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Tournaisian trilobites from Dalnia in the Holy Cross Mts

ABSTRACT: The paper comprises descriptions of Tournaisian trilobites from the neptunian dykes on Dalnia Hill in the Holy Cross Mts. One new genus *Globusia* is established; 6 species and subspecies are new, viz. *Phillibole nitida annosa* subsp. n., *Ph. drewerensis latipalpebrata* subsp. n., *Ph. prenes* sp. n., *Globusia dalniana* sp. n., *G.? glabrina* sp. n., *Liobolina? oblativa* sp. n. The supposed signification of some cephalic adaptations as well as some taphonomic aspects of the trilobite assemblages are also discussed.

INTRODUCTION

The comparatively rich fauna of the corals (Fedorowski 1973, Stasińska 1973), conodonts (Szulczewski 1973) and trilobites was discovered by Docent M. Szulczewski (Institute of Geology, Warsaw University) in the neptunian dykes cutting the Frasnian limestones on Dalnia Hill near Kielce in Holy Cross Mts. The age of the trilobites which occur there is Famennian and Tournaisian (Szulczewski 1973). The Famennian trilobites are scanty and rather poorly preserved and they were determined as *Phacops granulatus* (Münster) and *Waribole* sp. 1. The Tournaisian trilobites are represented by *Phillibole nitida annosa* subsp. n., *Ph. drewerensis latipalpebrata* subsp. n., *Ph. prenes* sp. n., *Carbonocoryphe* cf. *hercynica* G. Hahn, 1967, *Waribole* sp. 2 *, *Liobolina* aff. *wurmi* Gandl, 1968, *L.? oblativa* sp. n., *Globusia differtigena* (Osmólska, 1962), *G. dalniana* sp. n., *G.? glabrina* sp. n., *?Globusia* sp. The more precise age of the depo-

* Librigena, not described in the present paper.

sits which yielded these trilobites was determined by Szulczewski (1973) as *cu I* (+ *?cu IIa*).

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CHARACTERISTICS OF THE MATERIAL

The Tourniaisian trilobites which are the subject of the present paper are comparatively numerous, although the samples from Dalnia were rather small. A number of the species is present among them, which are characterized by the very high anteriorly longitudinal profile of the cranidium (*Globusia differtigena, G. dalniana, G.? glabrina, Liobolina? oblativa*) and at least two of them, by the presence of the librigenae with swollen genal spines (*G. differtigena, ?Globusia* sp.). The trilobites from Dalnia show more or less advanced reduction of the eyes, but the completely eyeless forms are absent. The trilobites of small sizes nummerically prevail and they represent two species with highly vaulted cranidia: *G. differtigena* and *G. dalniana*. The remaining species are represented by the individuals of the moderate sizes, typical for the trilobites from the *cu I* and *cu II* Zones. The exuviae of the young individuals (presumably beginning with the late meraspis stage) are comparatively numerous in material from Dalnia.

The Tournaisian trilobites which have been found elsewhere in the Holy Cross Mts come, almost exclusively, from the shales of the Culm facies, while those from the neptunian dykes on Dalnia Hill are preserved in limestone, which causes that their state of preservation is exceptionally good. It allowed to obtain some new data on the morphology of *G. differtigena* which had previously been known from the shales on Karczówka Hill near Kielce, distant c. 1 km from Dalnia (Osmólska 1962). The majority of trilobites from Dalnia represent new species and subspecies. They come from two different kinds of limestone: light grey organodetrital limestone and pink pelitic limestone, either of them containing slightly different trilobite assemblage, although vaugely of the same stratigraphic age (Table 1). The trilobite exoskeletons which come from the light grey limestone are discoloured and about the same colour as the sediment, contrary to that, those from pink pelitic limestone are dark brown.

Table 1

Distribution of trilobite species in the Tournaisian limestones (neptunian dykes) at Dalnia

Species	Grey organodetrital limestone		Pink pelitic limestone
Phillibole nitida annosa subsp.n.	CR, PY	+	CR, PY, LB
Ph. drewerensis latipalpebrata subsp.n.	CR	+	CR, PY, ?LB
Ph. prenes sp.n.	-		CR
Carbonocoryphe cf. heroynica G.Hahn	-		PY, ?CR, ?LB
Waribole sp. 2 *	LB	+	-
Liobolina aff. wurmi Gandl	CR	+	-
L.? oblativa sp.n.	-		CR
Globusia differtigena /Osmólska/	CR, PY, LB		CR, PY
G. dalniana sp.n.	-		CR, PY
G.? glabrina sp.n.	-		CR
?Globusia sp.	LB	+	LB

CR cranidium, *PY* pygidium, *LB* librigena; marked by a cross (+) are single specimens
* Not described and not illustrated (*cf.* introduction to the present paper).

SYSTEMATIC DESCRIPTION

Family **Proetidae** Salter, 1846
Subfamily **Cyrtosymbolinae** Hupé, 1953
Genus *PHILLIBOLE* Richter & Richter, 1937
Phillibole nitida annosa subsp. n.
(Text-fig. 2*B* and Pl. 1, Figs 1—3)

Holotype: cranidium (Z. Pal. No. Tr. III/7), figured in Pl. 1, Fig. 3.
Type horizon: Tournaisian, pink limestone.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *annosus* — very old, aged, as the oldest subspecies of *Ph. nitida* (Holzapfel).

Diagnosis. — Subspecies of *Ph. nitida* with highly arched anterior outline of cranidium, flat anterior border, β situated outside the projection of δ; pygidium with axis poorly defined posteriorly, 9 axial rings; surface of glabella and pygidium granulated.

Material. — Five cranidia, three pygidia; all from the type horizon and locality.
Dimension in *mm:*

	Z. Pal. Nos Tr. III/ 7	9f
Length of cranidium	8.2	—
Length of glabella	6.0	—
Width of glabella	5.1	—
Length of pygidium	—	4.1
Width of pygidium	—	7.4
Length of axis	—	3.2
Width of axis	—	2.4

Description. — Anterior border weakly delimited, flat, horizontally placed and only slightly upturned; anterior outline of cranidium distinctly arched; glabella reaching the border and separated from the latter but by a shallow furrow; three pairs of glabellar furrows very weakly pronounced and devoid of ornamentation; basal lobe subcircular, flat, occupying one third of the total basal width of glabella; occipital furrow shallow at extremities, where it directs forwards; occipital ring broadened (*exsag.*) laterally with very weakly pronounced occipital lobes; palpebral lobe almost flat, horizontally placed, with γ and ε nearly equally close to axial furrow, γ opposite S_3, ε opposite the middle of basal lobe; δ situated slightly outwards the projection of β; anterior branch of facial suture between γ and β slightly divergent from axial furrow, its section between β and α convergent and comparatively long, what results in the high arching of the anterior outline of cranidium; posterior branch of facial suture parallel and close to axial furrow. In longitudinal section, occipital ring and glabella flat, the latter sloping gently at front towards the flat anterior border. In transverse section, glabella low, axial furrows weakly marked, palpebral lobes flat, nearly horizontal.

Pygidium twice as broad as long; no separated border; axis triangular occupying anteriorly one third of the total pygidial width, poorly defined posteriorly; 10 flat axial rings; postaxial ridge faint; ring-furrows shallowed at the axial furrow; pleural lobes distinctly vaulted with 3—6 flat ribs visible; first two pleural furrows deeper than others, rib-bands equal in width (*exsag.*); some distance from the outer margin, opposite the adaxial edge of the doublure, pleural and interpleural furrows become shallower marking off a border; pygidial doublure broadest posteriorly, where it reaches to the tip of axis. Ornamentation granular, granules low, flat; on pygidium, along posterior edge of each axial ring the granules merge together forming a kind of elevated ridge. In longitudinal section, axis and postaxial region gently sloping. In transverse section, axis broad, moderately vaulted, pleural lobes slightly arched. Several fragments of librigenae with very short genal spines were recovered, which may belong to the same subspecies. Other skeletal elements unknown.

Remarks. — *Phillibole nitida annosa* subsp. n. differs from the nominate subspecies mainly in the presence of the distinct granular ornamentation on the cranidium. The anterior outline of the cranidium is more strongly arched and the anterior border is horizontal in *Ph. nitida annosa*. The latter character is however variable, because on some cranidia, especially the smaller ones, the anterior border is slightly upturned. Although the pygidia of *Ph. nitida annosa* were not found in articulation with the cranidia there exists but a little doubt as to their assignment to the same subspecies. They are very similar to the pygidia of the nominate subspecies (*see* discussion *in:* G. Hahn 1966, p. 49) and differ only from the latter in being relatively broader and having a wider axis. Three subspecies within *Ph. nitida* were so far known, all from West Germany. The subspecies stratigraphically youngest is *Ph. nitida rara* R. Hahn, 1968 (= *Archegonus (Phillibole) nitidus rarus)* from the Lower Carboniferous *cu IIIα* zone. The nominate subspecies comes from *cu IIγ*, while the oldest representative of the species — *Ph. nitida schuebelensis* Gandl, 1968 (= *Archegonus (Ph.) nitidus schuebelensis)* was described from *cu* $IIα_1$ (Siphonodella crenulata Zone). *Ph. nitida annosa* from Dalnia also occurs in the Siphonodella crenulata Zone (*cf.* Szulczewski 1973) but it differs from *Ph. nitida schuebelensis* in the course of the anterior branch of the facial suture, having the distance α-β longer and distance β-γ shorter than these in the subspecies compared. The palpebral lobes in *Ph. nitida annosa* are relatively longer (*exsag.*) than in *Ph. nitida schuebelensis*, in which the former subspecies resembles *Ph. nitida nitida* (Holzapfel). Two fragments of similarly ornamented librigenae, with very short genal spines, were found

in the same b ; which yielded the cranidia and pygidia of the new subspecies described above. They resemble very much the librigenae of *Ph. nitida nitida*, but differ from the librigenae of *Ph. nitida schuebelensis* which lack the genal spines.

Phillibole dreweren sis latipalpebrata subsp. n.
(Text-fig. 1C and Pl. 1, Figs 7—9)

Holotype: cranidium (Z. Pal. No. Tr. III/9a), figured in Pl. 1, Fig. 8.
Type horizon: Tournaisian, pink limestone.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *latus* — broad, *palpebra* — eyelid; because of broad palpebral lobe.

Diagnosis. — Glabella faintly conical with weak glabellar furrows; preglabellar field broad (*sag.*); no anterior border furrow; anterior branch of facial suture very long, divergent; β situated on the same projection line as δ; palpebral lobe curved, relatively broad (*tr.*); posterior branch parallel to axial furrow; pygidium with high, narrow axis of 10 rings, 8 well pronounced ribs, radially arranged posteriorly; pygidial border differentiated; ornamentation granular, dense and fine.

Material. — Five cranidia, including a young one; four pygidia probably belonging to the subspecies from grey and pink limestone of the type horizon and locality.

Dimension in *mm:*

	Z. Pal. Nos 9a	9b	Tr. III/ 8
Length of cranidium	9.0	—	—
Length of glabella	6.2	—	—
Width of glabella	4.5	—	—
Length of pygidium	—	8.1	6.0
Width of pygidium	—	12.0	9.3
Length of axis	—	6.5	5.2
Width of axis	—	4.0	3.3

Description. — Cranidium with arched anterior outline; anterior margin with several parallel lines; no border furrow; preglabellar field wide (*sag.*); glabella weakly conical, axial furrows shallow; three pairs of faintly incised glabellar furrows, none reaching the axial furrow, S_1 bifurcated medially, not reaching occipital furrow; the latter somewhat deepened laterally, with very short "branch-furrow" invading the occipital ring, which is broadened (*exsag.*) at extremities; anterior branch of facial suture very long but relatively weakly divergent, its distance α-β nearly as long as β-γ distance; palpebral lobe well curved, its width (*tr.*) equal about three quarter of that of the occipital ring (*sag.*), and situated between S_3 and the mid-length (*exsag.*) of basal lobe; posterior branch of facial suture long and parallel to axial furrow; posterior border very long (*tr.*) and thin. In longitudinal section, occipital ring relatively high, glabella very slightly arched, preglabellar field concave, slightly raising forwards. In transverse section, glabella flat, axial furrows faintly incised, palpebral lobes almost horizontal and flat, only somewhat lower than glabella.

Pygidium semielliptical surrounded by poorly defined border; the latter is differentiated only by means of the pleural furrows, which end some distance from the outer margin, along the line where the adaxial margin of the doublure approaches dorsal carapace; axis conical, anteriorly narrower than one pleural lobe, reaching to the border and further posteriorly prolonged by postaxial ridge; 10 narrow rings, ring-furrows bent mesially backwards; 8 ribs, their anterior bands invade

the border but do not reach the outer margin, posterior ribs radially arranged; pleural furrows much deeper and shorter than interpleural furrows; pygidial doublure very broad, flat with about 14 terrace lines; it is equally wide around the pygidium and very close to dorsal carapace. In longitudinal section, axis faintly sloping backwards, axial rings convex, tip of axis poorly delimited, postaxial region gently sloping. In transverse section, axis high, strongly vaulted, pleural lobes slightly arched. Exoskeleton covered by very dense and fine granulation, with exception of the glabellar furrows. Granules most distinct along central portion of exoskeleton, tending to become smaller and lower towards the margins of the fixigenae and palpebral lobes, as well as on the lateral slopes of pygidial axis and adaxial slopes of the pleural lobes. Hypostoma and librigenae unknown.

Remarks. — *Phillibole drewerensis latipalpebrata* subsp. n. has a weakly conical glabella and long, parallel to axial furrow posterior branch of the facial suture in which it is close to *Phillibole drewerensis drewerensis* Richter & Richter, 1951. It differs from the nominate subspecies in having less divergent anterior branch of the facial suture and comparatively broader (*tr.*) palpebral lobes, so that β and δ are placed on the same projection line, instead of β being outwards δ as it is the case in *Ph. drewerensis drewerensis.* The difference concerns also the ornamentation of the exoskeleton, which is smooth in the nominate subspecies while distinctly granulated in *Ph. drewerensis latipalpebrata.*

Two types of librigenae were found in the same beds which yielded the cranidia of *Ph. drewerensis latipalpebrata,* which according to the course of their facial sutures may belong to this subspecies. One of them displays the very long, slender genal spine and steep, extensive visual lobe, the other is characterized by the shorter genal spine and its visual surface is not preserved. Richter & Richter did not illustrate the librigena of *Ph. drewerensis drewerensis,* although they mentioned that it was found, they did not determine also the length of the genal spine. The only illustrated librigena of *Ph. drewerensis* is that from the *cu?β* Zone of Frankenwald (Gandl 1968, Pl. 5, Fig. 2) and it shows the genal spine of the moderate length equal about a half of the length of librigena. Pygidium described above is so similar to that of the nominate subspecies, that there exists but little doubt that it belongs to the same subspecies as the cranidium.

Phillibole prenes sp. n.
(Text-fig. 2C and Pl. 1, Fig. 4)

Holotype: cranidium (Z. Pal. No. Tr. III/14), figured in Pl. 1, Fig. 4.
Type horizon: Tournaisian, pink limestone.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Gr. *prenes* — inclined, sloping; because of the anteriorly sloping profile of cranidium.

Diagnosis. — Glabella weakly conical without glabellar furrows; preglabellar field narrow; anterior border slightly upturned; longitudinal section of cranidium strongly sloping down forwards; anterior branch of facial suture long, faintly divergent, posterior one also long, nearly parallel to axial furrow; palpebral lobe small, narrow (*tr.*); ornamentation in form of coarse, anastomosing wrinkles present exclusively along the central portion of cranidium.

Material. — Two cranidia from pink limestone of type horizon and locality.

Dimension in *mm:*

	Z. Pal. No. Tr. III/14
Length of cranidium	7.9
Length of glabella	5.8
Width of glabella	4.7

Description. — Anterior outline of cranidium weakly arched; anterior margin of cranidium slightly upturned; preglabellar field concave, comparatively narrow (*sag.*); glabella weakly conical, axial furrows and occipital furrow shallow, glabellar furrows absent; occipital ring with faintly marked occipital lobes; fixigena comparatively broad (*tr.*) anteriorly, but very narrow posteriorly; palpebral lobe slightly behind the middle of glabella, weakly curved and narrow (*tr.*); anterior branch of facial suture long, divergent, further anteriorly gently bent inwards; posterior branch long and straight; pleura of occipital ring narrow (*exsag.*) and short (*tr.*). In longitudinal section, occipital ring flat, glabella gently but continuously sloping down forwards, preglabellar region (preglabellar field + anterior border) slightly raising upwards. In transverse section, glabella forming almost continuous, flat arch with the palpebral lobes. Along its medial portion, glabella covered with wrinkles and tubercles arranged in the papillar-like fashion; ornamentation slightly coarser anteriorly. Other parts of carapace unknown.

Remarks. — *Phillibole prenes* sp. n. is most similar to *Ph. drewerensis* Richter & Richter, 1951, in the course of the facial suture and in the shape of glabella. It differs from the representatives of the latter species in having more strong forward slope of glabella, coarser ornamentation as well as in lacking of the glabellar furrows. A similar forward slope of the glabella and the course of the facial suture is found in *Phillibole twistonensis* (Reed, 1943), although the slope in this latter species is more gentle. *Ph. twistonensis* has more slender glabella than in *Ph. prenes* and the glabellar furrows are more distinct. Two other representatives of the same genus which were found in the same beds and locality: *Ph. nitida annosa* subsp. n. and *Ph. drewerensis latipalpebrata* subsp. n. are distinctly different from *Ph. prenes*, the first one having the glabella closer to anterior border and the anterior outline of cranidium more arched, the other in having distinct furrows and the broader palpebral lobes. Both subspecies mentioned additionally differ from *Ph. prenes* in being more delicately ornamented and not so strongly arched in the longitudinal profile.

Carbonocoryphe cf. *hercynica* G. Hahn, 1967
(Pl. 1, Figs 5—6)

Material. — Two pygidia and numerous negatives of pygidia, 1 cranidium (probably also belonging to the species) from the pink Tournaisian limestone of Dalnia Hill near Kielce, Holy Cross Mts.

Dimensions in *mm:*

	Z. Pal. Nos Tr. III/ 11b	14a	11d
Length of cranidium (estim.)	—	—	5.3
Length of glabella	—	—	4.0
Width of glabella	—	—	3.3
Length of pygidium	4.2	4.0	—
Width of pygidium	6.9	7.0	—
Length of axis	3.2	3.3	—
Width of axis	2.3	2.2	—

Description. — Pygidium slightly longer than semicircle; axis high, conical, anteriorly slightly narrower or equal in width to that of the pleural lobe; 10 convex and narrow (*sag.*) axial rings; postaxial ridge weakly pronounced; ring-furrows undulated; pleural lobes weakly vaulted with 7—8 radially arranged ribs; pleural and interpleural furrows deepened opposite the adaxial edge of doublure, separating to the slight extent broad pygidial border; ribs not reaching the margin of pygidium, their anterior bands slightly higher and invading the border, the posterior ones

ending at the border; doublure equally broad around pygidium, posteriorly reaching to the tip of axis. Ornamentation granular, very densely arranged. The same ornamentation exposes a nearly complete cranidium found in the same beds and locality. It has long, divergent anterior branch of facial suture and β placed slightly outwards the projection of δ, glabella is conical with deep furrows, occipital ring with faint occipital lobes; posterior branch of facial suture is very close and parallel to axial furrow.

Remarks. — The pygidium is somewhat similar to that of *Carbonocoryphe hercynica* G. Hahn, 1967, from the *cu I* Zone of Winterberg, Harz (West Germany), in the number of the axial rings and pleural ribs. This number is in both forms the lowest among the representatives of the genus *Carbonocoryphe* Richter & Richter, 1950. The most striking difference between *C. hercynica* and the pygidium here described is a presence of weakly delimited but wide border and more distinct ornamentation in *C.* cf. *hercynica.* The bands of a rib are nearly equally high in the latter form while in *C. hercynica* the anterior one is more strongly developed. Taking into account the differences above quoted, as well as the fact that the pygidium described in the present paper is probably stratigraphically older, it is possible that it represents a new subspecies of *C. hercynica.*

The genus *Carbonocoryphe* is very insufficiently known in spite of the fact that it is represented by a large number of species. They are mostly based on the pygidia which are very characteristic and easily recognizable. The only complete cranidium (and librigena) so far known is that of the type species *C. bindemanni* Richter & Richter, 1950. Other cranida referred to this genus are either strongly distorted or fragmentary. As was already stated by Hahn & Hahn (1969, p. 122) the cephalon of *Carbonocoryphe* shows the general characters of the genus *Archegonus* sensu Hahn, 1965; it may be difficult to distinguish from some species of the *drewerensis*-group of the genus *Phillibole* Richter & Richter, 1937 (= *Archegonus (Phillibole)* of G. Hahn, 1965) or from *Latibole* Hahn & Hahn, 1969 (= *Archegonus (Latibole)* Hahn & Hahn, 1969), practically the only difference being limited to the course of posterior branch of facial suture (without distinctly pronounced ζ in *Carbonocoryphe).* Unfortunately it cannot be stated at the moment for sure, whether this latter feature was constant in the various species of *Carbonocoryphe.* The distorted cranidia assigned to this genus by Gandl (1968, p. 80, Pl. 6, Figs 2 and 5) as the undeterminable species display the course of the posterior branch of facial suture comparable to that of the *Phillibole* species rather than to this of *Carbonocoryphe bindemanni.* The facial suture of phillibolid type is visible on the cranidium described above which is covered by dense and uniformly spaced granulation similar to that which covers the pygidium of *C.* cf. *hercynica.* This is why the cranidium is here tentatively considered as being conspecific with the pygidium.

Subfamily **Cummingellinae** Hahn & Hahn, 1967
Genus *LIOBOLINA* Richter & Richter, 1951
Liobolina aff. *wurmi* Gandl, 1968
(Text-fig. 2*D*; Pl. 2, Fig. 11)

Material. — One cranidium from the light grey Tournaisian limestone of Dalnia Hill near Kielce, Holy Cross Mts.

Dimensions in *mm*:

	Z. Pal. No. Tr. III/2
Length of cranidium	5.0
Length of glabella	3.8
Width of glabella	3.0

Description. — Anterior outline of cranidium very slightly curved; anterior border broad (*sag.*), well delimited but weakly convex and somewhat invaded by glabella; anterior border furrow visible only across the fixigenae; glabella convex cylindrical, slightly constricted in the middle; most glabellar furrows lacking, but faint S_1 present; axial furrows and occipital furrow well incised, the latter slightly overhung laterally by basal lobes; occipital ring broad (*sag.*); palpebral lobe well curved, situated opposite the mid-length of glabella; anterior and posterior branches of facial suture diverging from axial furrow; pleura of occipital ring very long and convex. In longitudinal section, occipital ring convex and slightly higher than glabella, the latter very steeply sloping down along its anterior third towards the flat and horizontal anterior border. In transverse section, glabella convex, axial furrows deeply plunged, palpebral lobes raising outwards, but their abaxial portions gently bent downwards. Surface of exoskeleton smooth.

Remarks. — The cranidium resembles these of two *Liobolina* species: *L. submonstrans* Richter & Richter, 1951, known from the *cu I* Zone of the Rheinische and Thuringische Schiefergebirge and *L. wurmi* Gandl, 1968, from the *cu* IIa_1 Zone of the Frankenwald. It seems to be closer to *L. wurmi* having in common with this species the comparatively large palpebral lobes, the convex and well delimited by the axial furrows glabella and a similarly wide (*sag.*) anterior border. However, *L. wurmi* has finely granulated exoskeleton, comparatively well incised glabellar furrows and less diverging anterior branches of the facial suture, in which characters it differs from the here described cranidium. The resemblances to *L. submonstrans* can be listed as follows: the smooth surface of the exoskeleton, indistinct lateral glabellar furrows and similarly diverging anterior branches of the facial suture. May be, the cranidium above described represents a new subspecies of *L. wurmi*, but the scarcity of the material does not allow the present author for establishing of a new systematic unit. The stratigraphic position of *L.* aff. *wurmi* may be only vaugely determined as the Tournaisian, the both compared species also occurring in the Lower and Upper Tournaisian.

Liobolina? oblativa sp. n.
(Text-fig. 1*D*; Pl. 2, Figs 12—13)

Holotype: cranidium (Z. Pal. No. Tr. III/9c), figured in Pl. 2, Fig. 12.
Type horizon: Tournaisian, pink limestone.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *oblativus* — offered, given; the material was offered to the present author.

Diagnosis. — Anterior outline of cranidium weakly arched; anterior border narrow (*sag.*), slightly convex; glabella short and broad reaching to the anterior border; only basal furrow visible, which is very faint; palpebral lobe relatively broad (*tr.*); anterior branch of facial suture nearly parallel to median axis of cranidium; posterior branch divergent; exoskeleton smooth; pygidium presumably broadly rounded, vaulted with broad axis of 10 flat rings; pygidial border faintly delimited.

Material. — Two cranidia and fragmentary pygidium probably belonging to the species, from the pink limestone of the type horizon and locality.

Dimensions in *mm*:

	Z. Pal. Nos Tr. III/ 9c	9d
Length of cranidium	5.6	—
Length of glabella	4.7	—
Width of glabella	3.6	—
Length of pygidium	—	6.0
Length of axis	—	4.5

Description. — Anterior margin of cranidium broadly rounded and situated well below the plane of glabella; anterior border weakly convex, narrow (*sag.*); no preglabellar field; glabella only slightly longer than broad, cylindrical in shape, broadly rounded frontally; anterior glabellar furrows absent, basal furrow very weak, reaching neither occipital nor axial furrows; basal lobe very weakly developed; occipital ring equally broad (*sag.*) along its length (*tr.*); fixigena narrow (*tr.*); palpebral lobe triangular, short (*exsag.*) but comparatively broad (*tr.*); anterior branch of facial suture arched, parallel to axial furrow; posterior branch divergent; pleura of occipital ring very long. In longitudinal section, occipital ring higher than glabella, outline of glabella very convex, glabella deeply sloping towards the narrow anterior border. In transverse section, glabella highly vaulted, palpebral lobes slightly raising outwards.

Librigena, hypostoma and thorax unknown. Only a half of pygidium, probably belonging to the species, was found closely to the holotype cranidium. Judging from its size and the generally liobolinid character, it could belong to the same specimen. It is broadly rounded posteriorly being vaulted transversely and longitudinally; pygidial border poorly delimited; axis broad and long with 10 flat rings; 6—7 ribs visible with poorly marked pleural and interpleural furrows; surface of exoskeleton smooth and covered by sparse stiches, which are less pronounced on glabella, but distinct on pygidial border.

Remarks. — The species is only tentatively assigned to the genus *Liobolina* Richter & Richter, 1951, because it has the broad palpebral lobes and a very high longitudinal vaulting of the glabella. The representatives of *Liobolina* so far known have no palpebral lobes, or they are very narrow, also vaulting of their glabellae is never so strong as it is in *Liobolina? oblativa* sp. n. However, the shape of glabella, lack of the preglabellar field, almost obsolete basal furrows as well as the smooth exoskeleton very much resemble *Liobolina nebulosa* Richter & Richter, 1951, and *L. praevia* Osmólska, 1962. The pygidium assigned to the same species shows the characters typical for *Liobolina,* such as: the long axis, weakly delimited border, faint furrowing and distinct longitudinal vaulting. The strong convexity and shortness of the glabella in *L.? oblativa,* as well as the anterior border which is placed well below the plane of the glabella make this species close to the species of *Globusia* gen. n.; *L.? oblativa* lacks, however, the preglabellar field which is present in the typical representatives of *Globusia* (except *Globusia? glabrina* sp. n.). It is possible that *L.? oblativa* had also the librigenae with swollen genal spines and the librigena described in the present paper as *Globusia?* sp. may belong to this species. The pygidium of *L.? oblativa* exposes a resemblant ornamentation to that on the pygidia of the *Globusia* species — *G. differtigena* (Osmólska) and *G. dalniana* sp. n., but otherwise they differ very much, this of *L.? oblativa* being longer and having the longer axis.

Subfamily ?**Proetinae** Salter, 1864
Genus *GLOBUSIA* gen. n.

Type species: Cyrtosymbole (?Macrobole) differtigena Osmólska, 1962.

Derivation of the name: Lat. *globus* — sphere; because of the hemispherical shape of glabella.

Species assigned: Globusia differtigena (Osmólska, 1962), *Globusia dalniana* sp. n., *Globusia? glabrina* sp. n.

Stratigraphic and geographic distribution: Tournaisian of the Kielce region, Holy Cross Mts.

Diagnosis. — Cephalon very high longitudinally and transversely; glabella cylindrical, short to very short, semiglobular longitudinally, commonly close but not

reaching anterior border; palpebral lobe opposite mid-length of glabella, triangular and short (*exsag.*); fixigena narrow, eye lobe greatly reduced; genal spine swollen; pygidium twice as broad as long, pygidial axis broad, *U*-shaped with 8 rings.

Remarks. — *Globusia* gen. n. in its high vaulting of the cephalon and the short, broad pygidium is very similar to the Upper Devonian/Lower Carboniferous representative of the subfamily Proetinae, viz. *Pudoproetus* Hessler, 1963, which is so far known mostly from North America and Asia, being only exceptionally found in Europe (the Ural). Based on this resemblance, the present author assigned *Globusia* gen. n. tentatively to the subfamily Proetinae. However, it should be emphasized here that the common presence of the preglabellar field, reduction of eyes and the comparatively long posterior branch of the facial suture speak against such assignment of *Globusia*. These characters of *Globusia*, as well as the short glabella and pygidium make this genus close to the representatives of the subfamily Cornuproetinae Richter & Richter, 1956, but no species of this subfamily was reported higher than the Upper Devonian (Famennian). The shortening and the general reduction of eyes, as well as a tendency of the preglabellar field to become narrower (*sag.*) are the common phenomena in the Lower Carboniferous Cyrtosymbolinae, however the shortness of glabella and of the pygidium eliminates, in the present author's opinion, any possibility to assign *Globusia* within this subfamily.

The type species of *Globusia* gen. n., viz. *G. differtigena* (Osmólska) is characterized by the presence of the genal spine, which exposes the *"Cystispina*--tendency". Three other librigenae were found in Dalnia, which are different from those of the type species and they also show the same tendency. They were assigned tentatively to the genus *Globusia*, because judging from their facial suture they may belong either to any species of this genus present in the same beds (*G. dalniana* sp. n., *G.? glabrina* sp. n.), or to *Liobolina? oblativa*. The *"Cystispina*-tendency" is quite often met with among the Lower Carboniferous trilobites (*cf.* Hahn & Hahn 1971, p. 476), and *Globusia* is the oldest of them, being reported from the horizons not higher than *cu IIa*, while the others occur in the upper part of *cu II* and in *cu III*. The palpebral lobes of the *Globusia* species raise very strongly upwards and outwards. On the other hand, the small visual lobes on the librigenae are very flat, nearly in the plane of the central field of these latter. The complete cephalon of *Globusia* was never found, but its only possible reconstruction is that with the librigenae steeply sloping down outwards. It results both from the mutual relation between the pelpebral and visual lobes, and from the downward and almost parallel to the axial furrow course of the anterior branch of facial suture. On the librigenae, such course of the facial suture is achieved only if they are steeply placed and tilted down forwards. Otherwise, if the central field of librigena is placed horizontally, the course of its facial suture is extremely divergent in its anterior portion (Pl. 2, Figs 3 and 8). The steep position of the librigenae caused that the complete cephalon of *Globusia* had to be deeply concave ventrally. The swelling of the genal spines enlarged depth (in dorsolateral direction) rather than width (*tr.*) of the cephalon.

Globusia differtigena (Osmólska, 1962)
(Text-figs 1*A* and 2*A*; Pl. 2, Figs 1—5)

1962. *Cyrtosymbole (?Macrobole) differtigena* n. sp.; H. Osmólska, p. 147, Text-fig. 5*B*; Pl. 12, Figs 3—5.
1965. *Archegonus (Phillibole) differtigena* (Osmólska, 1962); G. Hahn, p. 252.
1969. *Archegonus (Phillibole) differtigena* (Osmólska, 1962); G. Hahn & R. Hahn, p. 98.
1971. *Archegonus (Phillibole) differtigena* (Osmólska, 1962); G. Hahn & R. Hahn, Tab. 2.

Holotype: pygidium (IG. No. 171.II.77c) figured in Osmólska, 1962, Pl. 12, Fig. 5.
Type horizon and locality: see Osmólska, 1962.

Revised diagnosis. — Pygidium almost twice as broad as long (length to width ratio 0.57), with rings and ribs weakly distinguished posteriorly; anterior border of cephalon upturned; anterior outline of cranidium arched; preglabellar field narrow (*sag.*), glabella short; S_1 weakly pronounced, other glabellar furrows absent; occipital ring high medially; palpebral lobe narrow (*tr.*); anterior and posterior branches of facial suture somewhat divergent; ornamentation of glabella wrinkle-like; librigena with weakly elongate, swollen genal spine, but with pointed tip at the end; visual surface small.

Material. — Eight cranidia, numerous librigenae, 6 pygidia from light grey limestone, 9 cranidia, 2 pygidia from pink limestone of the type horizon and locality.

Dimensions in *mm*:

	Z. Pal. Nos Tr. III/			
	1a	6	11e	1b
Length of cranidium	2.0	4.5	4.0	—
Length of glabella	1.5	2.3	2.5	—
Width of glabella	1.1	2.0	2.5	—
Length of pygidium	—	—		3.5
Width of pygidium	—	—		6.5
Length of axis	—	—		2.8
Width of axis	—	—		2.0

Redescription. — Cephalon broadly arched in anterior outline, with flat, poorly delimited border, which is slightly upturned anteriorly; preglabellar field very narrow; glabella very short and wide, its frontal outline in form of very high arch in dorsal view; glabellar furrows, except S_1 lacking; basal lobes subtriangular, poorly pronounced; axial furrows distinct but shallow; occipital furrow somewhat deeper, straight, occipital ring broad (*sag.*) and high medially, being equally broad along its entire length (*tr.*); anterior branch of facial suture very slightly divergent, posterior one much more strongly divergent beginning with ε; posterior portion of fixigena comparatively broad (*tr.*); palpebral lobe triangular, very small. In longitudinal section, occipital ring very high steeply sloping down towards the occipital furrow, glabella along its posterior 3/4 slightly raising upwards, anteriorly sloping vertically down towards the narrow and concave preglabellar field, anterior border somewhat upturned. In transverse section, glabella highly vaulted, palpebral lobes raising obliquelly upwards and outwards. Librigena with short genal spine, which is thickened and swollen but with very short, pointed tip; lateral border weakly delimited with 2—3 ridges along its outer surface, it slightly upturns toward the front; visual surface small, faintly convex with tiny facets; no lateral border furrow, posterior border furrow distinct, slightly invading backwards genal spine; entire surface of genal spine covered by thin longitudinal ridges, which are the continuation of the ridges along the lateral border and the doublure; a shallow, egg-shaped depression present on the doublure of librigena and situated at the base of genal spine. Thorax and hypostoma unknown.

Pygidium without marked border, slightly less than twice as broad as long; axis broad, *U*-shaped, poorly delimited posteriorly with 8 broad axial rings; articulating half-ring convex and narrow; 3 ribs on pleural lobe, pleural and interpleural furrows equally weakly marked, reaching close to pygidial margin; anterior band of rib only a little broader (*exsag.*) than posterior one; marginal part of pygidium, especially posteriorly, steeply sloping down. In longitudinal section, axis very gently sloping posteriorly down, poorly delimited from the postaxial region; axial rings flat. In transverse section, axis low, gently arched, pleural lobes faintly vaulted. Pygidial

doublure comparatively broad and flat posteriorly, while narrower and convex anteriorly; it thickens significantly towards the margin of pygidium, where it is much thicker than dorsal exoskeleton.

Distinct ornamentation present only on glabella where it consists of concentrically arranged, flattened tubercles which anastomose forming the wrinkles; librigena as well as the pygidium smooth, the latter finely and scarcely punctured on the marginal part.

Individual variability concerns the course of the anterior branch of facial suture, which can be nearly parallel to axial furrow or slightly divergent, as well as the occipital ring which is very convex transversely in the majority of specimens, but may be sometimes comparatively flat.

Growth changes. — The smallest specimens found show some adolescent features which were already reported in other young proetids (Osmólska 1962, G. Hahn 1963, Chlupač 1966). That means: the cranidium is slightly pointed frontally, has wide (*sag.*) preglabellar field as well as wide (*tr.*) fixigenae and the palpebral lobes. The glabella is more slender than in the adult individuals and the pygidium displays a larval notch. The smallest cranidium known (Z. Pal. No. Tr. III/1a; length 2.0 mm; Text-fig. 2*A* and Pl. 2, Fig. 1) has its glabella already very high anteriorly, and, differently than it is the case in other young proetids, the lateral glabellar furrows are absent, except the basal one, the latter is however by no means sharp. The smallest pygidium found (Z. Pal. No. Tr. III/1b; length 2.0 mm) represents probably the late meraspis, because it shows the sharp boundary marked between the first pygidial segment and the rest of pygidium. It exposes also a very shallow larval notch. The small librigenae of the young specimens have slightly more slender genal spines than those of older individuals.

Remarks. — The topotype series of this species comes from the Tournaisian shales of Karczówka Hill, *c.* 1 km from Dalnia Hill. The poor state of preservation did not allow then the present author (Osmólska 1962) for an accurate recognition of the peculiar characters of the cranidium, and the species has been assigned to *Cyrtosymbole (?Marcrobole)* Richter & Richter. The excellent material from the Tournaisian limestone of Dalnia Hill consists of pygidia and librigenae which without any doubt are conspecific with those of Karczówka Hill, and they are associated with the cranidia displaying subglobular glabellae, quite different than those known in the Cyrtosymbolinae. The quantitative and size relations between the pygidia, librigenae and cranidia prove that they belong to the same species. It has presently appeared that the number of axial rings on the pygidium is smaller than it was stated earlier (Osmólska 1962) and it is eight instead of nine.

Globusia dalniana sp. n.
(Text-fig. 2*E* and Pl. 2, Figs 6—7)

Holotype: cranidium (Z. Pal. No. Tr. III/13a), figured in Pl. 2, Fig. 6.
Type horizon: Tournaisian, pink limestone.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: found on Dalnia Hill.

Diagnosis. — Glabella cylindrical distinctly longer than broad, anterior border horizontal, preglabellar field narrow (*sag.*), anterior branch of facial suture close and parallel to axial furrow; basal lobe very small, circular, palpebral lobe very small; pygidium at least twice as broad as long, with 8 rings and 4—5 ribs; wrinkle--like ornamentation of glabella coarse, pygidium with sparse punctures on pleural lobes and low tubercles along posterior edge of each ring.

Material. — Five cranidia, 2 pygidia from the pink limestone of the type locality and horizon.

Dimensions in *mm*:

	Z. Pal. Nos Tr. III/ 13a	9e
Length of cranidium	3.3	—
Length of glabella	2.5	—
Width of glabella	2.1	—
Length of pygidium	—	2.8
Width of pygidium	—	5.6
Length of axis	—	1.7
Width of axis	—	1.5

Description. — Anterior part of cranidium narrow (*tr.*), its outline distinctly arched and slightly pointed; anterior border narrow (*sag.*) with several thin lines along (*tr.*) it; preglabellar field narrower (*sag.*) than the border; glabella cylindrical, longer than wide, partly covering the border in dorsal view; glabellar furrows absent, except S_1; basal lobe weakly pronounced, circular; occipital ring convex, weakly narrowed (*exsag.*) at extremities; palpebral lobe very small, triangular; fixigenae very narrow (*tr.*); anterior branch of facial suture longer than posterior one, straight and closely parallel to axial furrow; posterior branch weakly divergent. In longitudinal section, occipital ring convex, somewhat higher than glabella, glabella slightly raising upwards along its 3/4, anteriorly sloping vertically down; preglabellar field obliquelly sloping towards a nearly horizontal anterior border. In transverse section, glabella very highly vaulted, palpebral lobes raising up outwards. Librigena, hypostoma and thorax unknown.

Pygidium twice as broad as long, without a marked border; axis *U*-shaped, comparatively wide, but narrower than a pleural lobe; 8 comparatively broad, distinctly delimited axial rings; pleural lobe with 4—5 ribs, both rib-bands subequal in width (*exsag.*); interpleural furrows deeper and broader (*exsag.*) than pleural furrows; none of them reaching the margin of pygidium; marginal part of pleural lobe gently curved downwards, especially in the posterior portion of pygidium. In longitudinal section, axis low and weakly inclined backwards, axial rings flat, postaxial region wide, flat and only marginally curved downwards. In transverse section, axis low, pleural lobes weakly vaulted. Ornamentation of glabella very coarse and consisting of wrinkle-like flattened and anastomosing tubercles, which arrange concentrically; pygidium covered by sparse punctures, a row of low tubercles present along each axial ring.

Growth changes. — The smallest cranidium found (Z. Pal. No. Tr. III/12; length 2.8 mm) exposes a faintly pointed anterior outline, somewhat broader (*tr.*) fixigenae and the posterior branch of the facial suture slightly sinusoidal instead of being straight as it is in the larger cranidia.

Remarks. — *Globusia dalniana* sp. n. differs from *Globusia differtigena* (Osmólska) in having more slender glabella, the anterior branch of facial suture parallel to the axial furrow and straight instead of being slightly divergent and sinusoidal as in *G. differtigena*. The fixigena and palpebral lobe are narrower in *G. dalniana* than they are in the type species. The similarities in the structure of the cranidium with its highly vaulted glabella allows one to expect that also the librigena in *G. dalniana* was similar to that in *G. differtigena* and that it might have the swollen genal spine. However, the only librigenae with the *"Cystispina*--tendency" found in the pink Tournaisian limestone, which yielded the cranidia and pygidia of *G. dalniana*, are much larger than the largest cranidium of this species, thus they cannot be attributed with any certainty to *G. dalniana*. They are described in the present paper as *?Globusia* sp. Although the pygidia assigned here to *G. dal-*

niana were found separately from the cranidia, there seems to be but a little doubt that they belonged together, because they correspond in size and are very similar to the pygidia of *G. differtigena*. The differences deal with the more distinct segmentation of the pleural lobes and better pronounced ornamentation in the pygidia of *G. dalniana*. The latter are also relatively broader than those of *G. differtigena*.

Globusia? glabrina sp. n.
(Text-fig. 1*B* and Pl. 2, Fig. 10)

Holotype: cranidium (Z. Pal. No. Tr. III/11b), figured in Pl. 2, Fig. 10.
Type horizon: Tournaisian, pink limestone.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *glaber* — smooth; because of smooth exoskeleton; ending *-ina* added for distinction from specific name *"glabra"* often met with in trilobites.

Diagnosis. — Cranidium broadly rounded anteriorly; anterior border narrow (*sag.*) and convex; no preglabellar field; glabella cylidrical, elongate, very high frontally; glabellar furrows absent; anterior branch of facial suture parallel to axial furrow; posterior branch long, indistinctly divergent; palpebral lobe comparatively narrow (*tr.*), short (*exsag.*), triangular; exoskeleton smooth.

Material. — Three cranidia from the pink limestone of the type horizon and locality.

Dimensions in *mm*:

	Z. Pal. No. Tr. III/ 11b
Length of cranidium	7.0
Length of glabella	5.8
Width of glabella	3.8

Description. — Anterior outline of cranidium flat; anterior border narrow and slightly convex; glabella distinctly longer than wide, reaching the anterior border; no glabellar furrows, even the basal one; occipital ring equally wide (*sag.*) along its length (*tr.*); occipital furrow fading away laterally, fixigena extremely narrow; anterior branch of facial suture long and parallel to medial axis of cranidium, posterior branch also long, very close to axial furrow, bent outwards posterior to the half of width (*exsag.*) of occipital ring; palpebral lobe placed comparatively far backwards, small and triangular, with distance γ-δ distinctly longer than δ-ε. In longitudinal section, occipital ring slightly higher than glabella, the latter horizontal, but sloping down vertically at front where it is very high and slightly overhangs the narrow, horizontal border. In transverse section, glabella very high and narrow, palpebral lobes steeply raising up outwards. Exoskeleton smooth. Other parts of exoskeleton unknown.

Remarks. — *Globusia? glabrina* sp. n. is very similar to the representatives of *Globusia* in its extremely high anterior profile of the glabella. It differs both from *G. differtigena* (Osmólska) and *G. dalniana* sp. n. in the lack of the preglabellar field, the larger size, the smooth glabella. The preglabellar field or its lack are believed to be a feature of great importance among the Carboniferous proetids and this is why the assignment of the species above described to the genus *Globusia* is only tentative. *G.? glabrina* slightly resembles the representatives of *Phillibole* in the narrowness of the posterior portion of the fixigena and in the long posterior branch of facial suture. On the other hand, similarly long posterior branch of the facial suture and the narrow fixigena are present in *G. dalniana*, which is the typical representative of *Globusia*. Some similarities exist between *G.? glabrina* and the species of *Spatulina*

Osmólska, 1962, the latter having also elongate, cylindrical and unfurrowed glabellae, which are high at front. However, the elevation of the frontal portion of the glabella is much higher in *G.? glabrina* and the course of the anterior branch of the facial suture is also dissimilar in both groups. There may exist a possibility that *G.? glabrina* represents the older growth stage of *G. dalniana* because, as it is widely known, the gradual shortening (*sag.*) of the preglabellar field and its final obliteration, flattening of the anterior outline of cranidium, narrowing of the fixigenae, fading of the glabellar furrows and of the ornamentation often take place in trilobites during the individual growth. However, this latter supposition does not seem very likely, because there was no specimen found which could be considered as a link between the group of specimens assigned to *G. dalniana* and *G.? glabrina* both in respect to the size as well as to the morphological characters. This speaks in the present author's opinion very much in favour of the specific separation of the forms mentioned above. The librigena described in the present paper as *?Globusia* sp. may be a counterpart to the cranidium of *G.? glabrina*, taking into account its size.

?Globusia sp.
(Pl. 2, Figs 8—9)

Material. — Three librigenae from the light grey and pink Tournaisian limestone of Dalnia Hill near Kielce, Holy Cross Mts.

Dimensions in *mm:*

	Z. Pal. No. Tr. III/4b
Length of librigena with genal spine (estim.)	13.2
Width of librigena (estim.)	4.8
Length of genal spine	4.3
Distal width of genal spine (measured in dorsolateral direction)	2.8

Description. — Librigena broad and flat; visual lobe very small, flat with tiny facets; lateral border convex, upturned; no lateral border furrow; posterior border broad and convex; posterior border furrow deep, distinct, invading the genal spine posteriorly; the latter thick and very broad, still broader distally and bluntly ended; distal, enlarged portion of genal spine developed in plane situated obliquelly to that of the central field of librigena; several ridges present along lateral border and on doublure and they pass onto the genal spine being present on its dorsal and ventral surface, except posterior border furrow.

Remarks. — The librigena most probably belongs to a species of *Globusia*, as it is very similar to that of *G. differtigena* (Osmólska) and differs from the latter only in having longer and more swollen spine, which is bluntly ended instead of being pointed as it is in the type species of *Globusia*. All three librigenae found are much larger than those of *G. differtigena*, and taking into account their size and the facial suture they could belong to *Globusia? glabrina* sp. n., but also to *Liobolina? oblativa* sp. n. As it was already stated above the librigena of that type was comparatively steeply sloping downwards when it was conjoined with the cranidium. In that case, the distal broadened surface of the genal spine was in a nearly vertical position. The genal spine of *?Globusia* sp. is most similar to that of *Cystispina diversa* Hahn & Hahn, 1971, the species from the *cu IIIa* Zone of Erdbach (West Germany) which is based exclusively on the librigena. *?Globusia* sp. lacks, however, a pointed tip and the abaxial swelling of the spine which are characteristic of *C. diversa*.

ECOLOGICAL AND TAPHONOMICAL REMARKS

The most striking feature of the Tournaisian trilobite material from the neptunian dykes at Dalnia is the presence of two distinctly different assemblages which occur in the lithologically different types of limestone (Table 1).

In grey organodetrital limestone practically the only component of the trilobite assemblage is *Globusia differtigena* (Osmólska), a species which exposes highly vaulted cranidium and swollen genal spines. In pink pelitic limestone *G. differtigena* is accompanied by some other species with the similarly high cephala (*G. dalniana* sp. n., *G. glabrina*? sp. n., *Liobolina*? *oblativa* sp. n., *L.* aff. *wurmi* Gandl) as well as by the species with a "normal" morphology of the cephalon (*Ph. nitida annosa* subsp. n., *Ph. drewerensis latipalpebrata* subsp. n., *Ph. prenes* sp. n., *C.* cf. *hercynica* G. Hahn). The trilobite assemblage from pink pelitic limestone contains numerous trilobite remains which belong to the forms representing various ecological adaptations. It seems that it may represent the agglomeration of the trilobite exuviae, derived from other environments, and which were transported and accumulated in the fissure. An additional evidence in favour of this supposition seems to be the entire lack of the librigenae of most frequent in this assemblage species, viz. *G. differtigena*. It is possible, that the librigenae in question had exposed the different hydromechanic properties than the cranidia and pygidia, because their genal spines were strongly thickened. Contrary to this, the trilobite assemblage from grey organodetrital limestone yielded the exuviae of the cranidia, librigenae and pygidia of *G. differtigena* in more or less proper quantitative proportions (librigenae being about twice as numerous). It seems to the present author, that the latter assemblage was deposited in the same site where the moulting had taken place. There may be some doubt, however, whether these trilobites inhabited the bottom of the fissure, or the deposit was displaced there with embedded trilobite remains. The latter variant seems to be more convincing.

The high percentage of the species in the Tournaisian limestone from Dalnia Hill exposes the high vaulting of the cephalon, the well advanced reduction of eyes and, most probably, the presence of swollen genal spines. These adaptations seem to inform that these species lived on the muddy bottom. The highly vaulted cephala had to be especially important for the small trilobites, to which most of the highly vaulted forms belong, because that might prevent, to some extent, the complete sinking in the soft deposit.

The presumed steep inclination of the librigenae of *G. differtigena* when they were attached to the cranidium (and most probably of many other species with the broadly expanded librigenal spines) places the

genal spines in such position, that their broadest surface faces laterodorsally. In this case, the ventrally directed edges of the spines were only slightly thickened transversely. They formed a kind of runners, which could be, probably used by the trilobites in sledge-like locomotion on the muddy bottom.

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Fig. 1

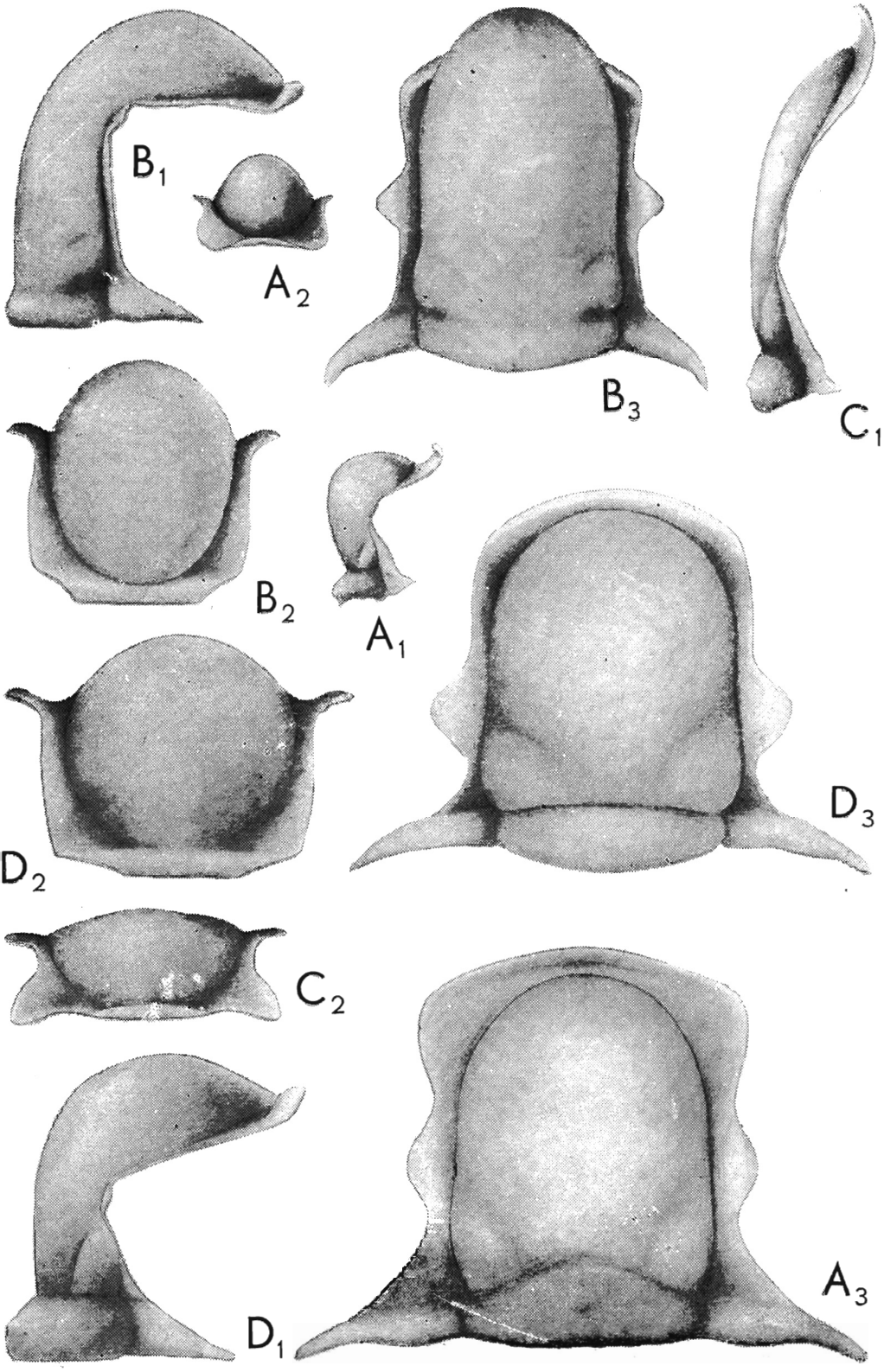
Diagrammatic drawings of cranidia of the Tournaisian trilobites from Dalnia. Ornamentation (if present) omitted; all drawings in dorsal view made with palpebral lobes placed horizontally

A — *Globusia differtigena* (Osmólska); *1* and *2* × 6.5, *3* × 16
B — *Globusia? glabrina* sp. n.; × 8
C — *Phillibole drewerensis latipalpebrata* subsp. n.; × 7
D — *Liobolina? oblativa* sp. n.; × 8.5
1 lateral view, *2* anterior view, *3* dorsal view

Fig. 2

Diagrammatic drawings of cranidia of the Tournaisian trilobites from Dalnia. Ornamentation (if present) omitted; all drawings in dorsal view made with palpebral lobes placed horizontally

A — *Globusia differtigena* (Osmólska); young form, × 16
B — *Phillibole nitida ammosa* subsp. n.; × 6.5
C — *Phillibole prenes* sp. n.; × 6.5
D — *Liobolina* aff. *wurmi* Gandl; × 10
E — *Globusia dalniana* sp. n.; × 16.5
1 lateral view, *2* anterior view, *3* dorsal view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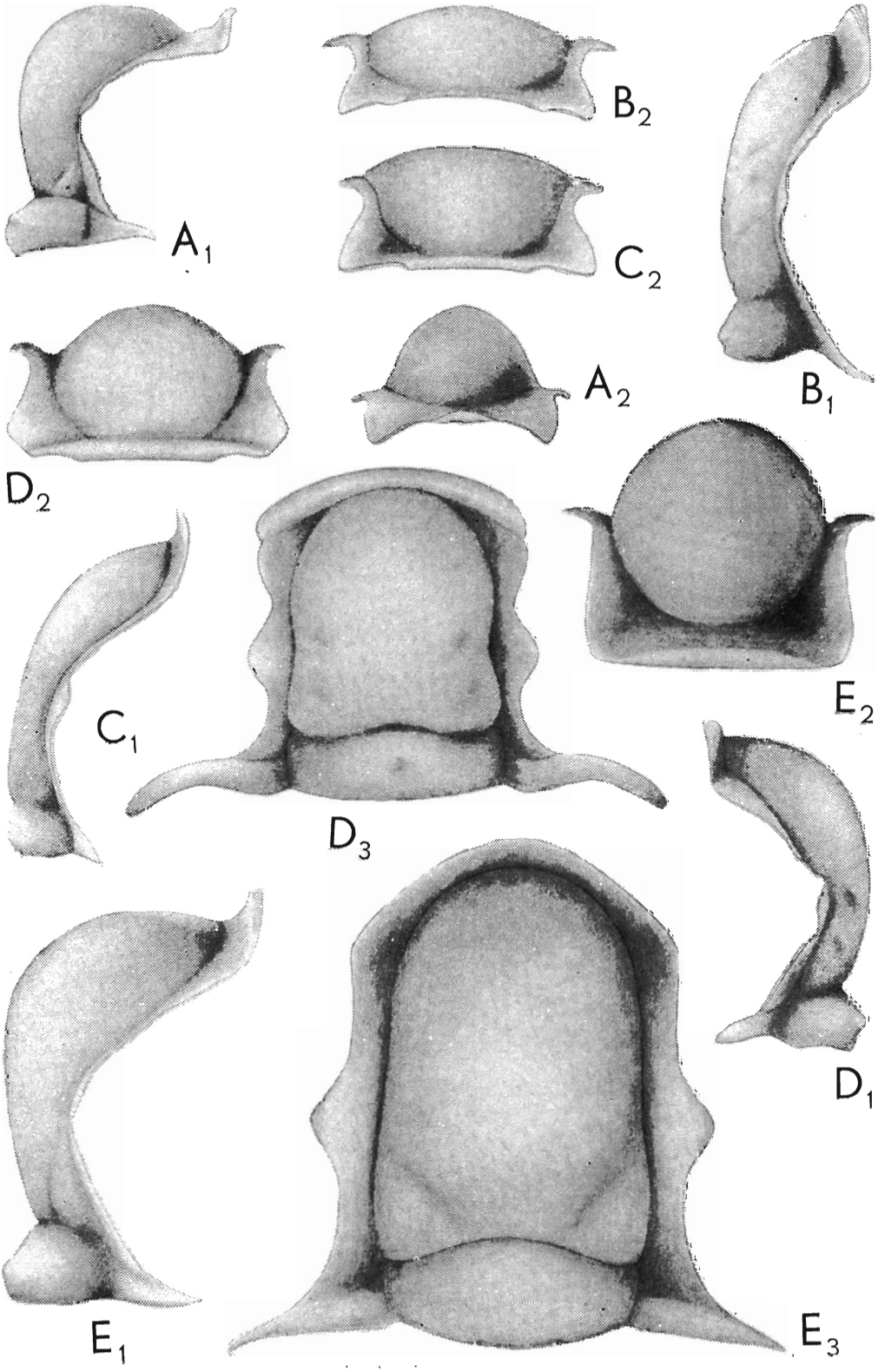
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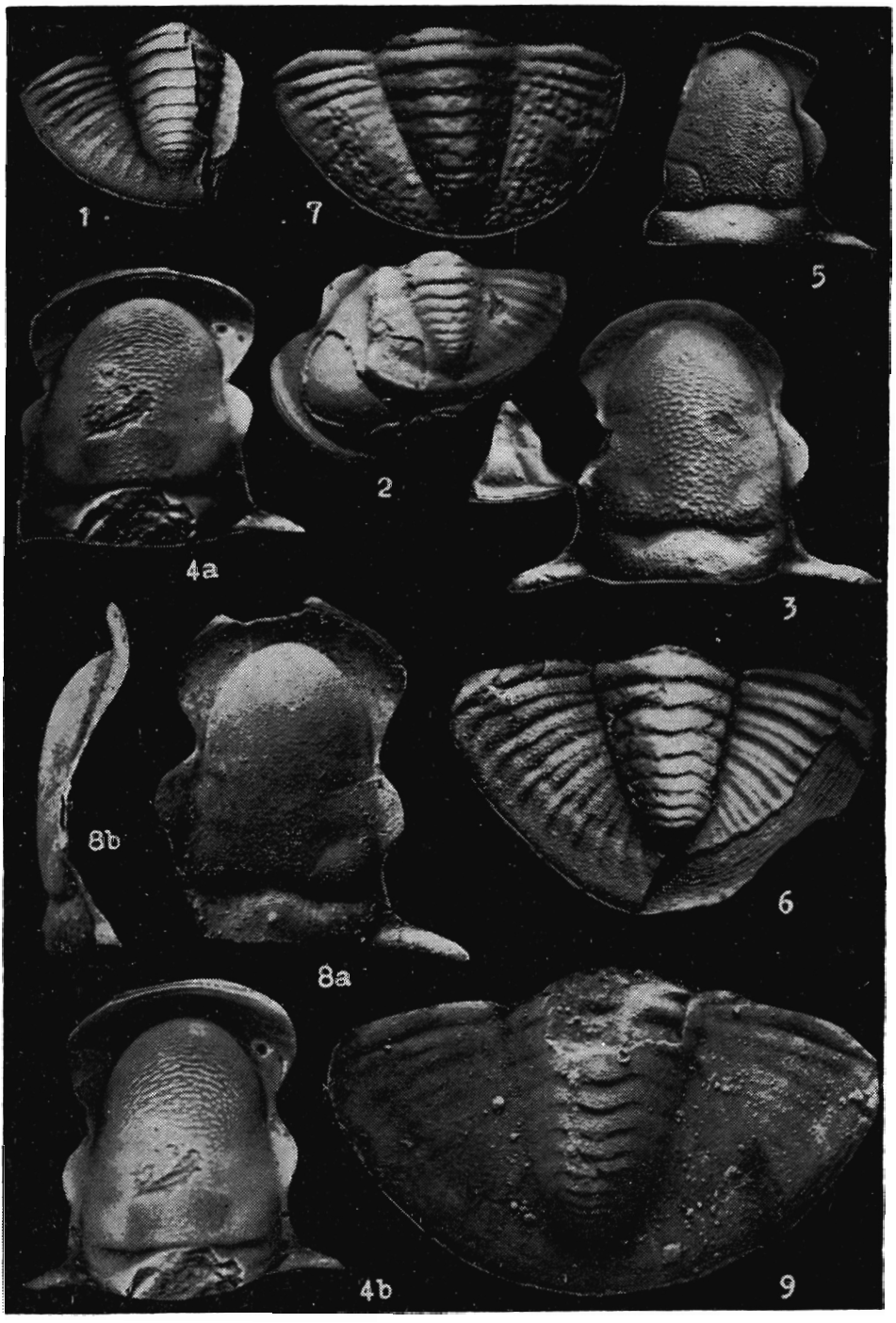
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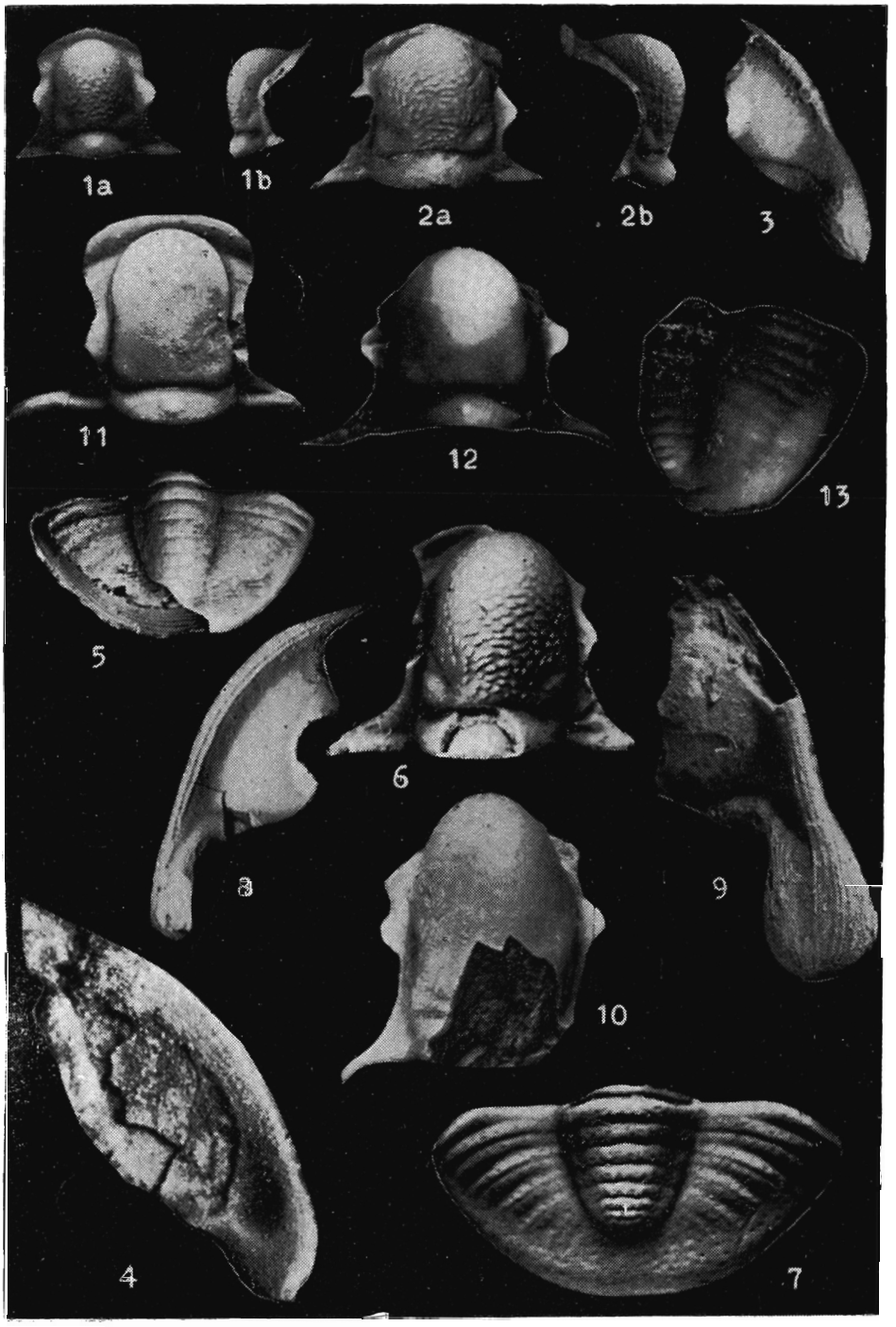
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PL. 1

1 — *Phillibole nitida annosa* subsp. n.; fragmentary pygidium (Z. Pal. No. Tr. III/9f), × 6.
2 — *Phillibole nitida annosa* subsp. n.; young pygidium and cranidium (Z. Pal. No. Tr. III/15), × 10.
3 — *Phillibole nitida annosa* subsp. n.; holotype cranidium with a fragment of librigena (Z. Pal. No. Tr. III/7), × 5.
4 — *Phillibole prenes* sp. n.; holotype cranidium (Z. Pal. No. Tr. III/14), *a* — with occipital ring in horizontal position, *b* — with palpebral lobes in horizontal position, × 6.
5 — *Carbonocoryphe* cf. *hercynica* G. Hahn; fragmentary cranidium (Z. Pal. No. Tr. III/11d), × 6.
6 — *Carbonocoryphe* cf. *hercynica* G. Hahn; pygidium (Z. Pal. No. Tr. III/11a), × 9.5.
7 — *Phillibole dreweren sis latipalpebrata* subsp. n.; pygidium with slightly abraded exoskeleton (Z. Pal. No. Tr. III/11c), × 6.
8 — *Phillibole dreweren sis latipalpebrata* subsp. n.; holotype cranidium (Z. Pal. No. Tr. III/9a) in dorsal (*a*) and lateral (*b*) views, × 5.5.
9 — *Phillibole dreweren sis latipalpebrata* subsp. n.; slightly flattened pygidium, belonging probably to the same specimen as the holotype cranidium (Z. Pal. No. Tr. III/9b), × 6.

All photographs of cranidia taken with occipital rings placed horizontally, unless stated otherwise

All specimens from the Tournaisian at Dalnia in the Holy Cross Mts

PL. 2

1 — *Globusia differtigena* (Osmólska); young cranidium (Z. Pal. No. Tr. III/1a) in dorsal (*a*) and lateral (*b*) views, × 9.
2 — *Globusia differtigena* (Osmólska); damaged cranidium (Z. Pal. No. Tr. III/6) in dorsal (*a*) and lateral (*b*) views, × 5.
3 — *Globusia differtigena* (Osmólska); librigena (Z. Pal. No. Tr. III/1c), × 10.
4 — *Globusia differtigena* (Osmólska); librigena (Z. Pal. No. Tr. III/5) in ventral view exposing the egg-shaped depression on the genal spine, × 14.
5 — *Globusia differtigena* (Osmólska); partly exfoliated pygidium (Z. Pal. No. Tr. III/1b), × 6.
6 — *Globusia dalniana* sp. n.; holotype cranidium (Z. Pal. No. Tr. III/13a), × 10.
7 — *Globusia dalniana* sp. n.; pygidium (Z. Pal. No. Tr. III/9e), × 10.
8 — *?Globusia* sp.; librigena with damaged visual lobe (Z. Pal. No. Tr. III/9g), × 5.5.
9 — *?Globusia* sp.; damaged librigena (Z. Pal. No. Tr. III/4b) — genal spine in oblique laterodorsal view, × 6.
10 — *Globusia? glabrina* sp. n.; holotype cranidium (Z. Pal. No. Tr. III/11b), × 5.
11 — *Liobolina* aff. *wurmi* Gandl; cranidium (Z. Pal. No. Tr. III/2), × 6.
12 — *Liobolina? oblativa* sp. n.; holotype cranidium (Z. Pal. No. Tr. III/9c), × 4.5.
13 — *Liobolina? oblativa* sp. n.; fragmentary pygidium (Z. Pal. No. Tr. III/9d) in slightly oblique posterolateral view, × 5.

All photographs of cranidia taken with occipital rings placed horizontally, unless stated otherwise

All specimens from the Tournaisian at Dalnia in the Holy Cross Mts

REFERENCES

CHLUPAČ I. 1966. The Upper Devonian and Lower Carboniferous trilobites of the Moravian Karst. — Sborn. Geol. Ved, ser. *P*, no. 7. Praha.

FEDOROWSKI J. 1973. Rugose corals Polycoelaceae and Tachylasmatina subord. n. from Dalnia in the Holy Cross Mts. — Acta Geol. Pol., vol. 23, no. 1. Warszawa.

GANDL J. 1968. Die Trilobiten im Unterkarbon des Frankenwaldes. Stratigraphische Untersuchungen im Unterkarbon des Frankenwaldes unter besonderer Berücksichtigung der Trilobiten, 1. — Senckenbergiana, Bd. 49, H. 1. Frankfurt a. M.

HAHN G. 1965. Revision der Gattung *Archegonus* Burmeister, 1843 (Trilobita). — *Ibidem*, Bd. 46, H. 4/6.

— 1967. Neue Trilobiten vom Winterberg/Harz (Unter-Karbon). — *Ibidem*, Bd. 48, H. 2.

— & HAHN R. 1969. Trilobitae carbonici et permici *I*. — Fossilium Catalogus *I*, Animalia, P. 118. Gravenhage.

— & — 1971. Trilobiten aus dem unteren Teil der *crenistria*-Zone (Unter-Karbon, cu IIIα_{1-2}) des Rheinischen Schiefer-Gebirges. — Senckenbergiana, Bd. 52, H. 5/6. Frankfurt a. M.

HAHN R. 1968. Proetidae aus der oberen *crenistria*-Zone von Herborn (Trilobita; Unter-Karbon), Teil *2: Archegonus (Phillibole)* Rud. & E. Richter 1937. — *Ibidem*, Bd. 49, H. 5/6.

OSMÓLSKA H. 1962. Famennian and Lower Carboniferous Cyrtosymbolinae (Trilobita) from the Holy Cross Mountains, Poland. — Acta Palaeont. Pol., vol. 7, no. 1/2. Warszawa.

RICHTER R. & RICHTER E. 1950. Tropidocoryphinae im Karbon (Tril.). — Senckenbergiana, Bd. 31, H. 5/6. Frankfurt a. M.

— & — 1951. Der Beginn des Karbons im Wechsel der Trilobiten. — *Ibidem*, Bd. 32, H. 1/4.

STASIŃSKA A. 1973. Tabulate corals from Dalnia in the Holy Cross Mts. — Acta Geol. Pol., vol. 23, no. 1. Warszawa.

SZULCZEWSKI M. 1973. Famennian-Tournaisian neptunian dykes and their conodont fauna from Dalnia in the Holy Cross Mts. — *Ibidem*.

H. OSMÓLSKA

TURNEJSKIE TRYLOBITY Z DALNI W GÓRACH ŚWIĘTOKRZYSKICH

(Streszczenie)

W osadach wypełniających synsedymentacyjne żyły neptuniczne z pogranicza dewonu i karbonu na Dalni koło Karczówki w Górach Świętokrzyskich (*por.* Szulczewski 1973) znalezione zostały trylobity wieku fameńskiego i turnejskiego. Trylobity turnejskie będące przedmiotem niniejszej pracy (*por.* tab. 1, fig. 1—2 oraz pl. 1—2) zaliczone zostały do 4 rodzajów, w tym 1 nowy, reprezentujących 10 gatunków i podgatunków, w tym 6 nowych: *Phillibole nitida annosa* subsp. n., *Ph. drewerensis latipalpebrata* subsp. n., *Ph. prenes* sp. n., *Liobolina? oblativa* sp. n., *Globusia dalniana* gen. n., sp. n. oraz *G.? glabrina* sp. n. Wśród form tych wyróżnić można dwa zespoły, z których pierwszy występujący w jasnoszarych wapieniach organodetrytycznych, składa się z wylinek należących prawie wyłącznie do jednego gatunku *Globusia differtigena* (Osmólska). Drugi, pochodzący z różowych wapieni pelitycznych, jest znacznie bardziej zróżnicowany, i obok licznych okazów gatunku *G. differtigena* zawiera wylinki wszystkich pozostałych trylobitów (tab. 1). Oba zespoły charakteryzują się obecnością gatunków posiadających bardzo wysoko sklepione cefalony, nabrzmiałe końce kolców policzkowych, oraz mniej lub bardziej zredukowane oczy. Cechy te uznać należy za wynik przystosowania rozważanych trylobitów do życia na miękkim i mulistym dnie.

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