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The oldest Hyolitha in the Lower Cambrian of the Holy Cross Mountains

ABSTRACT: A few exceptionally well preserved Hyolitha are described from the early Lower Cambrian strata (Czarna Shale Formation) of the Holy Cross Mountains, Central Poland. These Hyolitha are recognized as the new species: *Allatheca kotuszowi* sp. n., and *Hyolithes czarnae* sp. n.

INTRODUCTION

The stratigraphy of the upper part of the Lower Cambrian in the Holy Cross Mountains, Central Poland, is well documented by large assemblage of trilobites, some of which are the index fossils (ORŁOWSKI 1974, 1981, 1985). An aglaspid is also noted (ORŁOWSKI 1983). A thick formation of clayey shales, the Czarna Shale Formation, is known below the trilobite-bearing strata (ORŁOWSKI 1975). As a rule, these shales are covered by marine Miocene and continental Quaternary deposits. Exposures of the shales are scarce and situated in some valleys of the rivers and in the highland ravines.

The big thickness of shales, their intense tectonics and scarcity of fossils make the problem of the detailed stratigraphy of the Czarna Shale Formation *(see* Text-fig. 1) complicated. Rare skeletal remains from these rocks were described (MICHNIAK & ROZANOV 1969, KOWALSKI 1983) and used for biostratigraphic subdivision of the shales; Acritarcha and algae were also reported (KOWALSKI 1983).

PALEONTOLOGICAL REMARKS

The Hyolitha are a Paleozoic group of fossils, which appeared in the earliest Cambrian strata. This group is important for stratigraphy of the Lower Cambrian especially in the areas where the strata are developed in carbonate facies, and thus the Hyolitha are best known in Asia (ROZANOV & *al.* 1969, SYSOIEV 1972, QIAN YI 1984). The Lower Cambrian in Europe is developed, as a rule, in clastic facies in which the Hyo-

litha are not very common but still very important for stratigraphy (HOLM 1893, POULSEN 1969).

Although the morphology of the Hyolitha is more or less well recognized (MAREK 1963, YOCHELSON 1974), and their biology has subjected to detailed studies (MAREK & YOCHELSON 1976, RUNNEGAR & *al.* 1975, DZIK 1980), some problems connected with their mode of life, anatomy of soft parts, and their ability of locomotion still remain under discussion.

The Hyolitha described in the present paper are characteristic by their complete state of preservation. The conchs are found together with opercula and appendages. The presence of all hard parts of the conch, and of the appendages suggests their burial in rather quiet conditions, perhaps below the wave base.

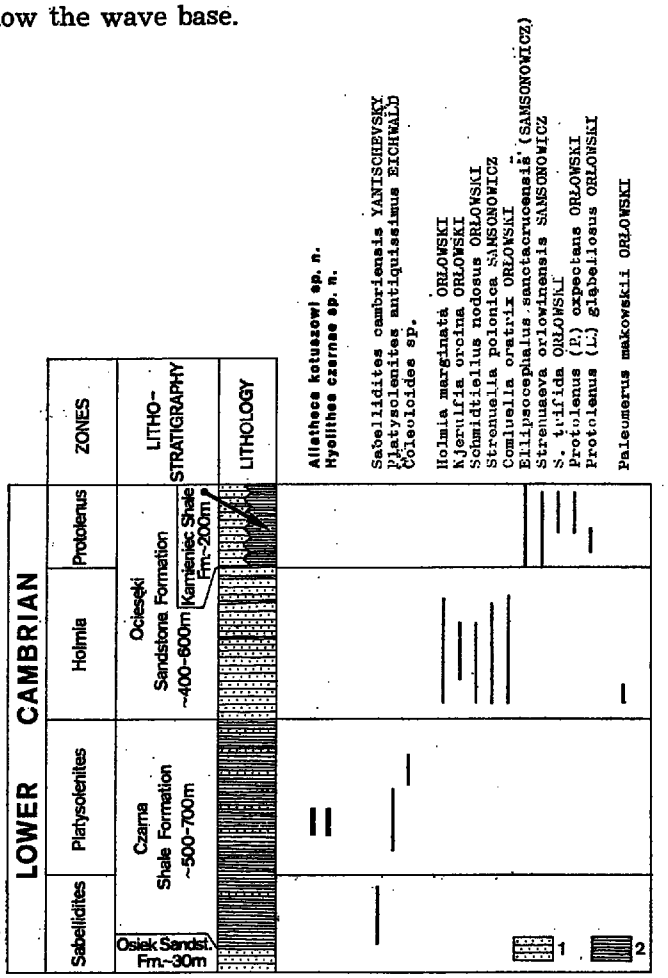


Fig. 1. Stratigraphy and some selected fossils of the Lower Cambrian in the Holy Cross Mts, Central Poland

1 — sandstones, 2 — shales

SYSTEMATIC ACCOUNT

Genus *Allatheca* MISSARZEVSKY, 1969
Allatheca kotuszowi sp. n.
(Text-fig. 2 and Pl. 1, Fig. 1)

HOLOTYPE: Complete conch with operculum (specimen *No. 1.801*), presented in Pl. 1, Fig. 1.
TYPE LOCALITY: Exposure in the Czarna riverside, north of village Kotuszów.
TYPE HORIZON: Lower Cambrian, Platysolenites Zone, Czarna Shale Formation.
DERIVATION OF THE NAME: After the name of village.
MATERIAL: One flattened specimen consisting of conch and operculum, preserved as inner and outer casts.

DIAGNOSIS: An *Allatheca* with the conch covered by faint growth lines; operculum oval with more flattened ventral margin, apex situated in the center of operculum.

DESCRIPTION: The conch is simple, narrowing slightly posteriorly. Only one fragment of the original shell is preserved, which is composed of the posterior part of the conch, but the whole specimen is known as a cast. The conch is covered by faint, straight growth lines; its cross section is almost oval with the ventral side more flattened. The apical angle is about 15°, and this is rather maximum value. The ventral side of the aperture is slightly longer and in lateral view the aperture is oblique (*see* Text-fig. 2).

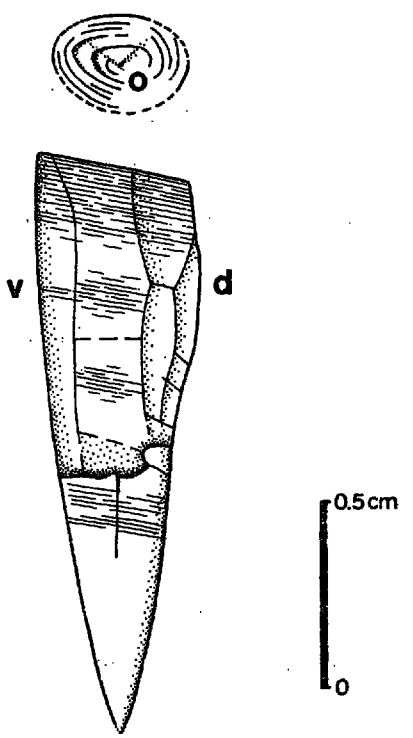


Fig. 2

Sketch-drawing of the holotype of *Allatheca kotuszowi* sp. n.

o — operculum, **d** — dorsal side of the conch, **v** — ventral side of the conch

The operculum is known from the outer side only; it is oval with the ventral margin a bit flattened. The apex is slightly elevated, situated in the center of the operculum. The surface of the operculum is covered by thick, concentric growth lines.

DISCUSSION: The new species has all diagnostic features of the genus *Allatheca* MISSARZEVSKY, 1969. To this genus belong such species as: *A. corrugata* MISSARZEVSKY, *A. concinna* MISSARZEVSKY, *A. recta* (SYSOIEV), which are known from the Tommotian Stage of the Lower Cambrian of the Siberian Platform. To this genus belongs also *A. degeeri* (HOLM) from the Lower Cambrian of Sweden and from the upper part of the Tommotian Stage and the Atdabanian Stage of Siberia.

The new species is slightly similar to the specimens of *A. degeeri* from Sweden; it concerns the shape of the conch and the cross section, but the apical angle of the Swedish specimens is smaller (8-9°), and the conchs are smooth (operculum unknown). The specimens of *A. degeeri* from Siberia have much bigger apical angle (10-14°), and the conch is either smooth or covered by faint growth lines.

The new species differs from *A. corrugata* in the bigger apical angle, more faint growth lines, oblique aperture and in the presence of an operculum.

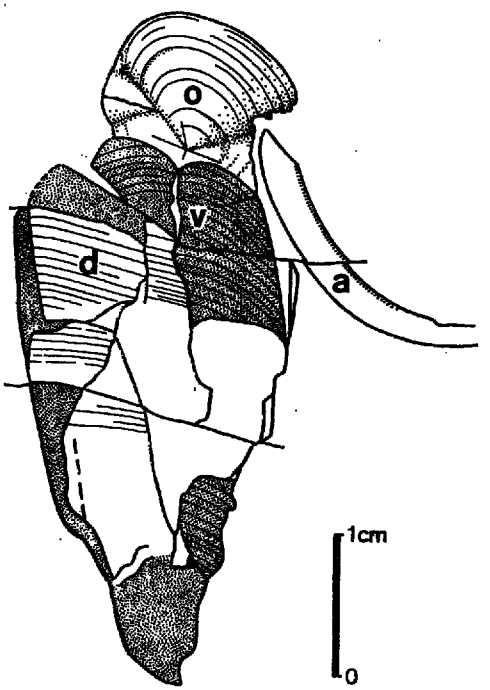


Fig. 3

Sketch-drawing of the holotype of *Hyolithes czarnae* sp. n.

o — operculum, **a** — appendage, **d** — dorsal fragments of the conch, **v** — ventral fragments of the conch *(dotted)*

PLATE 1

Allatheca kotuszowi sp. n.

1 — Conch with operculum (Specimen No 1.801 — holotype); Czarna reverside, × 4

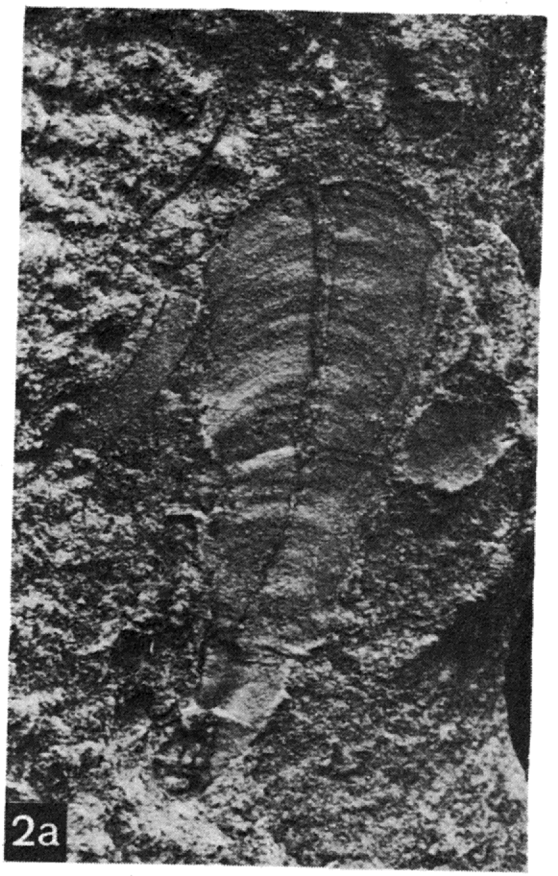
Hyolithes czarnae sp. n.

2a-2b — Conch with operculum and appendage (Specimen No 1.803): 2a — outer cast of ventral side of the conch with appendage *(left)* and part of operculum *(right)*, 2b — inner cast of operculum and part of conch; Czarna riverside, × 6

3a-3b — Operculum (Specimen No 1.804): 3a — frontal view, 3b — lateral view; Czarna riverside, × 2

Photos taken by K. ZIELIŃSKA


1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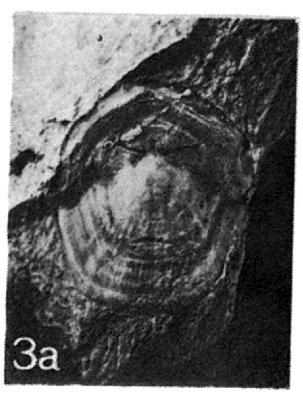
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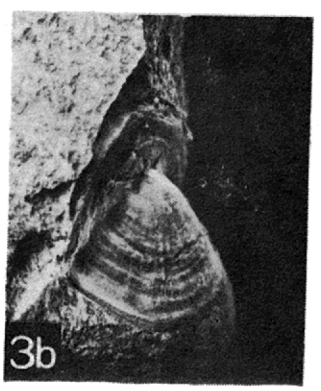
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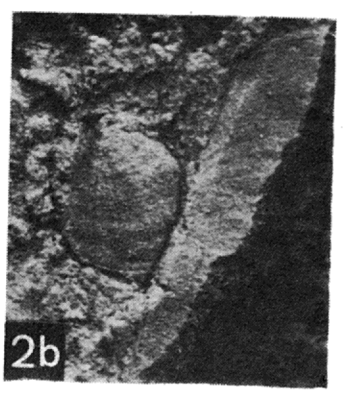
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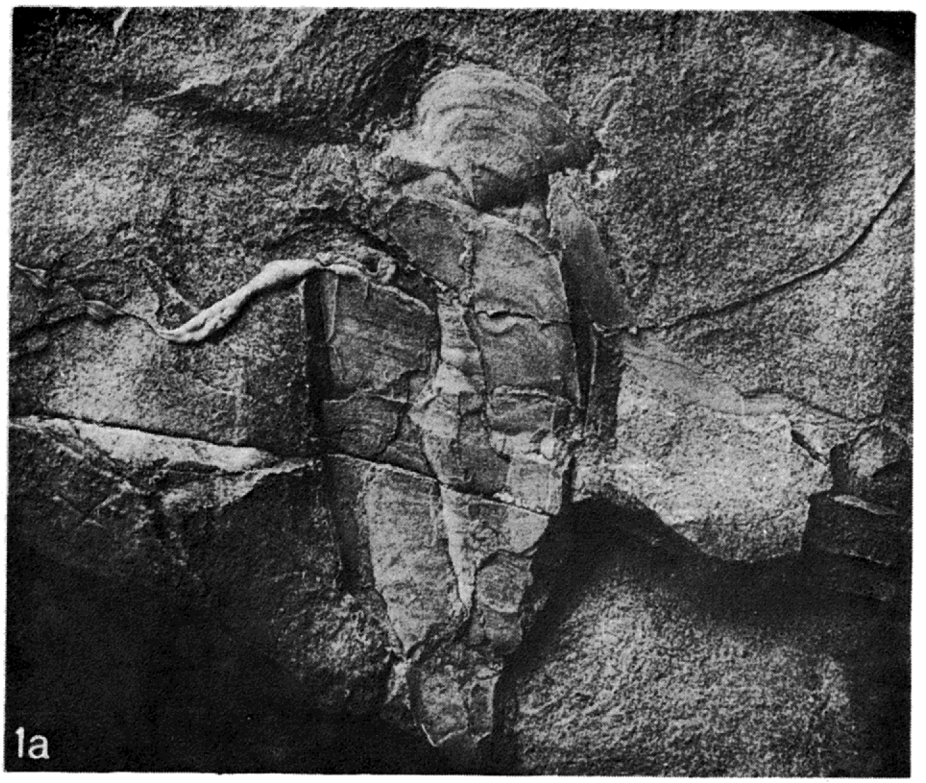
1a


1b

Genus *Hyolithes* EICHWALD, 1840

Hyolithes czarnae sp. n.

(Text-figs 3—4; Pl. 1, Figs 2—3 and Pl. 2, Fig. 1a—b)

HOLOTYPE: Conch with operculum and an appendage (specimen *No. 1.802*), presented in Pl. 2, Fig. 1.

TYPE LOCALITY: Exposure in the Czarna riverside, north of village Kotuszów.

TYPE HORIZON: Lower Cambrian, Platysolenites Zone, Czarna Shale Formation.

DERIVATION OF THE NAME: After the name of the river Czarna.

MATERIAL: Two almost complete flattened specimens consisting of conch, operculum and one appendage; as well as a separate operculum.

DIAGNOSIS: A *Hyolithes* with an elongated conch, covered by faint growth lines, with straight aperture and ligula; cross section oval with ventral side more flattened; operculum oval with large conical shield and a horizontal, straight furrow on the level of the apex; appendages curved.

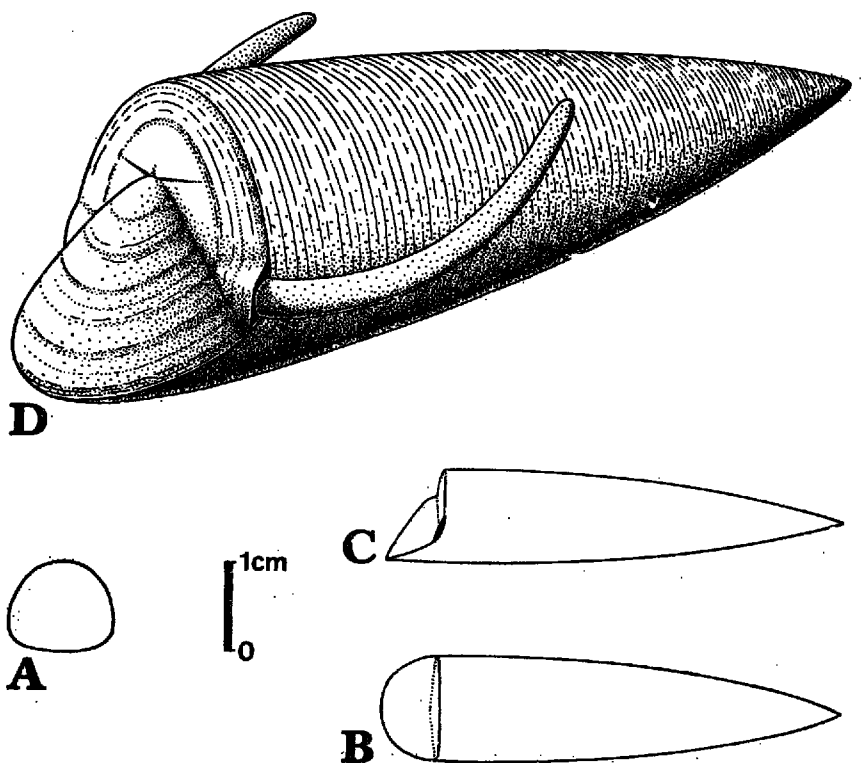

Fig. 4. Reconstruction of *Hyolithes czarnae* sp. n. and its outlines: A — cross section of the conch, B — top view of the conch, C — lateral view of the conch, D — complete specimen restored

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PLATE 2

Hyolithes czarnae sp. n.

1a-1b — Conch with operculum and appendage (Specimen No 1.802 — holotype): 1a — top view, 1b — cast; Czarna riverside, × 2

Photos taken by K. ZIELIŃSKA

DESCRIPTION: The conch is straight, broader anteriorly and narrowing posteriorly; its cross section is oval with the ventral side flattened (*see* Text-fig. 4*A*). The apical angle is about 35°. The bigger conch is about 40 mm, the whole length is about 50 mm. The ventral side of the conch is rather straight or slightly convex with the ligula forming a semicircle; the length of the ligula is about half a width of the aperture (*see* Text-figs 3—4 *B-C*). The surface of the ventral side is covered by faint and regular growth lines, curved anteriorly and repeating the shape of the anterior margin of ligula (*see* Text-figs 3—4*D*). Dorsal side is convex, covered with faint straight growth lines directed perpendicularly to the conch axis. The aperture is straight, without sinus.

The operculum is known as an outer cast only. It is oval, with conical shield convex and cardinal shield rather flat. The conical shield is big, convex and covered by thick growth lines parallel to the operculum margin; it is situated obliquely to the cardinal shield. The apex is well marked; apex angle of the conical shield is about 120°. The cardinal shield is more flat and situated more perpendicularly to the axis of the conch. Distinct growth lines parallel the dorsal margin of the shield. A horizontal straight furrow appears on the level of the apex of the conical shield. A pair of rooflets is present (*see* Text-figs 3—4*D*).

Two appendages, smooth and strongly flattened, are found in two separate specimens. The bigger appendage is about 200 mm long, 2 mm broad near the operculum, and it is progressively narrowing laterally; its curvature is regular and increasing toward the narrower, distal end of the appendage (*see* Text-figs 3—4*D*).

DISCUSSION: Such features as the existence of ligula, shape of aperture, shape and ornamentation of the conch, shape of the operculum, and the existence of appendages attributes the species to the genus *Hyolithes*. The new species is characterized by some features typical of the earliest species of this genus, as evidenced by oval cross-section of the conch and a smooth conch without any keels or furrows so characteristic of later species of the genus *Hyolithes*. An oval operculum with a large cardinal shield is also typical of an earlier period of evolution of this genus.

The new species is, in the shape and ornamentation of the conch, similar to *Hyolithes tenuistriatus* LINNARSSON (*see* HOLM 1893) from the Middle Cambrian of Sweden, but the operculum is different.

The new species is also similar to *Hyolithes carinatus* MATTHEW from the Middle Cambrian of the Burgess Shales, but it differs in the shape of the conch and operculum, as well as in a much bigger conical shield and a horizontal furrow on the cardinal shield.

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NAJSTARSZE HYOLITY Z KAMBRU DOLNEGO GÓR ŚWIĘTOKRZYSKICH

(Streszczenie)

Przedmiotem pracy jest opis hyolitów, znalezionych w łupkach formacji Czarnej, zaliczanej do dolnej części kambru dolnego Gór Świętokrzyskich (*patrz* fig. 1-4 oraz pl. 1-2). W łupkach tych skamieniałości występują bardzo rzadko, a ponadto są one trudne do interpretacji. Opisane hyolity są najbardziej jednoznaczną grupą skamieniałości, pozwalającą zarówno na określenie wieku osadów, jak też na przeprowadzenie korelacji stratygraficznych. Znalezione okazy opisano jako gatunki dla nauki nowe: *Allatheca kotuszowi* sp. n., oraz *Hyolithes czarnae* sp. n.
