from the Lower Cambrian of Scotland (Stubblefield 1956). The presence of the *Skolithos*-type bioglyphs indicates that the deposits from the Goczałkowice borehole should be assigned to the Cambrian. The boundary between the Vendian and Cambrian runs, therefore, between the continental and marine deposits (at a depth of 3129.2 m).

The next Cambrian member (between 2957 and 2765 m) is represented by gray-greenish siltstones, rarely interbedded by fine-grained sandstones; dipping by ca. 10–16°. The siltstones yield inarticulated brachiopods and such trilobites as *Schmidtiellus panowi* (Samsonowicz), *Strenuaeva primaeva* (Brögger) and *Ellipsocephalus nordenskjoeldi* Linnarsson.

These deposits are overlain in angular discordance by gritstones and sandstones of Lower Devonian age (Kotas 1973).

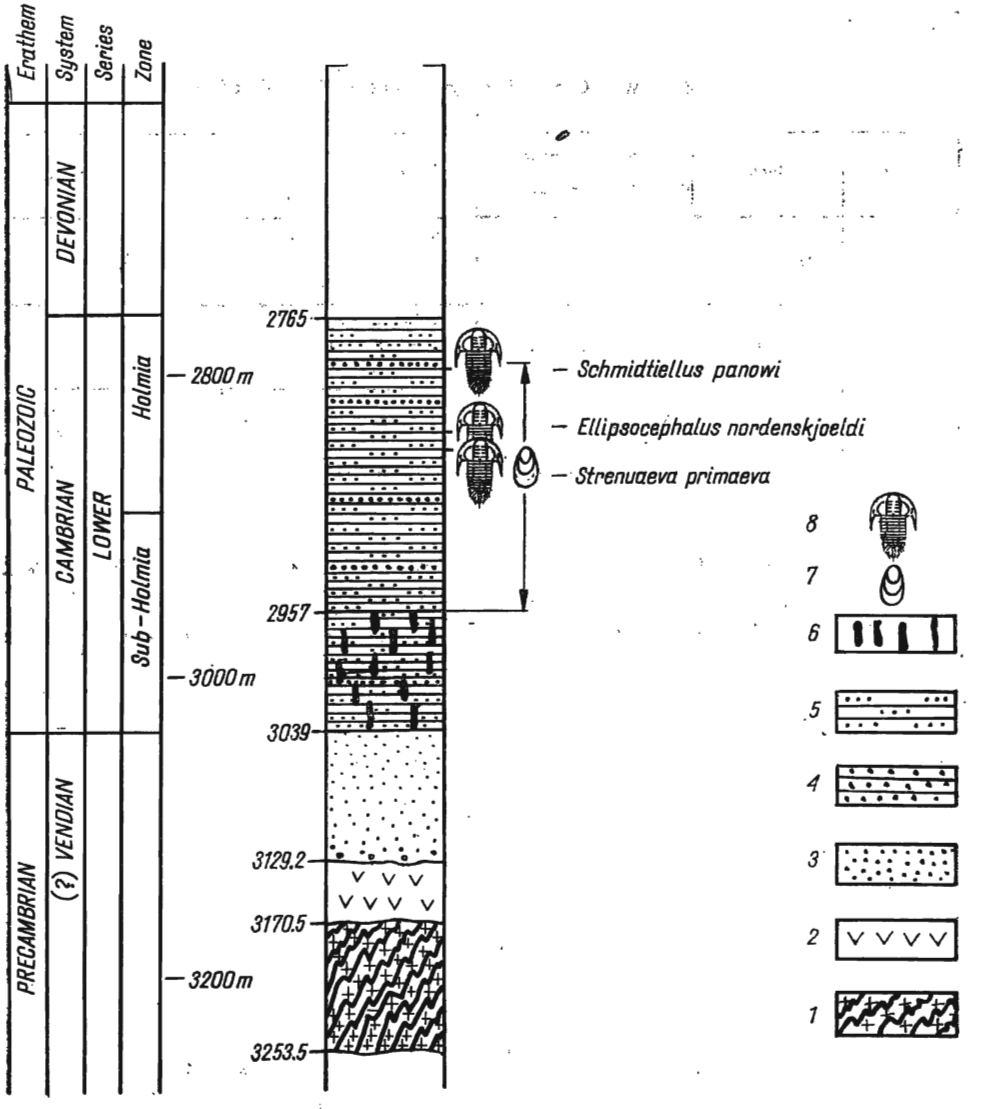


Fig. 2. Geological section obtained in the Goczałkowice borehole

1 metamorphic substrate, *2* diabase, *3* unstratified sandstones, *4* fine-grained sandstones, *5* siltstones, *6* burrows of the *Skolithos* type, *7* occurrence of brachiopods, *8* occurrence of trilobites

The collection of trilobites from the Goczałkowice borehole comprises (Pls 1 and 2) seven cranidia, one cranidium with three and one with ten thoracic segments, all of them preserved as molds and casts, *Schmidtiellus* having an exoskeleton preserved. All specimens are well or even very well preserved but strongly flattened and, consequently, the exoskeleton of some specimens is broken to pieces. As a result of lateral stress, some specimens are slightly deformed and, therefore, the length-to-width proportions of cranidia and their parts are distorted (Pl. 1, Fig. 4).

Fig. 3. Lower Cambrian stratigraphy in Poland

Series	Zone	Upper Silesia Goczałkowice borehole	Holy Cross Mts	Podlasie depression
Lower Cambrian	Protolenus	———	Ellipsocephalus and Protolenus	Ellipsocephalus
	Holmia	Schmidtiellus	Schmidtiellus, Kjerulfia and Holmia	Holmia
	Sub-Holmia	(no trilobites)	(no trilobites)	(no trilobites)

The boundary between the sub-Holmia and Holmia zones, recognized on the basis of trilobites, runs within the range of a uniform facies of siltstones and should be drawn below the lowermost occurrence of the trilobites (2860 m).

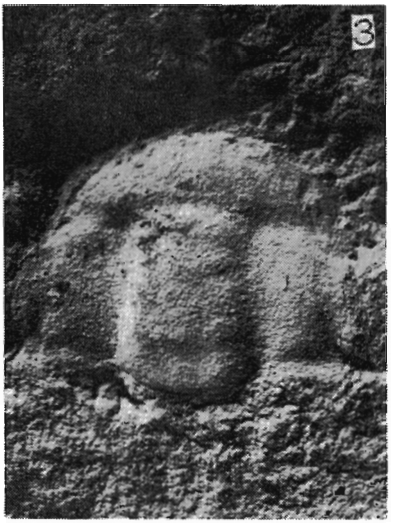
SYSTEMATIC DESCRIPTIONS

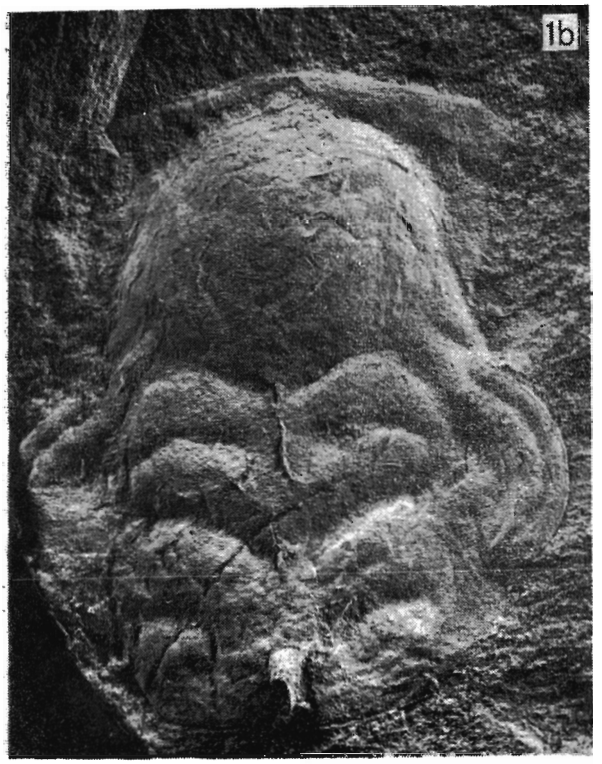
Family **Olenellidae** Vogdes, 1873
Genus *SCHMIDTIELLUS* Moberg, 1906
Schmidtiellus panowi (Samsonowicz, 1959)
(Pl. 1, Fig. 1)

1959a. *Holmia panowi* nova species; Samsonowicz, pp. 449—450, Fig. 12a, b.
1973. *Schmidtiellus panowi* (Samsonowicz); Bergström, pp. 13, 17, 19.
1973. *Holmia grandis* Kiaer; Osmólska in Kotas, p. 76.
1974. *Schmidtiellus panowi* (Samsonowicz); Orłowski, pp. 7—8, Pl. 1, Figs 5—6.

Material. — Large, partly preserved cephalon and its cast.

Supplementary description. — The revision of this species, presented by the writer (Orłowski 1974), was, however, based on a rather scarce paleontological material. The cephalon collected, very large and well preserved, introduces new data to the description.



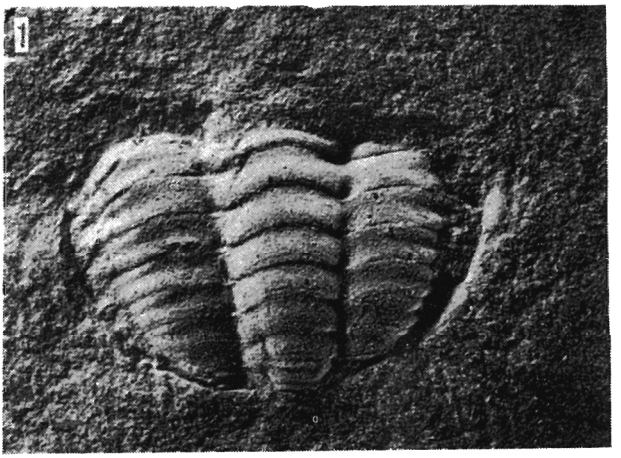


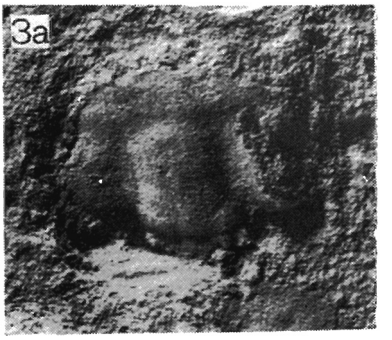
1 — *Schmidtiellus panowi* (Samsonowicz, 1959); cephalon — *1a* exoskeleton, *1b* latex cast; borehole Goczałkowice (depth 2793 m), × 2.

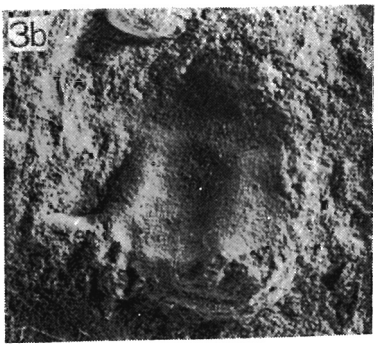
2 — *Strenuaeva primaeva* (Brögger, 1879); cranidium, latex cast, × 4; borehole Goczałkowice (2850.45 m).

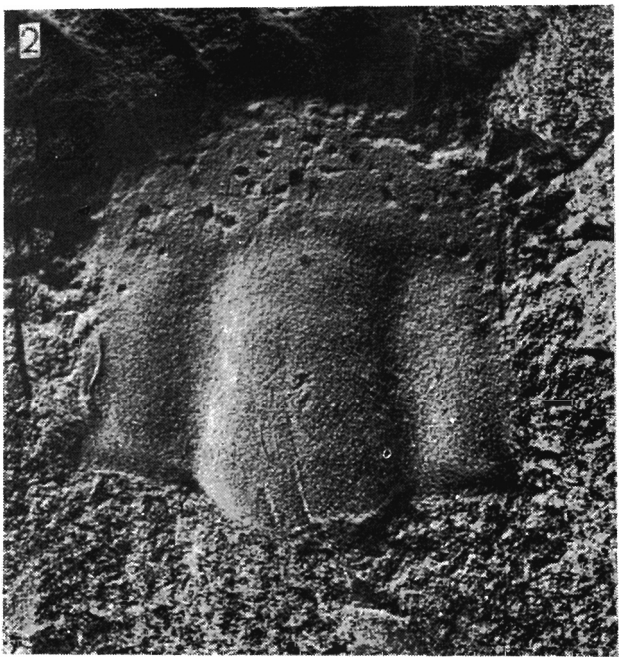
3-4 — *Ellipsocephalus nordenskjoeldi* Linnarsson, 1883: *3* cranidium, × 4; borehole Goczałkowice (2841.4 m); *4* cranidium with three thoracic segments, × 4; borehole Goczałkowice (2842.7 m).

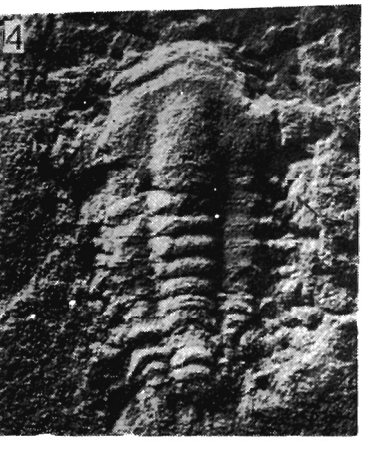
All photos taken by B. Drozd, M. Sc.











Ellipsocephalus nordenskjoeldi Linnarsson, 1883

1 — Part of thorax, latex cast; borehole Goczałkowice (depth 2842.3 m).
2 — Cranidium; borehole Goczałkowice (2844 m).
3 — Cranidium (*3a* internal cast, *3b* latex cast); borehole Goczałkowice (2843.5 m).
4 — Cranidium and thorax of a young individual; borehole Goczałkowice (2843.5 m).

All photos × 4; taken by B. Drozd, M. Sc.

Cephalon rounded anteriorly, with cephalic border broad but narrower in the front of the glabella. Cephalic border moderately convex, separated from preglabellar field by a distinct anterior border furrow. Glabella parallel-sided, reaching cephalic border but separated by a distinct anterior border furrow. Occipital furrow (*SO*) short (*tr.*), directed posteriorly. Median spine situated on the occipital lobe; the posterior border of its basic part coincides with the posterior margin of glabella. The dorsal exoskeleton of the cephalon is ornamented by small, often polygonal meshes.

Horizon and locality. — The species *Schmidtiellus panowi* (Samsonowicz) was described from the Lower Cambrian of the Holy Cross Mts, where it occurs with *Holmia kjerulfi marginata* Orłowski, *H. glabra* Orłowski, *H. orienta* Orłowski and *Kjerulfia orcina* Orłowski. This species is an index fossil of the Lower Cambrian Holmia Zone.

The genus *Schmidtiellus*, represented by few species, is known in the same zone in Poland, Sweden, Estonia and the Ukraine (*cf.* Bergström 1973; Orłowski 1974).

Family **Ellipsocephalidae** Matthew, 1887

Genus *STRENUAEVA* Richter & Richter, 1940

Strenuaeva primaeva (Brögger, 1879)

(Pl. 1, Fig. 2)

1916. *Strenuella primaeva* Brögger; Kiaer, pp. 31—38, Pl. 4, Figs 1—4; Pl. 5, Figs 1—6.
1959b. *Strenuaeva primaeva* (Brögger); Samsonowicz, pp. 521—522, Pl. 1, Figs 1—9.
1972. *Strenuaeva primaeva* (Brögger); Lendzion, pp. 132—133, Pl. 4, Figs 3—11.
1973. *Strenuaeva primaeva* (Brögger); Orłowski, p. 368, Pl. 1, Fig. 1.

Material. — Cranidium preserved as a cast.

Remarks. — Cranidium matches in all features the diagnosis of the species given by Kiaer (1916); it is identical with these described so far and illustrated from Poland (*cf.* Samsonowicz 1959b; Lendzion 1972; Orłowski 1973).

Horizon and locality. — The species *Strenuaeva primaeva* (Brögger) is an index fossil of the Lower Cambrian Holmia Zone. It was first described in Norway where it occurs with *Holmia kjerulfi* (Linnarsson) and *Kjerulfia lata* Kiaer. It is also known from Sweden (Kiaer 1916). In Poland, it was described from the Holmia Zone of the Holy Cross Mts (Samsonowicz 1959b) and of the Podlasie depression (Lendzion 1972; Orłowski 1973).

In the borehole Goczałkowice *IG-1*, *Strenuaeva primaeva* was found at the depth 2850.45 m in the Holmia Zone, together with *Schmidtiellus panowi* (Samsonowicz) and *Ellipsocephalus nordenskjoeldi* Linnarsson.

Genus *ELLIPSOCEPHALUS* Zenker, 1833

Ellipsocephalus nordenskjoeldi Linnarsson, 1883

(Pl. 1, Figs 3—4 and Pl. 2, Figs 1—4)

1916. *Ellipsocephalus nordenskjöldi* Lnrs; Kiaer, pp. 41—44, Pl. 4, Figs 7—8; Pl. 5, Figs 11—13.
1962. *Ellipsocephalus nordenskjöldi?* Lnrs; Samsonowicz, p. 12, Pl. 4, Fig. 1.

Material. — Five cranidia, including that with three thoracic segments, and that with ten thoracic segments.

Description. — Cranidium flattened, shorter than wide. Glabella flat, almost parallel-sided, somewhat narrower in the center, slightly triangular anteriorly; its length is four- to five-sixths of that cranidium. Three pairs of faintly marked glabellar furrows are visible. Occipital lobe short (*sag.*), rounded posteriorly; occipital

furrow faintly marked, straight. Glabella more convex and conical in juvenile individuals. Fixigenae narrower (*tr.*) than glabella. Palpebral lobe long, almost reaching the posterior border furrow. Glabella and fixigenae separated from the preglabellar field by a preglabellar furrow. The exact number of thoracic segments unknown; the most completely preserved specimen has only ten thoracic segments. Axial part of thorax convex, pleurae with pleural furrows and blunt pleural spines. Pygidium and librigenae unknown.

Remarks. — Kiaer (1916), who gave a detailed description of *Ellipsocephalus nordenskjoeldi*, pointed out its considerable similarity to some species of the genus *Strenuella*. Frequently, this similarity makes the recognition of the species very subjective. Since that time, the species *Ellipsocephalus nordenskjoeldi* has never been revised or discussed. Samsonowicz (1962) only mentions this species and gives an inadequate photograph.

The features of the specimens from the Goczałkowice borehole correspond to those indicated by Kiaer (1916), but some additional features are here much better visible. Glabella is well preserved and differences from that of the genera *Strenuella* and *Strenuaeva* are easily detectable; the differences between the tharaxes are also visible.

The investigated glabella of *Ellipsocephalus nordenskjoeldi* is short, bears three pairs of shallow glabellar furrows and its anterior part is less triangular. It appears therefore that the glabella of this species is more primitive than that of the Middle Cambrian *Ellipsocephalus* species.

Horizon and locality. — The species *Ellipsocephalus nordenskjoeldi* was found in the middle and upper part of the Lower Cambrian of Norway (Kiaer 1916); it was also described from the Protolenus Zone of the Holy Cross Mts (Samsonowicz 1962).

PALEOGEOGRAPHICAL REMARKS

The trilobites from the discussed borehole are characteristic of the Baltic zoogeographical subprovince, which in the Lower Cambrian includes Great Britain, Norway, Sweden, Denmark, Estonia, Poland, and the western Ukraine (*cf.* Stubblefield 1956; Bergström 1973; Orłowski 1974). The Cambrian recognized in the Upper Silesian Goczałkowice borehole considerably shifts soutwards the range of this Baltic subprovince which thus embraces the entire territory of Poland up to the area of the present-day Carpathians.

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TRYLOBITY DOLNEGO KAMBRU Z WIERCENIA GOCZAŁKOWICE NA GÓRNYM ŚLĄSKU

(Streszczenie)

Przedmiotem pracy jest opis trylobitów kambryjskich stwierdzonych po raz pierwszy w wierceniach na obszarze Górnego Śląska. Trzy znalezione gatunki, *Schmidtiellus panowi* (Samsonowicz), *Strenuaeva primaeva* (Brögger) oraz *Ellipsocephalus nordenskjoeldi* Linnarsson, wyznaczają poziom holmiowy dolnego kambru. Obecność młodszych ogniw kambru na terenie Górnego Śląska jest sprawą otwartą, gdyż w badanym profilu (wiercenie Goczałkowice *IG-1*) bezpośrednio na osadach dolnokambryjskich spoczywają niezgodnie osady dolnego dewonu.
