A C T A P A L A E O N T O L O G I C A P O L O N I C A

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CONTRIBUTIONS TO THE LOWER CARBONIFEROUS CYRTOSYMBOLINAE (TRILOBITA)

Contents

Abstract. — Seven species and subspecies of the Lover Carboniferous Cyrtosymbolinae Hupé from Poland and Great Britain are described, including 5 new ones. They are assigned to 5 subgenera (one new) of the genus *Archegonus* Burmeister, 1843 (emend. Hahn, 1965). *Archegonus* (*Cyrtoproetus*) Reed, 1943 is revised. The relation between *Archegonus* (*Phillibole*) R. & E. Richter, 1937 and *Liobole* R. & E. Richter, 1949 is discussed. Also described is the ontogenetic development of *Archegonus* (*Phillibole*) *aprathensis richteri* n.subsp.

INTRODUCTION

The trilobites described in the present paper come from the Central Sudeten and Holy Cross Mountains (Poland), from Yorkshire and Lancashire (Great Britain) as well as from Limerick (Eire).

The material from Sudeten was kindly put at the present authors disposal by Dr. H. Żakowa (Geological Institute, Kielce). It contains, among others, cyrtosymboline trilobites from zones Go α and Go β (=cu III α, β), determined as: *Archegonus* (*Archegonus*) *aequalis aequalis* (Meyer, 1831), *A.* (*Waribole*) *laevicauda acutifrons* n.subsp., *A.* (*Waribole*) *laevicauda* subsp., *A.* (*Phillibole*) *aprathensis richteri* n.subsp., *A.* (*Phillibole*) *culmicus jugovensis* n.subsp. and *A.* (*Cyrtoproetus*) *anteriolatus* n.sp.

In the Holy Cross Mountains the writer herself collected several

specimens of "*Phillipsia cracoensis*" Reed, 1899 (=*Cyrtoproetus cracoensis*) found for the first time in Poland. The investigation of the new material and of the type collection of "*Phillipsia cracoensis*", housed in the Sedgwick Museum, Cambridge, allowed her to revise *Cyrtoproetus* Reed, 1943, so far insufficiently known. The latter is here regarded as a subgenus of *Archegonus* Burmeister. As a result of this revision, the subgeneric name *Archegonus* (*Angustibole*) Hahn, 1965 is considered to be a younger synonym of *A.* (*Cyrtoproetus*) Reed, 1943.

In the British Museum (Nat. Hist.) and in the Geological Survey and Museum (London) the present author examined the specimens of *Archegonus* (*Phillibolina*) *worsawensis* n.subgen., n.sp., coming from Lancashire and from Limerick. These specimens allowed her to elucidate the systematic position of the very rare cyrtosymboline species "*Phillibole* (*Phillibole*) *opatovicensis*" Přibyl, 1950. This latter is regarded here as a representative of the new subgenus *Archegonus* (*Phillibolina*).

The present writer wishes to express her gratitude to Dr. H. Żakowa (Geological Institute, Kielce) and to the authorities of the British Museum (Nat. Hist.), the Geological Survey and Museum (London), the Sedgwick Museum (Cambridge), and the Museum of Geological Institute (Warsaw), for loaning of material, and to Miss M. Czarnocka (Palaeozoological Institute, Polish Academy of Sciences), as well as to Mr. J. Watkins (Sedimentology Research Laboratory, Reading) for preparing the photographs.

Special thanks are due to Sir J. Stubblefield (Geological Survey, London) and Dr. R. Goldring (Sedimentology Research Laboratory, Reading) for their constant help and most valuable suggestions.

The abbreviations used in the present paper are:

Z.Pal. — Palaeozoological Institute, Polish Academy of Sciences, Warsaw
IG — Museum of the Geological Institute, Warsaw,
SMC — Sedgwick Museum, Cambridge,
GSM — Geological Survey and Museum, London,
BM — British Museum (Nat. Hist.), London.

MATERIAL AND STRATIGRAPHY

Sudeten

Most of the material here described comes from several localities in the Central Sudeten (see the map in Żakowa, 1966, p. 10, Fig. 1). This region was recently the subject of detailed study by Żakowa (1958*a*, 1958*b*, 1960*a*, 1960*b*, 1960*c*, 1963*a*, 1963*b*, 1966). The trilobites from this area had been already described by Scupin (1900) and mentioned by R. & E. Richter (1949). Unfortunately, Scupin's collection was lost during World War II.

The trilobites in the Lower Carboniferous deposits of Central Sudeten are comparatively rare and poorly preserved, usually in shales of the

"culm" facies. They are often distorted and devoid of exoskeletons. However, as a result of extensive field work, a comparatively large collection of about 150 trilobites were obtained, some of them satisfactorily preserved. The greatest bulk of this collection is made up of the Cyrtosymbolinae, the rest being assigned to the phillipsid genera: *Phillipsia* s. lato, *Griffithides, Bollandia* and *Cummingella*. The whole assemblage of the trilobites considered is of Upper Visean age (Go α, β). This is in agreement with the results obtained by Żakowa and based on non-trilobitic fauna.

Table 1

Range of Cyrtosymbolinae in Central Sudeten

Species	Localities					
	Wałbrzych Miasto		Konradów	Jugów	Glinno	Kamionkowo
	Go α	Go β	Go β	Go α	Go α	Go α
Archegonus (Archegonus) aequalis aequalis	...	...	...	...	+	
A. (Waribole) laevicauda acutifrons	+	...	...	+	○	
A. (W.) laevicauda subsp.	...	...	...	...	...	+
A. (Phillibole) aprathensis richteri	+	○	*	○		
A. (Ph.) culmicus jugovensis	...	...	...	○		
A. (Cyrtoproetus) anteriolatus	...	...	...	○	○	

\+ single specimen, ○ several specimens, * numerous specimens.

Archegonus (Archegonus) aequalis aequalis is the only form common for Sudeten (Poland) and Westfalen (Germany). In both areas it occurs in Go α. The rest of the cyrtosymboline from Sudeten are assigned to new species and subspecies, but still they seem to be of some stratigraphic value.

The nominate subspecies of *A. (Phillibole) aprathensis* is known from Go α in Moravia (ČSSR) and in Go β in the type locality (Aprath, sheet Elberfeld). The new Sudeten form is rare in Go α, but very abundant in Go β.

A. (Phillibole) culmicus culmicus (R. & E. Richter, 1937) is known from Go β in the Erbelfeld region, and from the undivided Go of the Hattingen region (Westfalen), but the new Sudeten subspecies occurring in Go α represents the older form.

The nominate subspecies of *A. (Waribole) laevicauda* is known from Go β in Westfalen, *A. (Waribole) laevicauda viaria* (Schwarzbach, 1962)

from the undivided *Goniatites* zone in Westfalen, but the new subspecies occurs in Sudeten in Go α.

A. (*Cyrtoproetus*) is, so far, a rare and weakly known subgenus. Its well defined species are known: from limestones of the cephalopod facies in Germany, *Pericyclus* zone (=Cu II) — *A.* (*Cyrtoproetus*) *winterbergensis* (Hahn, 1965); from coral-brachiopod facies (D_1—D_2) in Great Britain and Poland — *A.* (*Cyrtoproetus*) *cracoensis*; and the new species *A.* (*Cyrtoproetus*) *anteriolatus* from shales of Go α in Sudeten, Poland, as well as probably also from the same horizon in Novaya Zemla, U.S.S.R.

Holy Cross Mountains

The only species from the Holy Cross Mountains, described in the present paper, is *A.* (*Cyrtoproetus*) *cracoensis* (Reed, 1899), found in the upper Visean limestone of Gałęzice. In the same assemblage occur: *Coignouina acanthina* (Coignou, 1890), redescribed previously by the present author (Osmólska, 1967), phillipsid trilobites — *Griffithides*, *Eocyphinium*, *Cummingella* and several representatives of *Brachymetopus*. *A.* (*Cyrtoproetus*) *cracoensis* has a very wide geographic range, being known also from Yorkshire and Staffordshire in Great Britain. In Yorkshire this form is also associated with *Coignouina acanthina*.

Great Britain and Eire

A. (*Phillibolina*) n.subgen., known so far only from "culm" facies of Moravia — Go α, β — *A.* (*Phillibolina*) *opatovicensis* (Přibyl, 1950), occurs also in Lancashire, Great Britain, and Limeric, Eire, but in this two latter areas — in calcareous facies. *A.* (*Phillibolina*) is here represented by a new species *A.* (*Phillibolina*) *worsawensis* n.sp. The age of British and Irish deposits containing the new species cannot be precisely determined, but it seems that Visean could be suggested. The other form described here from Great Britain is *A.* (*Cyrtoproetus*) *cracoensis* (see above).

DESCRIPTIONS

Family **Proetidae** Salter, 1864
Subfamily **Cyrtosymbolinae** Hupé, 1953
Genus *Archegonus* Burmeister, 1843 (emend. G. Hahn, 1965)
Subgenus *Archegonus* (*Archegonus*) Burmeister, 1843
Archegonus (*Archegonus*) *aequalis aequalis* (Meyer, 1831)
(Pl. II, Fig. 1; Text-pl. I, Fig. 3)

1967. *Archegonus* (*Archegonus*) *aequalis aequalis* (H. v. Meyer); R. Hahn, Neue Trilobiten..., p. 100, Fig. 1 (*with the previous synonymy*).

Material. — One internal mould of cranidium (IG 442.II.26) from Go α of Glinno, Central Sudeten, Poland.

Dimensions (in mm):

	IG 442. II. 26
Length of cranidium	4.0
Length of glabella	3.0
Width of glabella	1.8

Remarks. — The cranidium from Glinno differs only very slightly from the specimen illustrated by R. Hahn (1967) in having smaller dimensions and comparatively broader (*tr.*) palpebral lobe, equal in width to the width (*sag.*) of occipital ring. From the paratype specimen figured by R. & E. Richter (1937, Fig. 3a) the cranidium here considered differs more significantly, having longer (*exsag.*) palpebral lobe, clearly marked α, and not so distinctly developed occipital lobes.

Subgenus *Archegonus* (*Waribole*) R. & E. Richter, 1926
Archegonus (*Waribole*) *laevicauda* (Sarres, 1857)
Archegonus (*Waribole*) *laevicauda acutifrons* n.subsp.
(Pl. I, Figs. 1—4, Text-pl. I, Figs. 6, 7)

Holotype: Cephalon (IG 442.II.24a); Pl. I, Figs. 2, 4.
Type horizon: Argilaceous shales, Go α, Lower Carboniferous.
Type locality: Glinno, Central Sudeten, Poland.
Derivation of the name: Lat. *acutus* = sharp, *frons* = front; because of acute frontal outline of cephalon.

Diagnosis. — Subspecies of *Archegonus* (*Waribole*) *laevicauda* with weakly convex, horizontally situated preglabellar region, without differentiated anterior border; pygidium short, with highly vaulted, abruptly narrowing axis; about 11 distinct axial rings, 7 ribs; doublure broad.

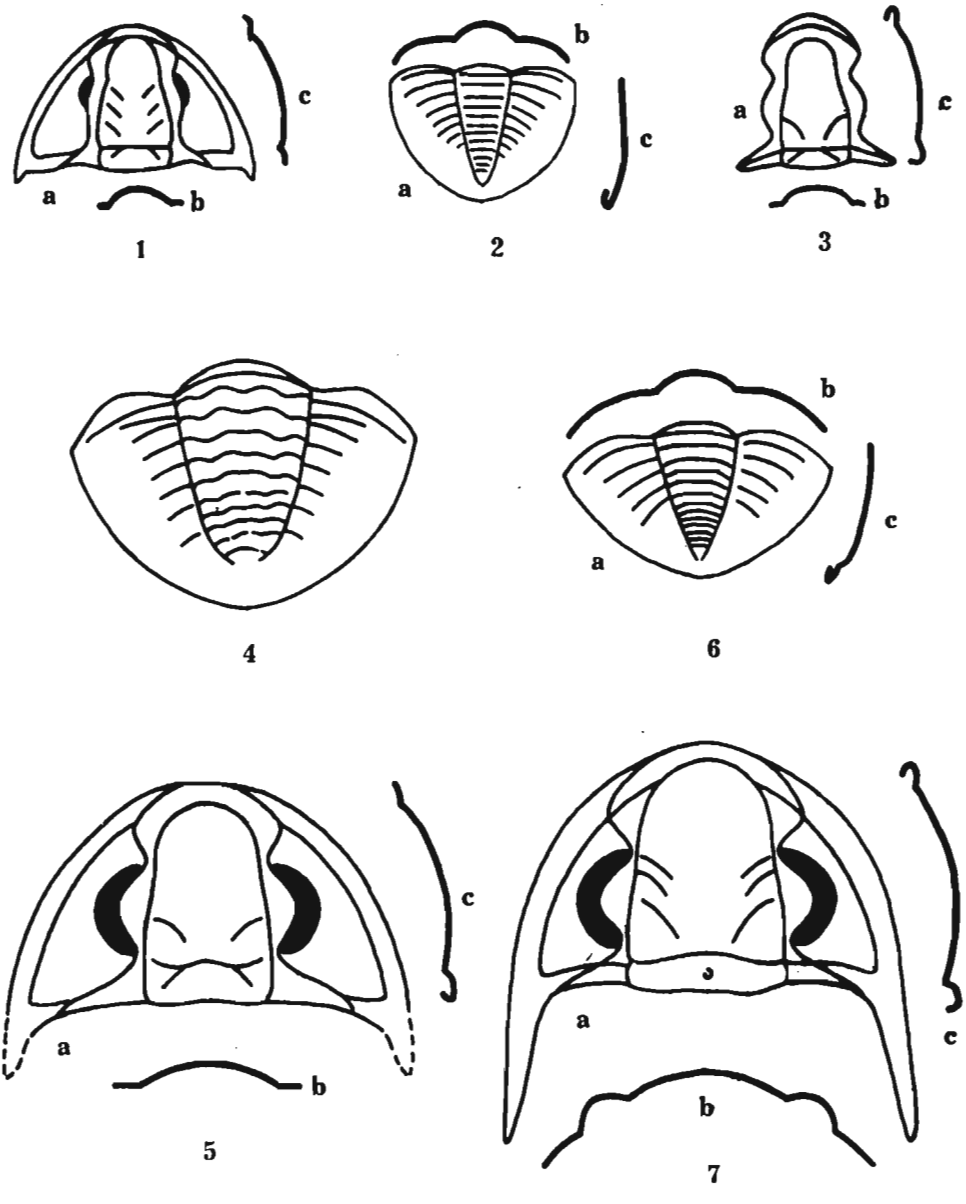
Material. — One cephalon (holotype), 1 external mould of entire exoskeleton, 2 pygidia from Go α of Glinno, fragment of cephalon, 1 pygidium with several thoracic segments attached from Go α of Jugów, fragment of internal mould of cephalon from Go α of Wałbrzych Miasto, Central Sudeten.

Dimensions (in mm):

	IG 442. II. 24a	IG 442. II. 24b	IG 442. II. 11
Length of entire exoskeleton	12.8	—	—
Length of cephalon	5.1	5.5	—
Width of cephalon	—	10.3	—
Length of glabella	4.0	4.0	—
Width of glabella	2.5	3.5	—
Length of pygidium	3.8	—	5.2
Width of pygidium	6.2	—	8.5
Length of axis	3.0	—	4.0
Width of axis	2.3	—	2.8

Description. — Cephalon subtriangular, with long genal spines; anterior outline of cephalon in the form of an acute arch; anterior border absent, preglabellar region weakly convex, horizontal, without preglabellar field developed; glabella gently narrowing anteriorly, broadly rounded frontally, slightly constricted between γ; 3 pairs of lateral glabellar furrows faintly marked; occipital ring equally broad (*sag.*),

TEXT-PLATE I



occipital furrow reaching axial furrows, at extremities directed slightly forwards; palpebral lobe strongly curved, wide (*tr.*), γ and ε close to axial furrow, β and δ situated on the same line; anterior section of facial suture between γ and β long and strongly divergent from axial furrow, from β to α long and convergent; posterior section relatively short, from ε to ζ running very close to axial furrow; librigena with slightly upturned, broad lateral margin, without border furrow, genal spine about half as long (*exsag.*) as the rest of librigena, visual lobe large, situated nearly perpendicularly to the level of palpebral lobe.

In longitudinal section, occipital ring convex, glabella posteriorly as high as occipital ring, slightly sloping forwards; preglabellar region somewhat convex, horizontally situated.

In transverse section, glabella gently convex, palpebral lobes raising steeply from axial furrow to the middle of their width (*tr.*), then horizontally, as high as glabella.

Hypostoma unknown.

Thorax of nine segments; axis somewhat broader (*tr.*) than pleural lobes, vaulted; axial rings convex longitudinally; pleural lobes on one third of their width (*tr.*) horizontal, then sloping obliquely; pleurae flat, pointed, divided by broad pleural furrows.

Pygidium shorter than semicircle, without border; axis composed of 10—11 rings, rapidly tapering backwards, prolonged by postaxial ridge; 6—7 flat ribs on pleural lobes.

In longitudinal section, axis gently sloping, not differentiated from postaxial region.

Text-Plate I

Archegonus (Phillibole) aprathensis richteri n.subsp.

Fig. 1. *a* Dorsal view of holotype cephalon, *b* transverse section, *c* longitudinal section (IG 442.II.20), Jugów.

Fig. 2. *a* Dorsal view of pygidium, *b* transverse section, *c* longitudinal section (IG 442.II.29), Wałbrzych Miasto.

Archegonus (Archegonus) aequalis aequalis (Meyer)

Fig. 3. *a* Dorsal view of cranidium, *b* transverse section, *c* longitudinal section (IG 442.II.26), Glinno.

Archegonus (Cyrtoproetus) anteriolatus n.sp.

Fig. 4. Dorsal view of pygidium (IG 442.II.6a); Jugów.

Fig. 5. *a* Dorsal view of cephalon, *b* transverse section, *c* longitudinal section (holotype cranidium-IG 442.II.10); Jugów.

Archegonus (Waribole) laevicauda acutifrons n.subsp.

Fig. 6. *a* Dorsal view of pygidium, *b* transverse section, *c* longitudinal section (IG 442.II.24a); Glinno.

Fig. 7. *a* Dorsal view of cephalon, *b* transverse section, *c* longitudinal section (holotype cephalon-IG 442.II.24a); Glinno.

Central Sudeten, Poland.

In transverse section, axis forming acute arch, slightly elevated above the comparatively flat pleural lobes.

Cephalic and pygidial doublure weakly convex, broad.

Ornamentation in the form of a very dense, fine granulation, which is less pronounced on the pygidium.

Remarks. — *Archegonus* (*Waribole*) *laevicauda acutifrons* n.subsp. is the third representative of *Archegonus* (*Waribole*) R. & E. Richter, 1926, known from the *Goniatites* Zone. It is closer to *A.* (*Waribole*) *laevicauda viaria* (Schwarzbach, 1962) than to the nominate subspecies, having a similar preglabellar region without border and preglabellar field, and longer genal spines, than those in *A.* (*Waribole*) *laevicauda laevicauda* (Sarres, 1857). However, the shape of the anterior margin of cephalon, shape of glabella, as well as the strongly diverging anterior sections of facial suture are similarly developed as in the nominate subspecies. In all these characters the new species differs from *A.* (*Waribole*) *laevicauda viaria.*

R. and E. Richter (1937) described the pygidium attributed to the cephala of *A.* (*Waribole*) *laevicauda laevicauda,* as being probably conspecific. The latex cast of the entire specimen (IG 442.II.24b) of *A.* (*Waribole*) *laevicauda acutifrons* displays the pygidium more typical for *A.* (*Waribole*), with short, strongly tapering axis and postaxial ridge. In the present author's epinion, the pygidium attributed to the cephala of nominate subspecies should be rather assigned to some representative of *A.* (*Phillibole*), known from the same locality.

Hahn (1967) described from cu II (*Pericyclus* Zone) another, late representative of *A.* (*Waribole*) — *A.* (*Waribole*) *richteri.* Our form is close to the latter in the shape of glabella, palpebral lobes, and especially in the pygidium which is of the same "*Waribole*-type", with short, rapidly tapering axis prolonged by postaxial ridge, quite unlike that described in *A.* (*Waribole*) *laevicauda laevicauda* (Sarres). However, *A.* (*Waribole*) *richteri* is very characteristic by its lack of genal spines and the presence of convex anterior border.

Archegonus (*Waribole*) *laevicauda* (Sarres, 1857) subsp.
(Pl. II, Fig. 7)

Material. — In Go α beds of Kamionkowo (=Steinkunzendorf), Central Sudeten, Poland, one entire, somewhat deformed specimen, which represents the early holaspis.

Dimensions (in mm):

	IG 442. II. 27
Length of entire exoskeleton	6.0
Length of cephalon	2.8
Width of cephalon	4.0
Length of glabella	2.0
Width of glabella	1.8
Length of pygidium	1.9
Width of pygidium	3.2
Length of axis	1.8
Width of axis	0.9

Description. — Cephalon semicircular, with long genal spines; cephalic border convex upturned; preglabellar region damaged, but a narrow (*sag.*) preglabellar field seems to be present; glabella conical, constricted anteriorly, distinctly furrowed; occipital ring slightly narrowed at extremities; palpebral lobe broad (*tr.*), γ and ε close to axial furrow, posterior section of facial suture for a short distance parallel to axial furrow, then abruptly turns outwards; librigena with large visual lobe, which is steeply placed; genal spines thin, rounded in cross section, reaching back to the 6-th thoracic segment.

Hypostoma unknown.

Thorax of nine segments, with axis highly vaulted, about as broad as pleural lobes.

Pygidium with differentiated narrow border, axis with 13 rings, all clearly visible till the end of axis; on pleural lobes 9 convex ribs, well marked to the very end of pygidium.

Remarks. — The course of facial suture as well as the significant width (*tr.*) and the posterior position of palpebral lobe clearly indicate that the above described young holaspid specimen should be assigned to *A.* (*Waribole*). The upturned lateral cephalic margin closely resembles that of *A.* (*Waribole*) *laevicauda* (Sarres). When compared with *A.* (*Waribole*) *laevicauda acutifrons* n.subsp. described from the same area, this specimen shows some differences in the rounded cross-section of genal spine, greater number of pygidial rings and the presence of differentiated pygidial border. These characters may be due to the fact that the specimen considered represents a very young instar of holaspis, and some of them could still undergo change during the postlarval ontogeny.

However, the specimen comes from a different locality than these of *A. Waribole laevicauda acutifrons* n.sp., thus its subspecifical assignment is questionable.

Subgenus *Archegonus* (*Phillibole*) R. & E. Richter, 1937

Remarks. — In the literature dealing with the Lower Carboniferous Cyrtosymbolinae there exists a great divergence of opinions on the forms described by Weber (1937) as "*Typhloproetus aequalis*" (pp. 23—25, Pl. 2, Figs. 24—27) from the South Urals (the right bank of the Ural river, locality no. 435, Figs. 24, 27; the Aktiubinsk region of Kazakhstan, localities nos. 284, 293, Figs. 25, 26) and "*Typhloproetus (?) aequalis* var. *megalophtalma*" from Novaya Zemla (locality no. 248, Figs. 28—34).

According to Přibyl (1950, p. 9), the specimens from the South Urals, illustrated by Weber (1937) on Pl. 2, Figs. 24—27, should be regarded as a new species of *Liobole* R. & E. Richter, 1949, for which Přibyl proposed the name "*Phillibole (Liobole) weberi*". For the holotype, this author (1950) chose the specimen illustrated by Weber on Fig. 24. Simultaneously, he regarded the specimens from Novaya Zemla as "*Phillibole (Phillibole) megalophtalma* (Weber)".

Later, the present author, discussing the status of *Liobole* (1962) considered "*weberi*-form" as a subspecifical unit — "*Liobole glabroides weberi*".

Recently, G. Hahn (1965, p. 253) has assigned "*Typhloproetus (?) aequalis* var. *magalophtalma*" (Weber's Fig. 31), but evidently also "*Typhloproetus aequalis*" (Weber's Fig. 24) to *Archegonus* (*Phillibole*) R. & E. Richter, under the name *A.* (*Phillibole*) *megalophtalmus* (Weber, 1937).

In fact, there exists so great a similarity between the two cranidia, the one from South Urals (Weber's Fig. 24) and the one from Novaya Zemla (Weber's Fig. 31), that Hahn's opinion about their being conspecific is fully justified.

Nevertheless, according to the present author's opinion, the remaining specimens from Novaya Zemla (Weber's Figs. 28—30, 33) are not conspecific with *A.* (*Phillibole*) *megalophtalmus*. Moreover, they display some characters of the other subgenus — *Archegonus* (*Cyrtoproetus*) Reed, 1943, and are most probably conspecific with *A.* (*Cyrtoproetus*) *anteriolatus* n.sp. described in the present paper (see discussion on p. 146). The librigenae from Novaya Zemla (Weber's Figs. 29, 33, 34) with very large visual lobes exhibit the course of facial suture, which does not correspond with that on the holotype cranidium. The latter is more likely to have a librigena with small and shifted forwards visual lobe, similar to that found with the specimen from South Urals (Weber's Fig. 24). The librigenae with large eyes should be rather attributed to the cranidia of *A.* (*Cyrtoproetus*) from the same locality. However, the name "*magalophtalmus*", inappropriate as it is, should be retained as a valid one, because Weber had chosen for the holotype of his "var. *megalophtalma*" the cranidium from Novaya Zemla, illustrated on his Fig. 31. Thus, the name "*weberi*", established by Přibyl (1950), is its younger synonym.

A. (*Phillibole*) *megalophtalmus* (Weber) is assigned by Hahn (1965) to the "*aprathensis*-group" recognized by this author within *Archegonus* (*Phillibole*). In the present author's opinion, the species most closely related to *A.* (*Phillibole*) *megalophtalmus* are: *A.* (*Phillibole*) *culmicus* (R. & E. Richter, 1937) (and especially its here described new subspecies *A.* (*Phillibole*) *culmicus jugovensis*), *A.* (*Phillibole*) *crameri* R. Hahn, 1967, and *A.* (*Phillibole*) *microphtalmus* R. Hahn, 1967.

It should be stated that *A.* (*Phillibole*) *megalophtalmus* displays some characters, i.e. the course of facial suture and the width (*tr.*) of fixigena, which give it an intermediate position between the "*aprathensis* group" of *Archegonus* (*Phillibole*) and the genus *Liobole*.

According to R. & E. Richter (1949), the main difference between *Phillibole* and *Liobole* is the width of fixigena which in *Liobole* is broad (*tr.*), with γ and ε moved far from the axial furrow, and the presence of occipital lobe in this genus ("*Liobole*-Bau der Neckengegend"). In their opinion, these two genera have, in addition, a different stratigraphic range — *Phillibole* being mainly present in cu III (excluding "*Ph. nitida*"), while *Liobole* occurs exclusively in cu II.

However, as indicated by the detailed, more extensive diagnosis recently presented by Hahn (1965), some of these differences do not exist: i.e. the occipital lobes are found in several representatives of *A.* (*Phillibole*), pygidia, both in *Liobole* as in *A.* (*Phillibole*), show the same tendency towards the elongation and the obsoleting of relief. The stratigraphic criterion is also not valid, *A.* (*Phillibole*) and *Liobole* being found side by side. As to the greater width (*tr.*) of fixigena in *Liobole*, there are found within *A.* (*Phillibole*) also the forms, which take, in this respect, an intermediate position (i.e. *A.* (*Phillibole*) *megalophtalmus*, *A.* (*Phillibole*) *culmicus jugovensis* n. subsp.).

The main difference which counts in this case seems to be a combination of the two characters: the anterior position of visual lobe associated with the divergent course of post-palpebral section of facial suture. This compound character, called by A. & E. Richter (1949) the "Peltura-Tendenz" occurs in *Liobole*.

It should be stated here that within the latter genus one can distinguish the two groups of species:

a) "*subaequalis* group" with: *L. subaequalis* (Holzapfel, 1889), *L. glabroides* R. & E. Richter, 1949, *L. barilliformis* Osmólska, 1962 and *L. zarembiensis* Osmólska, 1962 — these species display the "*Phillibole* type" of facial suture;

b) "*glabra* group" — here may be assigned the remaining representatives of *Liobole* with developed "Peltura-Tendenz".

In conclusion, it should be stated that subgenus *A.* (*Phillibole*), being recently so precisely distinguished from the other subgenera of *Archegonus* (Hahn, 1965), is still not very well separated from the representa-

tives of *Liobole*, namely those assigned above to the "*subaequalis* group".

The suggestion is here put forwards that *Liobole* may possibly be a diphyletic unit, part of it being very closely related with *Archegonus* (*Phillibole*). However, this question cannot be resolved without a detailed revision of *Liobole*. The "culm" facies which yields most of *Liobole* and *A.* (*Phillibole*) species, is not the most favourable for their preservation, and most of their representatives are known as distorted internal moulds only, what makes proper investigation very difficult.

Archegonus (*Phillibole*) *aprathensis* R. & E. Richter, 1937
Archegonus (*Phillibole*) *aprathensis richteri* n. subsp.
(Pl. II, Figs. 3—5; Pl. III, Figs. 1—7; Text-pl. I, Figs. 1, 2)

?1949. *Phillibole* (*Phillibole*) aff. *aprathensis*; R. & E. Richter, Die Trilobiten der Erdbach-Zone... p. 69.

Holotype: Cephalon (IG 442.II.20); Pl. III, Fig. 3.
Type horizon: Argillaceous-graywacke series, Go *a* Lower Carboniferous.
Type locality: Jugów, Central Sudeten, Poland.
Derivation of the name: richteri — in honour of the late Rudolf and Emma Richter.

Diagnosis. — Subspecies of *Archegonus* (*Phillibole*) *aprathensis* with upturned cephalic border, comparatively broad (*tr.*) fixigena and librigena provided with short, sharply pointed spine.

Material. — One cephalon (holotype), 1 external mould of pygidium from Go α in Jugów (= Hausdorf), 1 internal mould of entire specimen and 1 pygidium from Go α in Wałbrzych Miasto (= Altwasser), 5 internal moulds of cranidia, 2 entire meraspis specimens, about 10 internal moulds of pygidia from Go β in Wałbrzych Miasto, about 50 deformed entire specimens and counter parts from Go β in Konradów (= Conradsthal), Central Sudeten, Poland.

Dimensions (in mm):

	IG 442. II. 36	IG 442. II. 35	IG 442. II. 28	IG 442. II. 20
Length of entire exoskeleton	6.8	—	—	8.5
Length of cephalon	3.0	—	3.8	14.0
Width of cephalon .	4.2	—	2.5	6.2
Length of glabella .	2.0	—	2.5	4.7
Width of glabella . .	1.3	—	2.0	—
Length of pygidium	2.2	2.0	—	—
Width of pygidium .	3.0	3.0	—	—
Length of axis . .	1.9	1.7	—	—
Width of axis . . .	0.9	0.6	—	—

Description. — Anterior outline of cephalon highly arched, cephalon surrounded by flat upturned border, no distinct border furrow; glabella gently narrowing frontally, reaching the border, somewhat pointed anteriorly; only basal furrow marked, however very indistinct; occipital ring wide (*sag.*) with weakly developed occipital lobes; occipital furrow uniformly and moderately deep, divided into 3 parts, the two external only slightly directed forwards; fixigena with differentiated palpebral lobe, the latter equal in width (*tr.*) to about the width (*sag.*) of occipital ring; posterior part of fixigena slightly broader (*tr.*) than half of palpebral lobe (*tr.*), anterior section of facial suture diverging from axial furrow, with β sharply marked, γ well pronounced and somewhat nearer to axial furrow than ε, which is not clearly determined, posterior section of facial suture convergent to axial furrow, librigena with upturned lateral border and very short, pointed genal spine, external margin of posterior border slightly bent inwards near the genal spine; visual lobe weakly convex, small, semicircular, situated in the anterior part of librigena, between δ and γ.

In longitudinal section, occipital ring weakly convex, glabella gently arched, slightly sloping towards somewhat upturned anterior border.

In transverse section, glabella comparatively flat, palpebral lobes nearly flat.

Hypostoma unknown.

Thorax of nine segments with vaulted, broad axis; axial rings slightly narrower than occipital ring (*sag.*); pleurae pointed, divided into two equally broad (*exsag.*) bands.

Pygidium parabolic without border; axis long, uniformly tapering, reaching the short distance before the posterior margin of pygidium; 13—14 axial rings, ring-furrows indistinct, 7—8 faintly pronounced ribs; pleural furrows deeper than interpleural ones, articulating half-segment well delimited; doublure narrow, moderately convex.

In longitudinal section, axis very gently sloping, well delimited from the postaxial region.

In transverse section, axis faintly vaulted, somewhat higher than nearly flat pleural lobes.

Ornamentation in form of very fine granulation, sparse on glabella, slightly denser on the middle portion of occipital ring and central part of librigena; on pygidium extremely faint.

Ontogenetic development. — In Wałbrzych Miasto (Go β), among adult individuals there were found 2 nearly complete young individuals and 2 small cranidia with attributed librigenae. The entire specimens represent degree 7 (Pl. II, Fig. 3) and 8 (Pl. II, Fig. 4) of meraspis stage. They allow one to state that the adolescent individuals display conical, deeply furrowed glabellae, as those typical for the Upper Devonian representatives of Cyrtosymbolinae, having also a marked, narrow preglabellar

field, which disappears in adult individuals. The position of visual lobe and the course of facial suture seem to be the most progressive characters, because they are already pronounced in a definitive form in these meraspids, while the other "*Phillibole*-characters" are still absent. This early stabilization of the course of facial suture was already noticed by Hahn (1966) in the other representative of the same subgenus — *A.* (*Phillibole*) *nitidus* (Holzapfel, 1889) and it seems to be the distinguishing character of *A.* (*Phillibole*).

Among the meraspid individuals of *A.* (*Phillibole*) *aprathensis richteri* n. subsp. not one shows the pointing of the anterior margin of cranidium which is characteristic for many known adolescent Cyrtosymbolinae, i.e. *A.* (*Phillibole*) *brevispina* (Osmólska, 1962). Also the larval notch is obsolete in the here considered meraspids. However, as was already suggested (Osmólska, 1962), both characters may be closely correlated. In some cases they probably could disappear earlier, during the ontogenetic development.

The meraspids here considered display also the adolescent characters common for the larvae of most of trilobites. The genal spines, long at first, gradually become shorter; the flat, horizontal rim surrounding transitory pygidium, later disappears; ornamentation distinct and dense at first, becomes less pronounced on the exoskeletons of adult individuals.

Remarks. — In 1949, R. and E. Richter mentioned that in Lower Silesia — localities Conradsthal (= Konradów) and Altwasser (= Wałbrzych Miasto) occurs "*Phillibole* (*Phillibole*) aff. *aprathensis* R. & E. Richter". The present author had at her disposal trilobites from both the above mentioned localities. There seems to be little doubt that the specimens mentioned by Richters are conspecific with these here described. However, it should be stated that there exist some slight differences between the specimens from the type locality and those from Konradów The one most noticeable is the upturning of the anterior border, distinctly marked on all the cranidia from Wałbrzych Miasto and Jugów, while in all the specimens from Konradów the anterior border is horizontal, being in this respect very close to the nominate subspecies. Also the fixigenae in the specimens of the first mentioned group are somewhat broader than in the specimens collected in Konradów. The common characters for both groups of specimens are among others: the presence of short genal spines and comparatively pointed front of glabella. These characters, as well as somewhat broader (*tr.*) fixigena differ the here described new subspecies from the nominate subspecies. The specimens from Konradów, representing mostly the entire exoskeletons, are much worse preserved than the others. They are usually strongly deformed, and the surfaces of internal and external moulds are "worn down" making all details obscure. It is difficult to decide whether the above men-

tioned differences are due to the state of preservation, or whether they characterize the separate infrasubspecific forms. In the present author's opinion, they cannot be regarded as of any subspecific value.

Archegonus (Phillibole) culmicus R. & E. Richter, 1937
Archegonus (Phillibole) culmicus jugovensis n. subsp.
(Pl. II, Fig. 2; Pl. IV, Fig. 1; Text-pl. II, Fig. 5)

1900. *Phillipsia* aff. *aequalis* Meyer; H. Scupin, Die Trilobiten des Niederschlesischen... pp. 3—5, Pl. 1, Fig. 10.
?1900. *Phillipsia* aff. *aequalis* Meyer; H. Scupin, *Ibid.*, Pl. 1, Figs. 11, 12.

Holotype: Cranidium (IG 442.II.4a); Pl. IV, Fig. 1.
Type horizon: Argillaceous-graywacke series, Go α, Lower Carboniferous.
Type locality: Jugów, Central Sudeten, Poland.
Derivation of the name: jugovensis — after the type locality Jugów.

Diagnosis. — Subspecies of *Archegonus (Phillibole) culmicus* with comparatively broad (*tr.*) fixigena, equal in width (*sag.*) to occipital ring, posterior section of facial suture parallel to dorsal furrow, occipital furrow very deep mesially, with its extremities directed strongly forwards, not reaching axial furrow; occipital lobes very faintly marked.

Material. — One cranidium with exoskeleton partly preserved (holotype), 1 internal mould of fragmentary cranidium, several pygidia probably belonging to the subspecies from Go α, Jugów (= Hausdorf), Central Sudeten, Poland.

Dimensions (in mm):

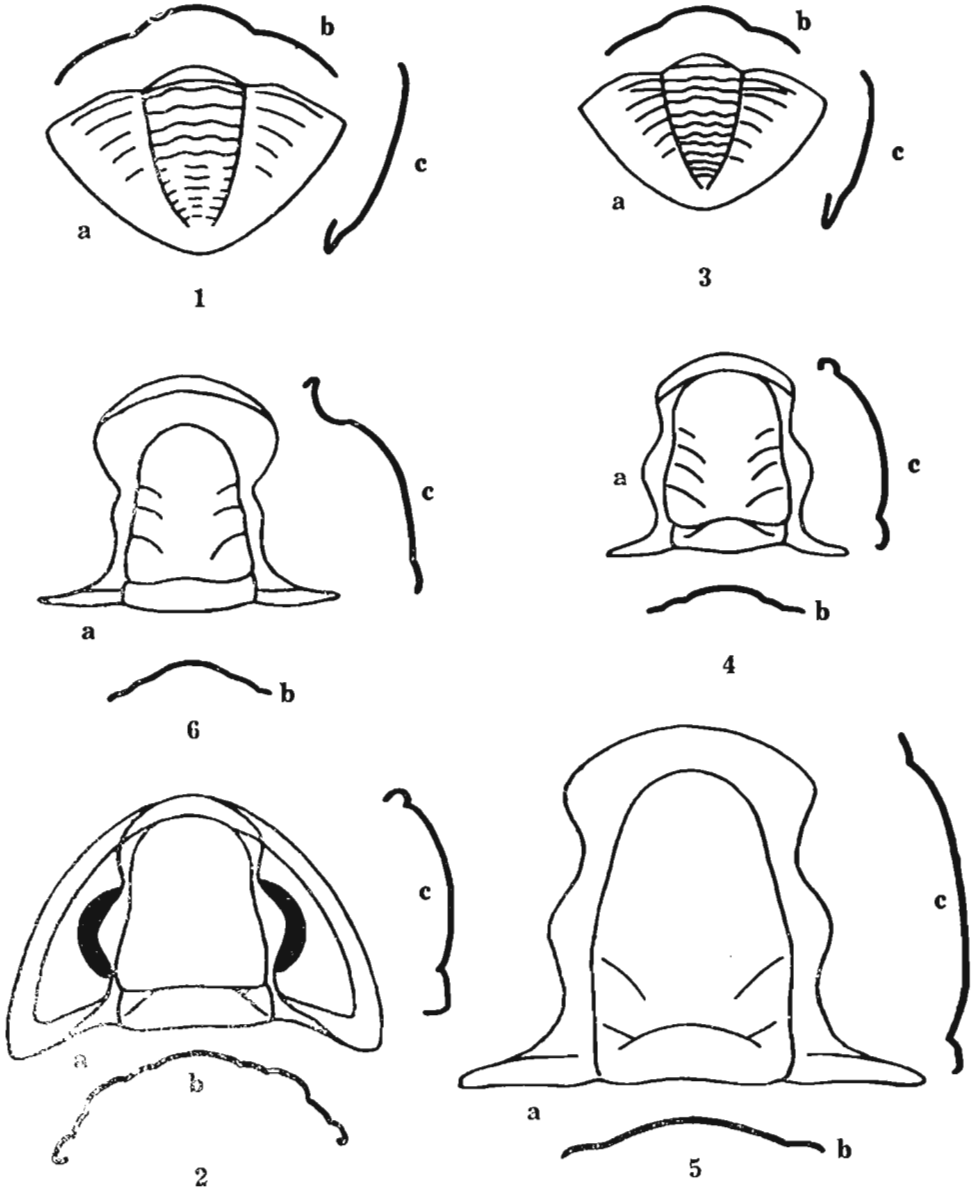
	IG 442. II. 4a	IG 442. II. 4b
Length of cranidium .	12.7	—
Length of glabella . .	8.0	—
Width of glabella . .	6.0	—
Length of pygidium . .	—	12.8
Width of pygidium . .	—	21.0
Length of axis . . .	—	11.0
Width of axis	—	6.0

Description. — Preglabellar region flat, comparatively wide (*sag.*), without differentiated anterior border; glabella somewhat narrowing forwards, indistinctly constricted anteriorly, only basal furrow faintly marked on exoskeleton, not reaching axial furrow, on internal mould 3 pairs of lateral furrows visible; occipital ring broad (*sag.*), distinctly widens towards axial furrows, without well developed occipital lobes; occipital furrow divided into 3 sections, the two outer directed strongly forwards, not reaching axial furrows; fixigena as broad (*tr.*) as the occipital ring (*sag.*); palpebral lobe curved, short (*exsag.*), situated approximately oppo-

site the middle of glabella; facial suture between γ and β divergent, its posterior section between ε and ζ parallel to axial furrow, from ζ abruptly turned outwards.

In longitudinal section, occipital ring convex, as high as glabella, the latter flat, gently sloping forwards; preglabellar region flat, about the width (*sag.*) of occipital ring.

TEXT-PLATE II



In transverse section, glabella extremely weakly vaulted, indistinctly delimited from flat palpebral lobes.

Librigena, hypostoma and thorax unknown.

Pygidium attributed to the holotype cranidium and probably belonging to the subspecies, shows the characters typical for the subgenus, such as a long, slender axis, and a lack of differentiated border. Besides, it has a comparatively broad and nearly flat doublure. The number of axial rings and ribs obscure because of the poor state of preservation.

Remarks. — The described cranidium is conspecific with the one described by Scupin (1900, Fig. 10) coming from the same beds and locality (Jugów). It is assigned to the *Archegonus* (*Phillibole*) *culmicus*, as its new subspecies, on account of the similarity in the shape of glabella, flat preglabellar region, position and shape of palpebral lobe, as well as the course of facial suture. This latter runs, however, in the new subspecies at a greater distance from the axial furrow, and accordingly the fixigena is broader (*tr.*). The pygidium probably belonging to this subspecies, differs distinctly from *A.* (*Phillibole*) *culmicus culmicus* R. & E. Richter, 1937 in having a longer axis. It is, however, close to the nominate subspecies in its comparatively broad and flat doublure. This broad doublure differs the pygidium of *A.* (*Phillibole*) *culmicus jugovensis* n. subsp. from the pygidia of *A.* (*Phillibole*) *aprathensis richteri* n. subsp. also present in the same locality. The doublure in the latter subspecies is narrow and convex. The broad doublure is also present in the pygidium of *A.* (*Cyrtoproetus*) *anteriolatus* n.sp. from the same beds and locality, here it is however flatter, and the pygidial axis broader and shorter.

The above described subspecies is very close to *A.* (*Phillibole*) *megalophtalmus* (Weber, 1937) described from the South Urals and Novaya Zemla, but has broader fixigena than the latter. In this respect, the new subspecies closely resembles some representatives of *Liobole* R. & E. Rich-

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Text-Plate II

Archegonus (*Cyrtoproetus*) *cracoensis* (Reed)

Fig. 1. *a* Dorsal view of pygidium, *b* transverse section, *c* longitudinal section (Z. Pal. Tr. II. 285); Gałęzice, Ostrówka Hill, Holy Cross Mountains, Poland.

Fig. 2. *a* Dorsal view of cephalon, *b* transverse section, *c* longitudinal section (Z. Pal. Tr. II. 284); Gałęzice, Ostrówka Hill, Holy Cross Mountains, Poland.

Fig. 3. *a* Dorsal view of pygidium, *b* transverse, section, *c* longitudinal section (BM 45008); Bolland, Yorkshire, Great Britain.

Fig. 4. *a* Dorsal view of cranidium, *b* transverse section, *c* longitudinal section (SMC E 3532); Cracoe, Yorkshire, Great Britain.

Archegonus (*Phillibole*) *culmicus jugovensis* n.sp.

Fig. 5. Dorsal view of cranidium (IG 442.II.4a); Jugów, Central Sudeten Poland.

Archegonus (*Phillibolina*) *worsawensis* n.subgen., n.sp.

Fig. 6. *a* Dorsal view of cranidium, *b* transverse section, *c* longitudinal section (BM In-25810a); Worsaw Hill, Clitheroe, Lancashire, Great Britain.

ter, 1949 (see p. 129), i.e. *Liobole subaequalis* (Holzapfel, 1889) and the specimen determined by R. and E. Richter (1949) as "*Phillibole* (*Liobole*) n.sp. *a*, aff. *subaequalis*" (p. 86, Pl. 2, Fig. 22).

Subgenus *Archegonus* (*Phillibolina*) n. subgen.

Type species: *Archegonus* (*Phillibolina*) *worsawensis* n.sp.

Derivation of the name: Phillibolina — similar to *Phillibole*.

Stratigraphic and geographic range: Upper Visean of Czechoslovakia, U.S.S.R. (Urals), ?Visean of Great Britain, Eire.

Species assigned: A. (Phillibolina) worsawensis n.sp., *A. (Phillibolina) opatovicensis* Přibyl, 1950, *A. (Phillibolina) bifurca* (Weber, 1937) *(=Phillipsia(?) bifurca)*.

Diagnosis. — Subgenus of *Archegonus* with wide (*sag.*) preglabellar region, "*Phillibole*-type" of facial suture, strongly reduced, flat, visual lobe, distinctly furrowed pygidium, with very slender, long axis, 13—16 axial rings; tiny dimensions.

Remarks. — The new subgenus is assigned to the genus *Archegonus* Burmeister, 1843 on account of its similarity to some representatives cf. *A.* (*Phillibole*) R. & E. Richter, namely those grouped by Hahn (1965) in "*drewensis*-group". The common characters are: relatively broad (*sag.*) preglabellar field, which is distinctly upturned at the frontal margin, and has no convex border, the type of facial suture with comparatively long and divergent anterior section, the distinctly furrowed pygidium, where both pleural and interpleural furrows are clearly visible to the posterior margin [1]. Nevertheless, the pygidia of the representatives of the new subgenus differ strongly from *A.* (*Phillibole*) in having an extremely slender and long axis. The latter occupies at most one fourth of the total width of pygidium. A similar relation between the width of axis and pleural lobes is found in *Carbonocoryphe* R. & E. Richter, 1950 and *Cyrtosymbole* (*Calybole*) R. & E. Richter, 1926. But, the representatives of *Carbonocoryphe* have clearly marked radial arrangement of the ribs, while in the known species of *C.* (*Calybole*) the axis is much shorter, and very often the trend towards the radial arrangement of ribs is also present.

In the revision of *Archegonus*, Hahn (1965) discussed the systematic position of "*Phillibole opatovicensis*" Přibyl, 1950 ("*opatovicensis*-group"), being assigned here to the *A.* (*Phillibolina*) n. subgen. He separated it from *Archegonus* and suggested its relationship with *Drevermannia* Richter, 1909. However, the analysis of well preserved material of *A.* (*Phillibolina*) *worsawensis* n.sp., being very close to "*Phillibole opatovicensis*" (see p. 139), indicates that the "*opatovicensis* group" has many characters in common with *Archegonus* (see discussion above).

[1] Cephalon and thorax are only known in the type species and in *A. (Phillibolina) opatovicensis* (Přibyl, 1950).

The relationship of "*opatovicensis* group" with *Drevermannia* seems to be less probable, because of the distinct difference in the course of facial suture, the lack of eyes and palpebral lobes, as well as the significant width of fixigenae in *Drevermannia*. Some common characters could be detected in pygidia, i.e. the shape of pygidium and the presence of a distinct relief. However, these characters do not seem to be important. Besides, it is very probable that *Drevermannia*, at least in Carboniferous, is an artificial unit, grouping sometimes the juvenile individuals of different, small-eyed, or blind cyrtosymboline genera. The present author herself had described as "*Drevermannia moravica minuta*" (Osmólska, 1962) a form bearing a close resemblance to the other drevermannids, which now, when the more suitable, additional material is available, turns out to be a juvenile stadium of *Liobolina praevia* Osmólska, 1962 occurring in the same bed.

Weber (1937) described the species "*Phillipsia* (?) *bifurca*" based on isolated pygidia, coming from the uppermost part of Visean. They seem to have the typical pattern of *A.* (*Phillibolina*) n. subgen. but are larger and have more axial rings (16) and narrower pygidial doublure than the pygidia of *A.* (*Phillibolina*) *opatovicensis* (Přibyl) and *A.* (*Phillibolina*) *worsawensis* n.sp. In the present author's opinion, the species mentioned cannot be assigned to another known Lower Carboniferous genus, being the representative of *A.* (*Phillibolina*).

Archegonus (*Phillibolina*) *worsawensis* n.sp.
(Pl. III, Fig. 8; Pl. IV, Figs. 4, 5; Text-pl. II, Fig. 6)

Holotype: Entire specimen, lacking librigenae (BM In 25810b); Pl. VI, Fig. 5.
Type horizon: ?Visean, Lower Carboniferous.
Type locality: Worsaw Hill, Clitheroe, Lancashire, Great Britain.
Derivation of the name: worsawensis — after the name of the type locality.

Diagnosis. — Exoskeleton oval, broadly rounded anteriorly and posteriorly; fixigena comparatively narrow (*tr.*); palpebral lobe short (*exsag.*), but distinctly developed; projection of β situated outwardly to that of δ; anterior section of facial suture long and comparatively divergent, posterior one long and parallel to axial furrow; pygidium with very broad, flat doublure; exoskeleton finely and densely granulated.

Material. — Two pieces of light-grey limestone, with an aboundant assemblage of entire exoskeletons and counter-parts (BM In 25810, GSM 32153) from Worsaw Hill, Clitheroe, Lancashire, Great Britain, 2 entire damaged specimens (BM 22867), 2 pygidia (BM I 15500, I 15498), 1 cranidium probably belonging to the species (BM I 15499) all in light-grey limestone from Rathkeale, Limerick, Eire.

Dimensions (in mm):

	BM In 21810b	GSM 32153a
Length of entire exoskeleton	7.5	11.0
Length of cephalon	3.5	5.0
Width of cephalon	—	7.5
Length of glabella	2.5	3.7
Width of glabella	1.8	2.8
Length of pygidium	2.5	3.2
Width of pygidium	4.7	6.0
Length of axis	1.9	2.9
Width of axis	1.1	1.2

Description. — Entire exoskeleton flat, oval in outline; cephalon rounded anteriorly, with genal spines; glabella tapering forwards, finger-shaped anteriorly; frontal border poorly defined, upturned; preglabellar field relatively broad (*sag.*); three pairs of lateral glabellar furrows visible, but only S_1 distinctly incised; basal lobe somewhat swollen; occipital furrow well marked, deepened at extremities and directed somewhat forwards; occipital ring equally broad (*sag.*), flat; palpebral lobes narrow (*tr.*), weakly curved; facial suture of "*Phillibole*-type" with anterior branches relatively long and divergent; posterior part of fixigena very narrow (*tr.*), anterior one much broader; librigena with spine reaching backwards to sixth thoracic pleura; no convex lateral border, but outer margin of librigena slightly upturned; visual surface extremely small, very weakly elevated, with about 50 minute lenses; cephalic doublure broad, flat.

Hypostoma of "cyrtosymboline pattern" elongate, with convex median body, narrow border, being slightly broader and notched posteriorly.

Thorax with nine segments. Width of axis somewhat less than $^1/_3$ of total width of thorax; thoracic rings with convex, broad articulating half-rings; pleural lobes flat, wide (*tr.*); pleurae flat, wide (*exsag.*), divided into two almost equally broad (*exsag.*) bands; boundaries between successive pleurae in the form of thin, sharp lines, while pleural furrows are shallow and broad (*exsag.*); ends of pleurae pointed, directed backwards.

Pygidium flat, broad (*tr.*), without marked border, but with marginal part of pygidium concave, with slightly raised outer edge; axis narrow, about $^1/_4$ of total width of pygidium, tapering backwards, with 14 rings; ring-furrows undulated, bent backwards mesially, becoming very indistinct near the end of axis; pleural lobes flat, with about 7 flat ribs; pleural furrows well marked; inter-pleural furrows extremely faint, both not reaching the margin of pygidium; pygidial doublure very broad, flat, its inner edge raising ventrally on the tip of axis.

In longitudinal section, preglabellar region steeply raised up at the front, frontal part of glabella sloping abruptly forwards, pygidial axis straight to the end, where it merges with flat, postaxial region.

In transverse section, cephalon gently arched, thorax and pygidium flat, with axis prominent and elevated above flat pleural lobes; marginal part of pygidium slightly upturned.

Exoskeleton very thin, with ornamentation, consisting of very fine granulation, present on the whole surface.

Remarks. — The new species here described is very close to *Archegonus* (*Phillibolina*) *opatovicensis* (Přibyl, 1950), both having in common these characters, which are here regarded as subgeneric ones (see p. 136). The differences between them concern: the fixigenae, which are narrower (*tr.*), the anterior section of the facial suture, which is more divergent, better pronounced palpebral lobes, slightly longer genal spines and a greater number of pygidial rings (14) in *A.* (*Phillibolina*) *worsawensis* n.sp.

A. (*Phillibolina*) *opatovicensis* (Přibyl) is known only from "culm"-facies zones III α, β in Moravia (Czechoslovakia). Přibyl (1950) did not state in his description of this species, whether it has a developed visual lobe, or is completely eyeless. This fact is also difficult to detect on the illustrations given by this author (1950, Pl. 1, Figs. 1—3; Pl. 2, Figs. 2, 3). But it should be here emphasized that in *A.* (*Phillibolina*) *worsawensis* n.sp. the visual lobe, though strongly reduced, is still present.

A remarkable character of *A.* (*Phillibolina*) *opatovicensis* and *A.* (*Phillibolina*) *worsawensis* are their tiny dimensions. The possibility that they could represent adolescent individuals of some other cyrtosymboline trilobite, was already discussed for *A.* (*Phillibolina*) *opatovicensis* by Přibyl (1950, p. 8). The present author fully accepts Přibyl's opinion that this is improbable, the new species here described also very small, being one more evidence of this. Nevertheless, a comparison of *A.* (*Phillibolina*) *opatovicensis* and *A.* (*Phillibolina*) *worsawensis* with the here described (pp. 131—132) meraspides of *A.* (*Phillibole*) *aprathensis richteri* n.subsp. shows striking resemblances in: the structure of finger-like and furrowed glabella, presence of comparatively long genal spines, narrow pygidial axis and flattened margin surrounding pygidium. All this implies that some of these characters in *A.* (*Phillibolina*) n. subgen. could be neotenic.

The well preserved Irish and British material of *A.* (*Phillibolina*) *worsawensis* allows one to state that the exoskeleton is very thin, the cephalon and especially the pygidium have a very broad doublure. These characters as well as the slender axis, slender glabella with incised glabellar furrows and the "*Phillibole*-type" of facial suture, very closely resemble the Famennian species of *Cyrtosymbole* (*Calybole*) R. & E. Richter, 1926, i.e. *C.* (*Calybole*) *radiata* Osmólska, 1962. But, the lat-

ter has broader (*sag.*) preglabellar field, wider (*tr.*) fixigena, less reduced visual lobes and much shorter pygidial axis.

Nevertheless, in the present author's opinion, the resemblances are the result of a convergence, caused by the same mode of life — probably floating in the sea. Such cases wery convincingly discussed by R. Richter (1919) for "Scheibenformen", which often exhibit the characters above mentioned, independently of their generic assignment.

It seems worth noticing that the representatives of *A. (Phillibolina) opatovicensis* and *A. (Phillibolina) worsawensis* are everywhere found as entire specimens or as exuviae consisting of the cranidial-thoracic-pygidial units, often with librigenae lying nearby. Thus, the sedimental environments were in comparatively calm parts of the ocean.

Subgenus *Archegonus (Cyrtoproetus)* Reed, 1943

Type species: Phillipsia cracoensis Reed, 1899.

Synonyms: Phillipsia Reed, 1899, p. 241.
Typhloproetus(?) Weber 1937, p. 25.
Cyrtosymbole (Cyrtoproetus) Reed, 1943, p. 64.
Cyrtosymbole (Waribole) Goldring, 1955, p. 34.
Cyrtoproetus Weller *in:* Treatise.., 1959, p. O413.
Archegonus (Angustibole) Hahn, 1965, p. 245.
Archegonus (Angustibole) Hahn, 1966, p. 359.

Stratigraphic and geographic range: Tournai-Visean of Great Britain, Germany, Poland, U.S.S.R. (Novaya Zemla).

Species assigned: A. (Cyrtoproetus) cracoensis (Reed, 1899), *A. (Cyrtoproetus) mulesi* (Goldring, 1955), *A. (Cyrtoproetus) winterbergensis* (Hahn, 1965), A. *(Cyrtoproetus) anteriolatus* n.sp.

Diagnosis. — Glabella cylindrical, reaching border, palpebral lobe broad (*tr.*) and long (*exsag.*), δ more outwardly situated than β; anterior section of facial suture weakly divergent, posterior section of facial suture close and parallel to axial furrow, visual lobe very large, weakly convex, facing dorsally; pygidium semielliptical with broad doublure, axis broad with 10—12 flat axial rings, bluntly rounded at the tip, relief weakly pronounced.

Remarks. — Reed's original description of *"Phillipsia cracoensis"* Reed, 1899, as well as the inaccuracies in some of the accompanying illustriations (1899, Pl. 10, Figs. 3, 7), gave rise to the misinterpretation of this form. In consequence, it led to misinterpretation of *Cyrtoproetus* Reed, 1943, because then *"Phillipsia cracoensis"* became the type species of this genus.

The re-examination of the type collection in Sedgwick Museum, Cambridge, and especially the finding of new material in the collection of British Museum (Natural History) and in the Holy Cross Mountains, Poland, allowed the present writer to revise this form.

On the restoration given by Reed (1899, Pl. 2, Fig.7), the cephalon is broadly semicircular [2], the glabella is slightly obtuse anteriorly, the occipital lobes are entirely differentiated from the occipital ring, and glabellar furrows are deeply incised.

The complete cephala of the considered species, recently found (Pl. V, Fig. 1), indicate that they are distinctly vaulted which results in a rather subtriangular, more narrow shape than that suggested by Reed. The occipital lobes, as well as the glabellar furrows are comparatively weakly pronounced on the surface of exoskeleton, quite opposite to the internal moulds, which make up the type collection. The original pygidia, also preserved as moulds, display some regular elevation along the ring furrows. These, called by Reed "tubercles", are distinctly visible, but comparatively low, and represent the casts of depressions on the ventral surface of pygidial exoskeleton. However, it should be emphasized that the external surface of exoskeleton on pygidial axis is smooth, ringfurrows being extremely faintly developed, and undulated.

These inaccuracies in Reed's drawings were repeated and exaggerated on the illustrations accompanying the diagnosis of *Cyrtoproetus* in Treatise on Invertebrate Paleontology (Weller, 1959, Fig. 318—1 a, b).

Also Bouček and Přibyl (1960), basing probably on these inadequate figures, assigned to *Cyrtoproetus* Reed, 1943 the Slovakian species *"Griffithides dobsinensis"* Illés, 1902, which in reality has nothing in common with *Cyrtoproetus.*

In 1965 Hahn, while revising the genus *Archegonus* Burmeister, established within the latter the new subgenus *A.* (*Angustibole*) with *A.* (*Angustibole*) *winterbergensis* Hahn, 1965 as the type species. However, *A.* (*Angustibole*) *winterbergensis* when compared with *"Phillipsia cracoensis"*, show the same typical characters in its cephalon: 1) subcylindrical glabella, 2) weakly incised glabellar furrows, 3) lack of preglabellar field, 4) convex, striated anterior border, comparatively broad (*tr.*) and long palpebral lobe reaching back from S_3 to behind S_1, 6) weakly divergent anterior section of facial suture, with β inwardly situated to the longitudinal projection of δ, 7) very narrow (*tr.*) fixigena with short and straight section between ε and ζ, 8) librigena with narrow border and large visual lobe.

These common characters are so numerous that there cannot be any doubt but that both forms are congeneric. The existing differences (discussed on p. 144) are of specific value. Thus, the subgeneric name *Archegonus* (*Angustibole*) Hahn, 1965 must be regarded as a younger synonym of *Cyrtoproetus* Reed, 1943. The present author accepts the opinion of Hahn (1965) that this form should be assigned to *Archegonus* Burmeister — as its subgenus *Archegonus* (*Cyrtoproetus*) Reed, 1943.

[2] He had completed the restoration situating the librigena in the horizontal position, instead of giving it a sloping position as it has in reality.

Originally, Reed (1943), while establishing *Cyrtoproetus*, considered it to be the subgenus of *Cyrtosymbole* R. Richter, 1913. Weller (1959, p. O413) excluded this form not only from Cyrtosymbolinae, but also from Proetidae, assigning it to an uncertain family. As a result of the present revision, *Cyrtoproetus* as a typical subgenus of *Archegonus* is close to *Cyrtosymbole* and should be, of course, assigned to the Cyrtosymbolinae.

Archegonus (*Cyrtoproetus*) *cracoensis* (Reed, 1899)

(Pl. V, Figs. 1—5; Pl. VI, Figs. 1, 2, Text-pl. II, Figs. 1—4)

1899. *Phillipsia cracoensis*; F.R.C. Reed, A new Carboniferous..., p. 241, Pl. 10, Figs. 1—6.

Lectotype: Cranidium (SMC E 3532); Pl. V, Fig. 3; Reed, 1899, Pl. 10, Fig. 1.
Type horizon: Pendleside Limestone, Visean($?D_2$), Lower Carboniferous.
Type locality: Cracoe, Yorkshire, Great Britain.

Diagnosis. — Species of *Archegonus* (*Cyrtoproetus*) with occipital lobes present, genal angle of librigena rounded, pygidium slightly longer than semicircle, comparatively flat, with broad axis, 10—12 axial rings. Surface of cephalon densely and delicately granulated, that of pygidium — covered by hardly visible dense granulation.

Material. — Numerous paralectotypes in SMC collection (E. 3532——3545), all from Pendleside Limestone, Butterhaw Knoll, Cracoe, Yorkshire, 1 cranidium (BM In. 37421) from NE end of Butterhaw Knoll, Cracoe, Yorkshire, 1 cephalon (BM In. 58425), 2 damaged cranidia (BM In. 58426, In. 58428) from the Middle D_1 of Elbolton Knoll, Cracoe, 1 damaged cephalon (BM In. 2605 C) from Wetton, N. Staffordshire, 3 pygidia (BM It. 2270, 2271, BM 45008) from Bolland, Yorkshire; 1 cephalon, 3 cranidia, 7 pygidia, 1 pygidum with thorax attached, from dark-grey Visean Limestone (D_2) of Ostrówka Hill, Gałęzice, Holy Cross Mountains, Poland (Z. Pal. collection).

Dimensions (in mm):

	SMC E 3532	SMC E 3536	Z. Pal. Tr. II. 284	Z. Pal. Tr. II. 285
Length of cephalon . .	11.0	—	9.0	—
Width of cephalon . . .	—	—	12.5	—
Length of glabella . . .	7.7	—	7.0	—
Width of glabella . . .	6.5	—	5.8	—
Length of pygidium . .	—	9.0	—	8.0
Width of pygidium . . .	—	14.0	—	12.0
Length of axis	—	7.2	—	6.5
Width of axis	—	5.2	—	4.8

Description. — Cephalon subtriangular, with rounded genal angles; glabella faintly tapering forwards, rounded at front, reaching convex, striated anterior border; 3 pairs of glabellar furrows very weakly marked; occipital ring broadening (*exsag.*) towards the extremities, occipital lobe present but not differentiated from the ends of ring; occipital furrow directed forwards, stopping short of the shallow axial furrow; palpebral lobe horizontal, broad (*tr.*), situated somewhat behind middle of glabella; γ and ε just at the axial furrow, β nearer to glabella than δ, anterior section of facial suture faintly divergent from axial furrow; posterior section very close and parallel to axial furrow for less than half the width (*exsag.*) of occipital ring, than directed at nearly right angles outwards; librigena without genal spine, lateral border narrow, flat, visual lobe very large, slightly convex, situated horizontally to the level of librigena.

In longitudinal section, occipital ring flat, glabella flat for most of its length, only frontal part gently sloping towards horizontally situated, weakly convex anterior border.

In transverse section, cephalon vaulted, glabella slightly arched, axial furrow shallow, palpebral lobes flat, somewhat lower situated than glabella, eyes weakly convex, very slightly elevated above the surface of librigena, the latter sloping obliquely, with flat lateral border.

Cephalic doublure narrow, rostral plate with straight anterior margin, and semioval posterior one.

Hypostoma proetid-like, elongate, with convex central body, and flat border.

Number of thoracic segments unknown. Axis convex, broader (*tr.*) than pleural lobe, axial rings weakly convex longitudinally; pleural lobes horizontal for less than half their width (*tr.*), then obliquelly sloping; pleura with blunt end, pleural furrow thin, running outwards to a point situated slightly behind the bend of pleural lobe, so that the adaxial part of pleura remains undivided.

Pygidium longer than semicircle, without border; axis broad, occupying 1/3 of total pygidial width, prolonged by indistinct postaxial ridge, distance between the end of axis and the posterior margin of pygidium equal to twice the width (*sag.*) of the first axial ring, 10—12 very flat axial rings, ring-furrows undulated, extremely indistinct on exoskeleton, comparatively deep on internal mould, 7—10 extremely indistinct flat ribs on pleural lobes; pleural and interpleural furrow not incised, only as thin lines; articulating half-segment very narrow (*sag.* and *exsag.*), but differentiated from the rest of pygidium by a deep, broad furrow; the very margin of pygidium with somewhat irregular striae, parallel to the outline.

In longitudinal section, pygidial axis very gently sloping backwards, its tip not differentiated from the postaxial region, which is flat, slightly inclined downwards.

In transverse section, axis vaulted, broad, pleural lobes very gently arched. Pygidial doublure very broad, reaching to the tip of axis, somewhat convex.

Ornamentation in the form of dense and very fine tubercles, which are still finer, and hardly visible on pygidium.

Remarks. — The species here re-described is most close to *A.* (*Cyrtoproetus*) *winterbergensis* (Hahn, 1965), but the latter differs in having the occipital ring, without any occipital lobes, narrowing towards its extremities, somewhat broader (*tr.*) palpebral lobe, the anterior outline of cranidium somewhat flatter, and developed genal spines. G. Hahn (1966) described the pygidia probably belonging to *A.* (*Cyrtoproetus*) *winterbergensis*. These pygidia are very similar in general shape, and in the obsoleting relief to those of *A.* (*Cyrtoproetus*) *cracoensis*. The number of axial rings seem in *A.* (*Cyrtoproetus*) *winterbergensis* not to exceed 10, while in specimens of *A.* (*Cyrtoproetus*) *cracoensis* from the type collection there are 12 rings, and in specimens from Poland 10—12 rings. The ring-furrows are also in German specimens not so distinctly undulated as in the type species. A very striking difference between the compared species is the presence of the pygidial border, which is lacking in all large pygidia of the type species. However, on the somewhat smaller pygidium (Pl. VI, Fig. 2) from the Holy Cross Mountains, such a comparatively indistinct border is developed. Thus it seems without doubt that the pygidia described by G. Hahn (1965) displaying the characters of the subgenus *Archegonus* (*Cyrtoproetus*) Reed, 1943, were properly assigned by him (G. Hahn, 1966).

The similarities between both the here compared species, which in fact are great, are listed in the discussion on the subgenus *Archegonus* (*Cyrtoproetus*) (see p. 141).

Archegonus (*Cyrtoproetus*) *anteriolatus* n.sp.

(Pl. II, Fig. 6; Pl. IV, Fig. 2; Pl. V, Fig. 6; Pl. VI, Fig. 3; Text-pl. I, Figs. 4, 5)

?1937. *Typhloproetus(?) aequalis* (Meyer) var. *megalophtalma* (partim); V. Weber, Kamennougolnye trilobity..., p. 25, Pl. 2, Figs. 28—30, 32—34.

Holotype: Cranidium (IG 422.II.10); Pl. V, Fig. 6.

Type horizon: Argillaceous-graywacke series, Go α, Lower Carboniferous.

Type locality: Jugów, Central Sudeten, Poland.

Derivation of the name: anteriolatus, Lat. *anterius* = anterior, *latus* = broad; because of comparatively broad (*tr.*) anterior portion of fixigena.

Diagnosis. — Species of *Archegonus* (*Cyrtoproetus*) with indistinctly marked occipital lobes, relatively broad (*sag.*), convex preglabellar region, anterior section of facial suture short, divergent, δ situated only a little further outwards than β.

Material. — Two cranidia, 2 librigenae, 3 pygidia from Jugów, Go α, 1 internal and 1 external mould of cranidia, 2 external moulds of librigenae from G α of Glinno, Central Sudeten, Poland.

Dimensions (in mm):

	IG 442. II. 10	IG 442. II. 6
Length of cranidium	7.5	—
Length of glabella	5.5	—
Width of glabella	6.2	—
Length of pygidium	—	11.0
Width of pygidium	—	17.0
Length of axis	—	9.0
Width of axis	—	6.0

Description. — Glabella cylindrical, weakly narrowing anteriorly, slightly constricted; preglabellar region weakly convex, relatively broad (*sag.*), glabellar furrows visible only on internal mould; occipital ring as broad (*sag.*) as preglabellar region, with very weakly pronounced occipital lobes; occipital furrow deep mesially, shallowing towards axial furrows, where it is directed slightly forwards; palpebral lobe broad (*tr.*), long (*exsag.*), distinctly delimited at γ and ε; anterior section of facial suture between γ and β short and divergent to glabella, posterior section parallel to axial furrow, at ζ rounded and directing outwards; δ situated more outwardly than β, librigena with very large, weakly convex visual lobe and facial suture, corresponding to that found on cranidium.

In longitudinal section, occipital ring convex, occipital furrow deep, glabella gently sloping forwards, towards the weakly convex preglabellar region.

In transverse section, glabella arched, axial furrows indistinct, palpebral lobes flat, lower than glabella.

Cephalic doublure broad.

Several thoracic segments connected with holotype cranidium. They display convex, narrow (*sag.*) axial rings, about half the width (*sag.*) of occipital ring, and bluntly ended pleurae equal in length (*tr.*) to that of thoracic ring (*tr.*).

The damaged external mould of pygidium was found lying just at the holotype cranidium and most probably belonging to the same individual. It allowed the author to determine other, more complete pygidia as belonging to the species. Pygidium somewhat longer than semicircle, axis gently convex with about 11—12 rings, ring-furrows extremely faint, undulated; on pleural lobe only the first rib visible, no developed border, doublure comparatively broad, weakly convex. All pygidia deformed, thus the longitudinal and transverse section do not give any proper detail.

Ornamentation present on pygidia in form of fine, dense granulation.

Remarks. — The described species displays some characters, which are typical for the subgenus *Archegonus* (*Cyrtoproetus*). Among them should be mentioned: long (*exsag.*) and broad (*tr.*) palpebral lobes, facial suture with δ situated further outwards than β, and its posterior section running close and parallel to axial furrow; visual lobe on librigena is also as large as that in the other representatives of the subgenus; pygidium has broad axis, and obsoleting relief, ring-furrows being undulated. Moreover, in the species above described the occipital ring is very similar to that of *A.* (*Cyrtoproetus*) *cracoensis* (Reed, 1899), with occipital lobe present, but also very faintly developed. From the latter species as well as from the other known representatives of the subgenus, *A.* (*Cyrtoproetus*) *anteriolatus* n.sp. differs in having the anterior section of suture shorter and more divergent between γ and β, but longer and more convergent between β and α. In the best known representatives of *A.* (*Cyrtoproetus*): *A.* (*Cyrtoproetus*) *cracoensis* and *A.* (*Cyrtoproetus*) *winterbergensis,* the distance between γ and β is long and only very weakly divergent from glabella. Also the distance between the projections of β and δ is there greater than that in the species above described. However, as the investigations on the ontogenetic development of *A.* (*Cyrtoproetus*) *winterbergensis* have shown (G. Hahn, 1966), the anterior section of facial suture is more divergent on young cranidia than on adult ones.

A further difference between *A.* (*Cyrtoproetus*) *anteriolatus* and the other species lies in the preglabellar region, which in all remaining species is developed in the form of true, convex border, which is lacking in *A.* (*Cyrtoproetus*) *anteriolatus.*

The similar relations between α, β and δ, as those found in *A.* (*Cyrtoproetus*) *anteriolatus,* are present in the representative of the other subgenus — *A.* (*Phillibole*) *nitidus* (Holzapfel, 1889). The latter has, however, shorter glabella, broader fixigena (*tr.*) and much shorter (*exsag.*) palpebral lobes. These characters, together with the similarity in pygidia of *A.* (*Phillibole*) *nitidus* and *A.* (*Cyrtoproetus*) *winterbergensis,* seem to indicate a very close relation between *A.* (*Phillibole*) and *A.* (*Cyrtoproetus*).

In 1937, Weber described and figured (Pl. 2, Figs. 28—30, 32—34) fragments of cranidia, librigenae and pygidium, which he named "*Typhloproetus*(?) *aequalis* var. *megalophtalma*" (see p. 128). It is probable that this material is conspecific with *A.* (*Cyrtoproetus*) *anteriolatus* because the librigenae and cranidia show the characters of the subgenus, and the anterior section of facial suture seems to be divergent to the same degree as in the species described above. However, as this material from Novaya Zemla is so badly preserved, nothing definite can be noticed about its specific assignment, but its subgeneric assignment is not in

doubt. The specimens from Novaya Zemla also come from the "culm"-facies of Upper Visean, like the material here described.

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HALSZKA OSMÓLSKA

DOLNO-KARBOŃSKIE CYRTOSYMBOLINAE (TRILOBITA)

Streszczenie

W niniejszej pracy podane są wyniki opracowania trylobitów dolno-karbońskich, zaliczanych do rodzaju *Archegonus* Burmeister, 1843, podrodzina Cyrtosymbolinae Hupé, 1953. Opisany materiał pochodzi w przeważającej części z Sudetów środkowych (Niecka Śródsudecka) i został zebrany przez Dr H. Żakową (Instytut Geologiczny, Stacja Świętokrzyska, Kielce). Zawiera on następujące gatunki i podgatunki: *Archegonus* (*Archegonus*) *aequalis aequalis* (Meyer, 1831), *A.* (*Waribole*) *laevicauda acutifrons* n.subsp., *A.* (*Waribole*) *laevicauda* (Sarres, 1857) subsp., *A.* (*Phillibole*) *aprathensis richteri* n.subsp., *A.* (*Phillibole*) *culmicus jugovensis* n.subsp., *A.* (*Cyrtoproetus*) *anteriolatus* n.sp.

Opracowanie to potwierdziło wnioski stratygraficzne Żakowej (1958—1966) co do górno-wizeńskiego (Go α, Go β) wieku osadów.

Ze zbiorów własnych autorki pochodzi opisany tu gatunek *Archegonus* (*Cyrtoproetus*) *cracoensis* (Reed, 1899), znaleziony po raz pierwszy w Polsce, w Górach Świętokrzyskich (Gałęzice, wzgórze Ostrówka). Zbadanie okazów typowych tego gatunku, znajdujących się w Sedgwick Museum (Cambridge, Wielka Brytania),

pozwoliło na zrewidowanie stanowiska systematycznego i ustalenie zakresu podrodzaju *Archegonus* (*Cyrtoproetus*) Reed, 1943.

Również z kolekcji brytyjskich (British Museum, Nat. Hist., London, Geological Survey and Museum, London) pochodzi nowy gatunek *Archegonus* (*Phillibolina*) *worsawensis* n.subgen., n.sp. Opisany w niniejszej pracy bogaty i dobrze zachowany materiał tego gatunku z dolnego karbonu Anglii i Irlandii pozwolił na zaliczenie go do nowoutworzonego podrodzaju *Archegonus* (*Phillibolina*) n.subgen.

Przedyskutowano również związek między dwoma przedstawicielami Cyrtosymbolinae: *Archegonus* (*Phillibole*) R. & E. Richter, 1937 i *Liobole* R. & E. Richter, 1949, które uznane zostały za blisko spokrewnione.

ГАЛЬШКА ОСМУЛЬСКА

НИЖНЕКАМЕННОУГОЛЬНЫЕ CYRTOSYMBOLINAE (TRILOBITA)

Резюме

В настоящей работе приведено результаты изучения нижнекаменноугольных трилобитов, причисленных к роду *Archegonus* Burmeister, 1843, подсемейство Cyrtosymbolinae Hupé, 1953. Описанный материал происходит в большинстве из центральных Судетов (Среднесудетская мульда) и был собран Др. Жаковой (Геологический Институт, Свентокржиское Отделение, Кельце). Включает он следующие виды и подвиды: *Archegonus (Archegonus) aequalis eaqualis* (Meyer, 1831), *A. (Waribole) laevicauda acutifrons* n. subsp., *A. (Waribole) laevicauda* (Sarres, 1857) subsp., *A. (Phillibole) aprathensis richteri* n. subsp., *A. (Phillibole) culmicus jugovensis* n. subsp., *A. (Cyrtoproetus) anteriolatus* n. sp.

Это изучение утвердило выводы Жаковой (1958—1966) о верхневизейском возрасте (Go α, Go β) отложений.

Из коллекции автора происходит описанный здесь вид *Archegonus (Cyrtoproetus) cracoensis* (Reed, 1899), найденный впервые в Польце, в Свентокржиских Горах (Галэнзице, холм Острувка). Исследование типичных для этого вида образцов, находящихся в Sedgwick Museum, Cambridge (В. Британия), позволило провести ревизию систематической позиции и установить предел подрода *Archegonus (Cyrtoproetus)* Reed, 1943.

Из британских коллекций (British Museum, Nat. Hist., London; Geological Survey and Museum, London) происходит также новый вид *Archegonus* (*Phillibolina*) *worsawensis* n. subgen., n. sp. Описанный в настоящей работе богатый и хорошей сохранности материал этого вида, из нижнекаменноугольных отло-

жений Англии и Ирландии, позволил причислить его к новоустановленному подроду *Archegonus (Phillibolina)* n. subgen.

Продискутировано также связь между двумя представителями Cyrtosymbolinae: *Archegonus (Phillibole)* R. & E. Richter, 1937, *Liobole* R. & E. Richter, 1949, и принято их близкое родство.

PLATES

Plate I

Archegonus (*Waribole*) *laevicauda acutifrons* n.subsp.

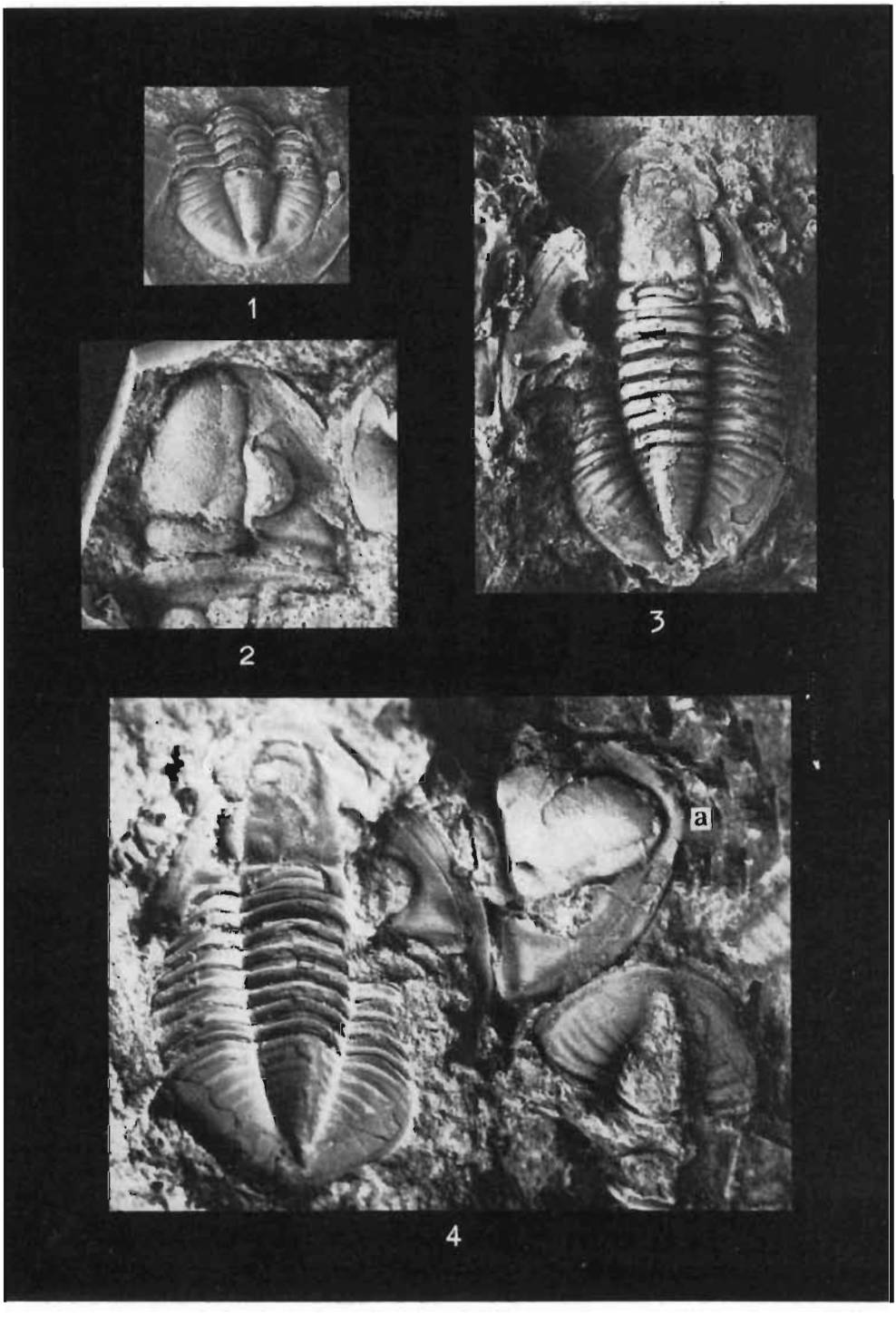
Fig. 1. Latex cast of pygidium (IG 442.II.11); ×3.

Fig. 2. Latex cast of holotype cephalon (IG 442.II.24a); ×6.

Fig. 3. Latex cast of entire paratype specimen (IG 442.II.24); ×6.

Fig. 4. Assemblage of specimens on a piece of rock (IG 442.II.24), *a* internal mould of holotype cephalon; ×6.

Fig. 1: Lower Carboniferous, Go α, Jugów
Figs. 2—4: Lower Carboniferous, Go α, Glinno
Central Sudeten, Poland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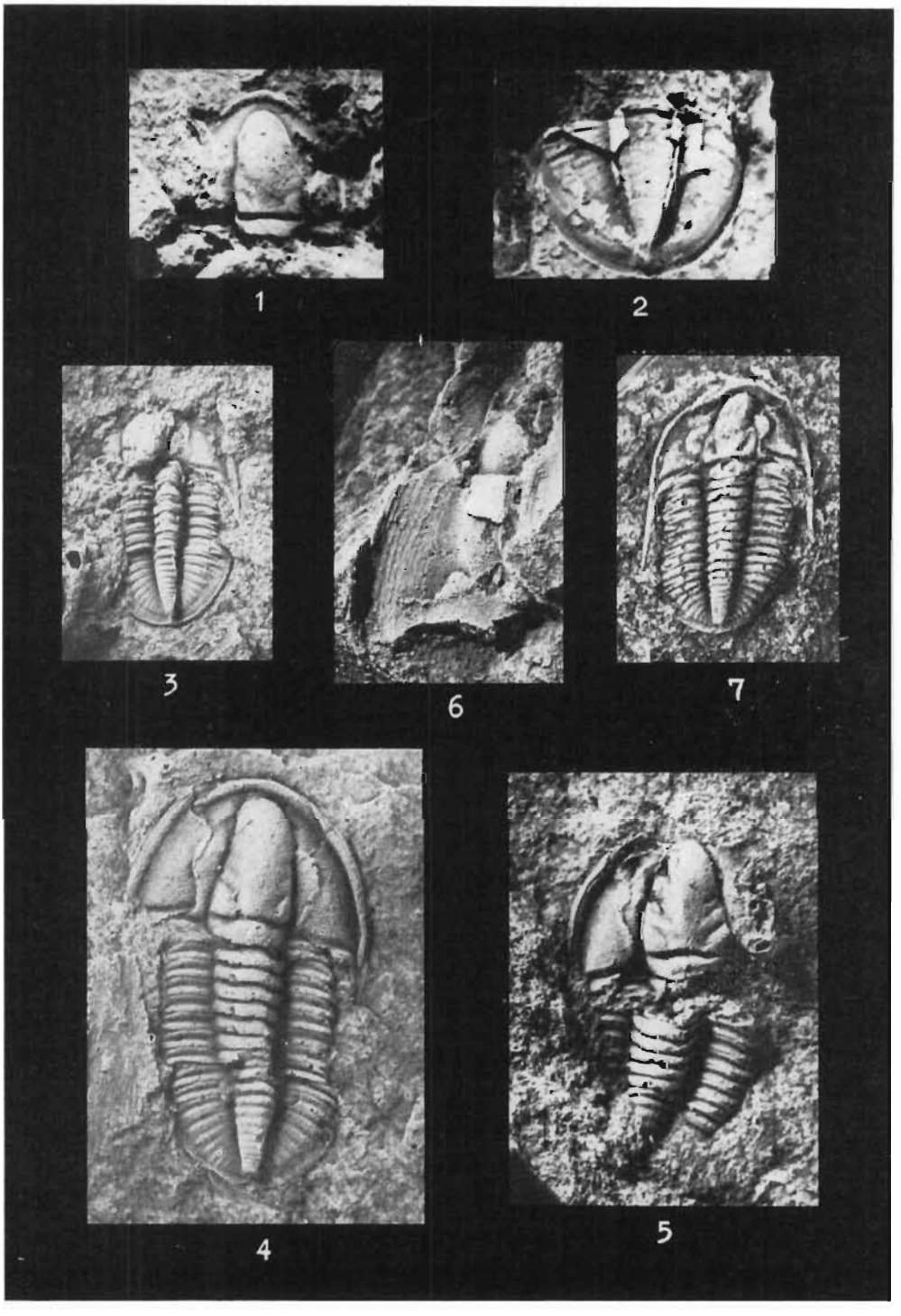
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Plate II

Fig. 1. *Archegonus* (*Archegonus*) *aequalis aequalis* (Meyer), internal mould of cranidium (IG 442.II.26); ×3.

Fig. 2. *Archegonus* (*Phillibole*) *culmicus jugovensis*. n.subsp., internal mould of pygidium (IG 442.II.4b); ×2.

Archegonus (*Phillibole aprathensis richteri* n.subsp.

Fig. 3. Latex cast of fragmentary meraspid individual, degree 7 (IG 442.II.35); ×6.

Fig. 4. Latex cast of entire meraspid individual, degree 8 (IG 442.II.36); ×8.6.

Fig. 5. Latex cast of fragmentary young individual (IG 442.II.33); ×6.

Fig. 6. *Archegonus* (*Cyrtoproetus*) *anteriolatus* n.sp., librigena (IG 442.II.6b); ×6.

Fig. 7. *Archegonus* (*Waribole*) *laevicauda* (Sarres, 1857) subsp., latex cast of young holaspid individual (IG 442.II.27); ×6.

Fig. 1: Lower Carboniferous, Go α, Glinno
Figs. 2, 6: Lower Carboniferous, Go α, Jugów
Figs. 3—5: Lower Carboniferous, Go β, Wałbrzych Miasto
Fig. 7: Lower Carboniferous, Go α, Kamionkowo
Central Sudeten, Poland

Plate III

Archegonus (*Phillibole*) *aprathensis richteri* n.subsp.

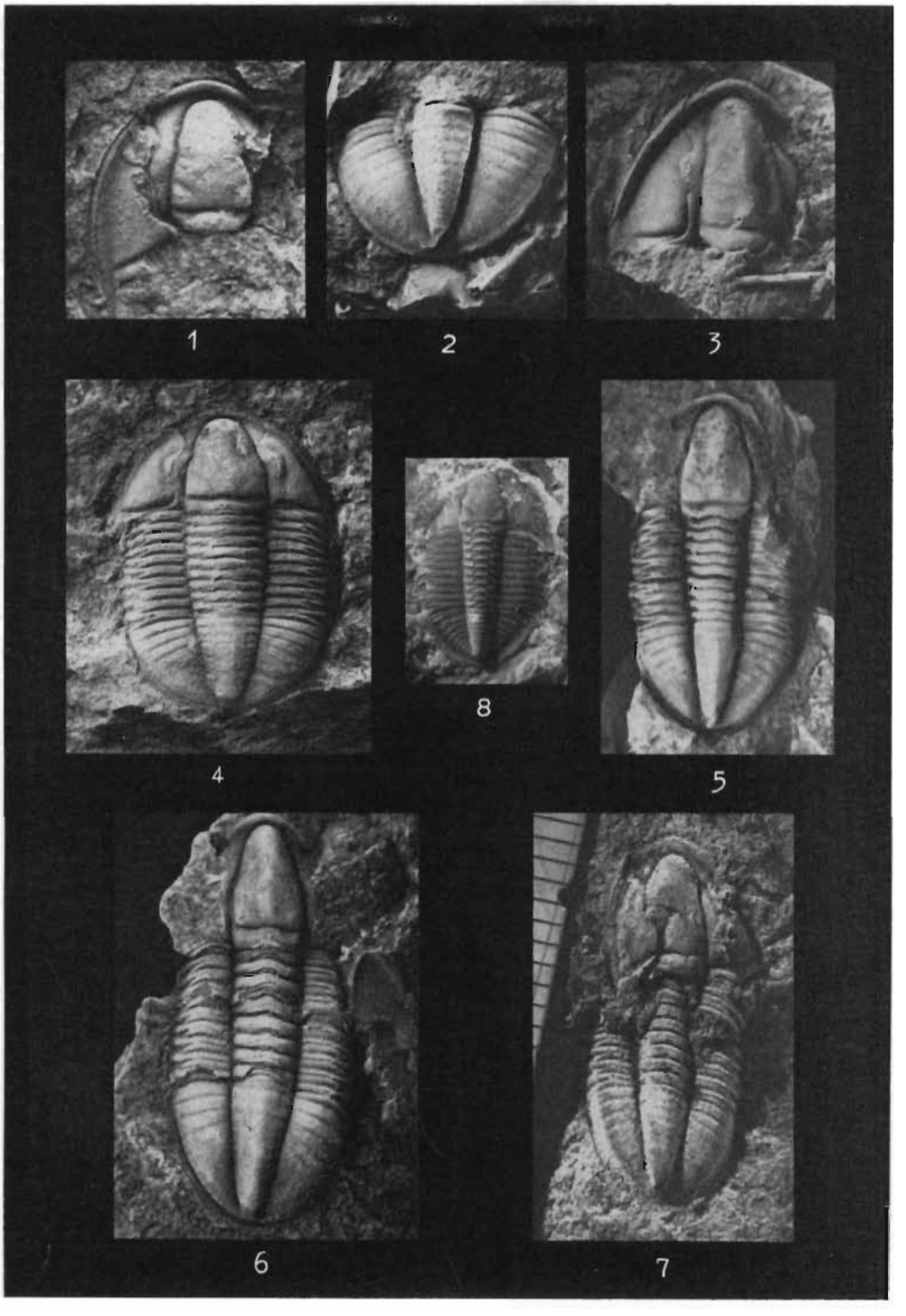
Fig. 1. Internal mould of young cranidium and librigena (IG 442.II.28); ×6.5.
Fig. 2. Latex cast of pygidium (IG 442.II.37); ×3.
Fig. 3. Latex cast of holotype cephalon (IG 442.II.20); ×3.
Fig. 4. Internal mould of entire, transversely compressed specimen (IG 442.II.138); ×2.
Fig. 5. Internal mould of entire specimen, librigenae lacking (IG 442. II.29); ×3.
Fig. 6. Internal mould of entire, laterally compressed specimen (IG 442.II.135); ×2.
Fig. 7. Latex cast of entire specimen, with short genal spine visible (IG 442.II.127); ×3.

Archegonus (*Phillibolina*) *worsawensis* n.subgen., n.sp.

(see also Plate VI, Figs. 4, 5)

Fig. 8. Entire specimen (GSM 32153a), ?Visean, Clitheroe, Worsaw Hill, Lancashire, Great Britain; ×2.8.

Figs. 1, 2: Lower Carboniferous, Go β, Wałbrzych Miasto
Fig. 3: Lower Carboniferous, Go α, Jugów
Figs. 4, 6, 7: Lower Carboniferous, Go β, Konradów
Fig. 5: Lower Carboniferous, Go α, Wałbrzych Miasto
Central Sudeten, Poland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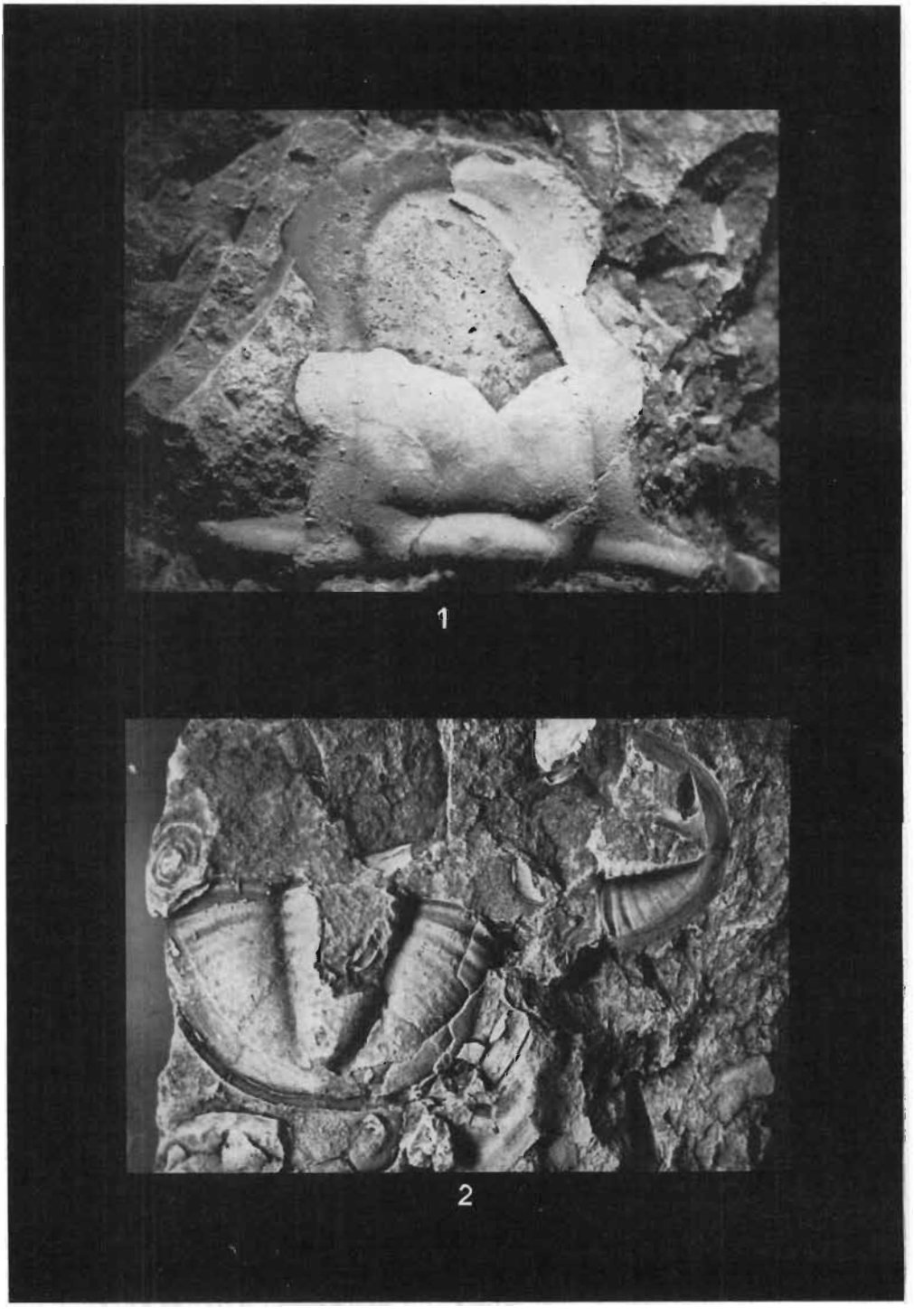

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Plate IV

Fig. 1. *Archegonus* (*Phillibole*) *culmicus jugovensis* n.subsp., holotype cranidium (IG 442.II.4a); ×6.

Fig. 2. *Archegonus* (*Cyrtoproetus*) *anteriolatus* n.sp. (see also Plate VI, Fig. 3), internal moulds of pygidia (IG 442.II.6); ×3.

Lower Carboniferous, Go α, Jugów, Central Sudeten, Poland

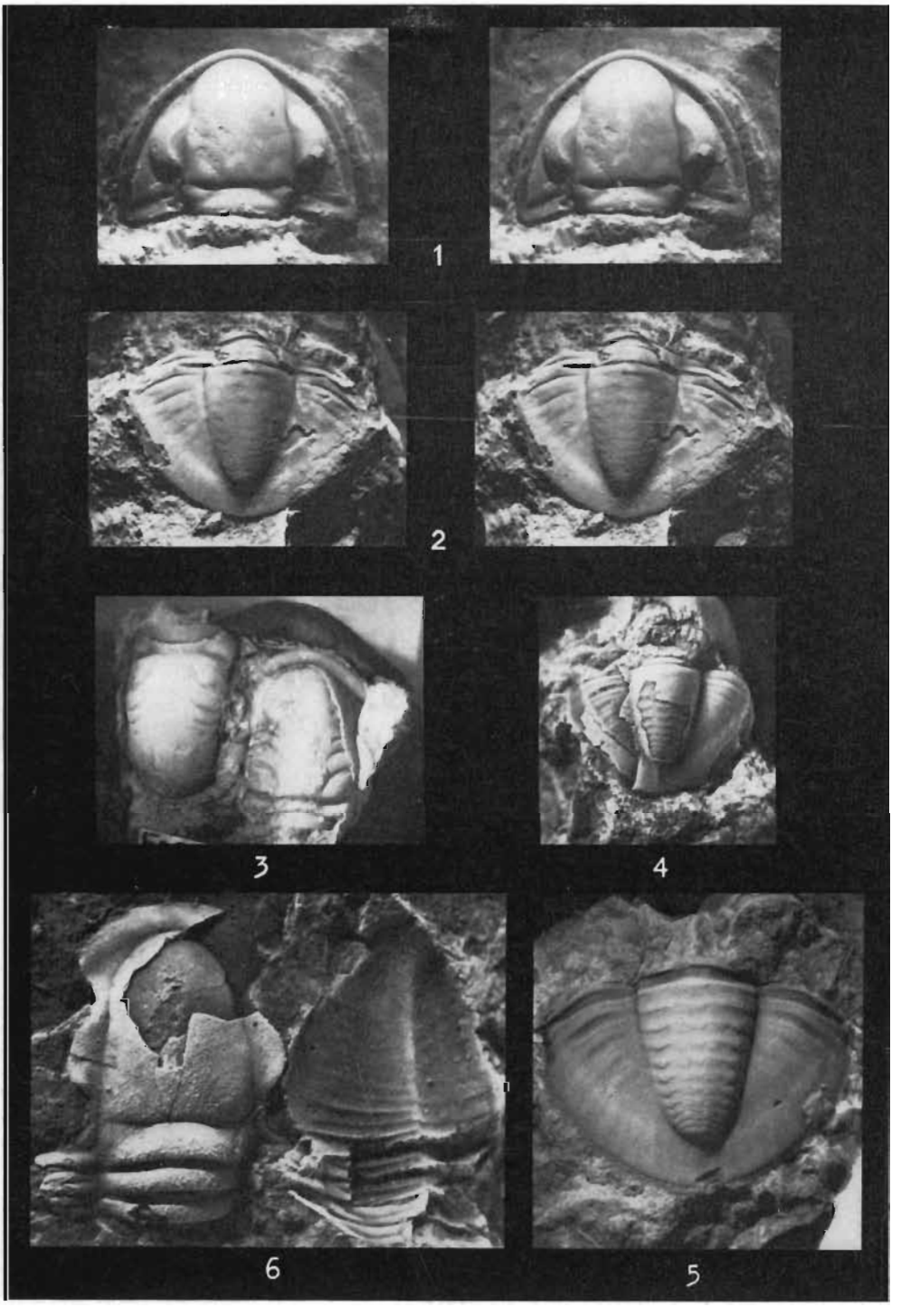
Plate V

Fig. 1. Stereograph of cephalon (Z. Pal. Tr. II. 284); ×3.
Fig. 2. Stereograph of pygidium (Z. Pal. Tr. II. 285); ×3.
Fig. 3. Internal mould of cranidium, lectotype (SMC E 3532) (Reed, 1899, Pl. 10, Fig. 1); ×2.5.
Fig. 4. Pygidium (BM 45008), Lower Carboniferous, Visean, Bolland, Yorkshire,
Fig. 5. Internal mould of pygidium, paralectotype (SMC E 3536) (Reed, 1899, Pl. 10, Fig. 3; ×2.5.

Archegonus (*Cyrtoproetus*) *anteriolatus* n.sp.

Fig. 6. Holotype cranidium and external mould of fragmentary pygidium, probably of the same specimen (IG 442.II.10); ×5.3.

Figs. 1, 2: Lower Carboniferous, D_2, Gałęzice, Ostrówka Hill, Holy Cross Mountains, (Góry Świętokrzyskie) Poland
Figs. 3, 5: Lower Carboniferous, Pendleside Limestone, Visean, Cracoe, Yorkshire, Great Britain; ×3.
Fig. 6: Lower Carboniferous, Go α, Jugów, Central Sudeten, Poland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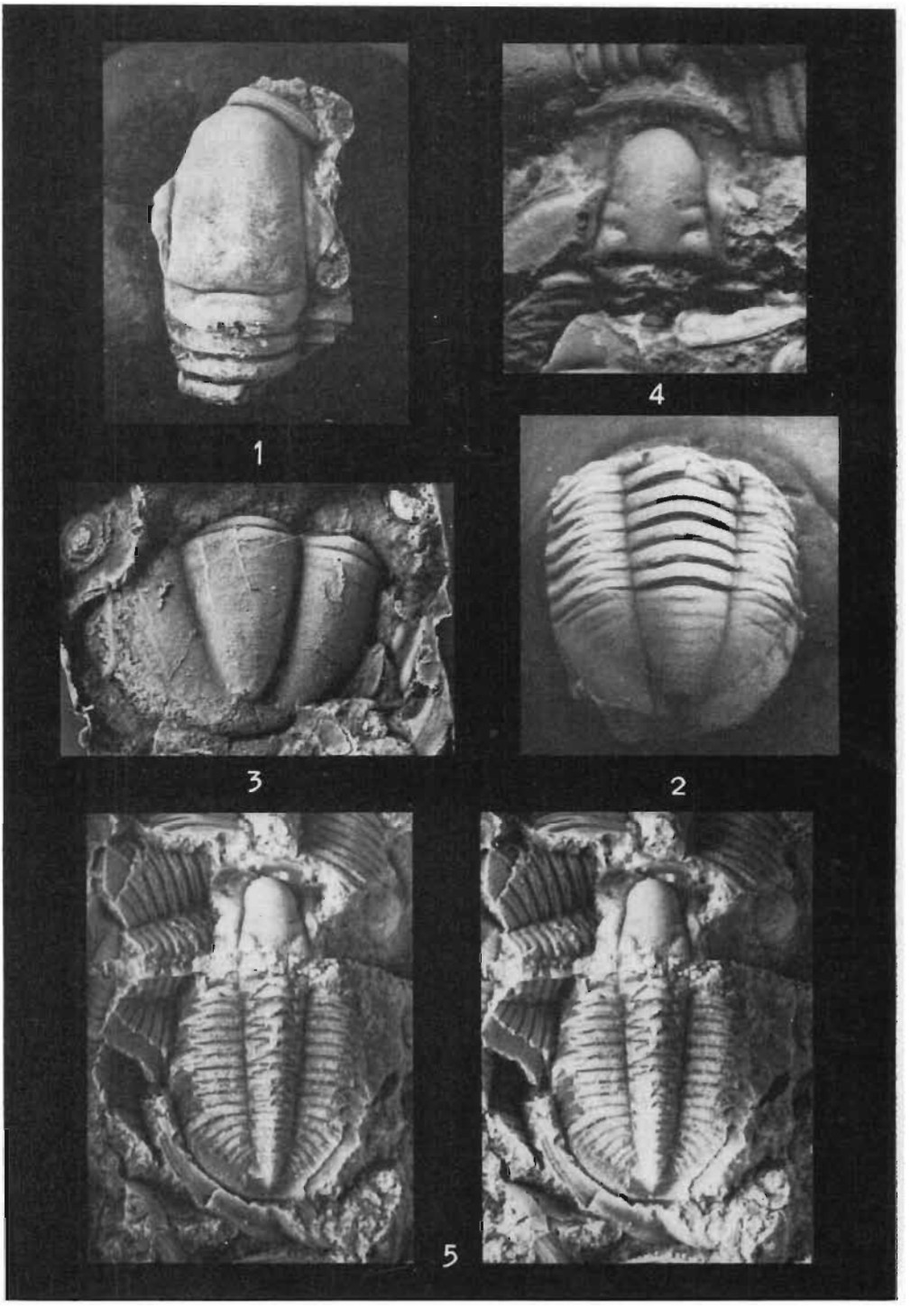
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Plate VI

Archegonus (*Cyrtoproetus*) *cracoensis* (Reed)

Fig. 1. Fragmentary cranidium (Z. Pal. Tr. II. 286); ×6.

Fig. 2. Pygidium with thoracic segments attached (Z. Pal. Tr. II. 287): ×6.

Archegonus (*Cyrtoproetus*) *anteriolatus* n.sp.

(see also Plate IV, Fig. 2)

Fig. 3. Latex cast of pygidium (IG 442. II. 6); ×3.

Archegonus (*Phillibolina*) *worsawensis* n.subgen., n.sp.

(see also Plate III, Fig. 8)

Fig. 4. Cranidium (BM In 25810a); ×10.

Fig. 5. Stereograph of entire specimen, librigenae lacking, holotype (BM In 2810b); ×6.

Rigs. 1, 2: Lower Carboniferous, D_2, Gałęzice, Ostrówka Hill, Holy Cross Mountains (Góry Świętokrzyskie), Poland

Fig. 3: Lower Carboniferous, Go α, Jugów, Central Sudeten, Poland

Figs. 4, 5: Lower Carboniferous, Visean, Clitheroe, Worsaw Hill, Lancashire, Great Britain