

Preliminary report of trilobites from the Hanonet Formation (Eifelian – Givetian transition), southern border of Dinant Synclinorium, Belgium

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Abstract

The macrofauna of the Hanonet Formation is well documented with the exception of trilobites. Recent investigation of the basal layers of this formation (*Polygnathus ensensis* conodont Zone) at Resteigne has allowed identification of six trilobite taxa, comprising *Calycoscutellum goolaertsi* n. sp., *Nyterops hollandi* n. sp., *Hypsipariops?* sp., *Gerastos* cf. *prox.*, *Dohmiella* sp. 2, and *Dechenella* sp. The taxa *Calycoscutellum* cf. *goolaertsi* n. sp. and *Cornuproetus cornutus* n. ssp. 1 are recorded from the same formation at Couvin.

Keywords: Trilobites, Hanonet Formation, Middle Devonian, Belgium.

Résumé

La macrofaune de la Formation de Hanonet est bien documentée, à l'exception des trilobites. Des fouilles récentes de la partie basale de cette formation (Zone à conodontes *Polygnathus ensensis*) à Resteigne ont permis d'identifier six taxons de trilobites, y compris *Calycoscutellum goolaertsi* n. sp., *Nyterops hollandi* n. sp., *Hypsipariops?* sp., *Gerastos* cf. *prox.*, *Dohmiella* sp. 2 et *Dechenella* sp. Les taxons *Calycoscutellum* cf. *goolaertsi* n. sp. et *Cornuproetus cornutus* n. ssp. 1 ont été découverts dans la même formation à Couvin.

Mots-clefs: Trilobites, Formation d'Hanonet, Dévonien moyen, Belgique.

Introduction

The Hanonet Formation is a major source of latest Eifelian to early Givetian trilobites that outcrops on the southern and southeastern borders of the Dinant

Synclinorium. Contrary to most other macrofaunal constituents, the trilobites of this formation are very poorly documented. There are few publications in which they are mentioned (see, e.g., BLONDIEAU, 1995; BULTYNCK & HOLLEVOET, 1999) and there are no descriptions available except for one species (see VAN VIERSEN, 2006b).

The present paper describes trilobite specimens from the basal part of the Hanonet Formation in the southwestern part of the abandoned quarry of Resteigne. Several additional specimens were collected from the Hanonet Formation in quarry "La Couvinoise" north of Couvin.

Locations and stratigraphy

ABANDONED QUARRY OF RESTEIGNE (Loc002, southern border of Dinant Synclinorium, Belgium; Fig. 1)

This quarry is occasionally nicknamed "Carrière de la Lesse". It has received much attention in sedimentological and palaeontological studies (see, e.g., MAMET & PREAT, 1983; PREAT *et al.*, 1984; COEN-AUBERT *et al.*, 1986; COEN-AUBERT, 1988, 1996, 2003; CASIER & PREAT, 1990, 1991; SIX, 1991; BLONDIEAU, 1995; VAN VIERSEN, 2006b). A nearly uninterrupted sequence of late Eifelian to early Givetian strata is exposed here, chiefly comprising the Hanonet, Trois-Fontaines and Terres d'Haurs formations. At Resteigne there is a hiatus near the base of the Hanonet Formation, just above contact with the lower Jemelle Formation, and the unit attains a thickness of 70 m here (PREAT & TOURNEUR in BULTYNCK *et al.*, 1991; BULTYNCK & DEJONGHE, 2001). A detailed account of the stratigraphic units in this quarry was provided by COEN-AUBERT *et al.* (1986).

Trilobites were collected from the predominantly argillaceous limestones that constitute the basal part of the Hanonet Formation in the southwestern part of the quarry, just below the Eifelian – Givetian boundary (*Polygnathus*

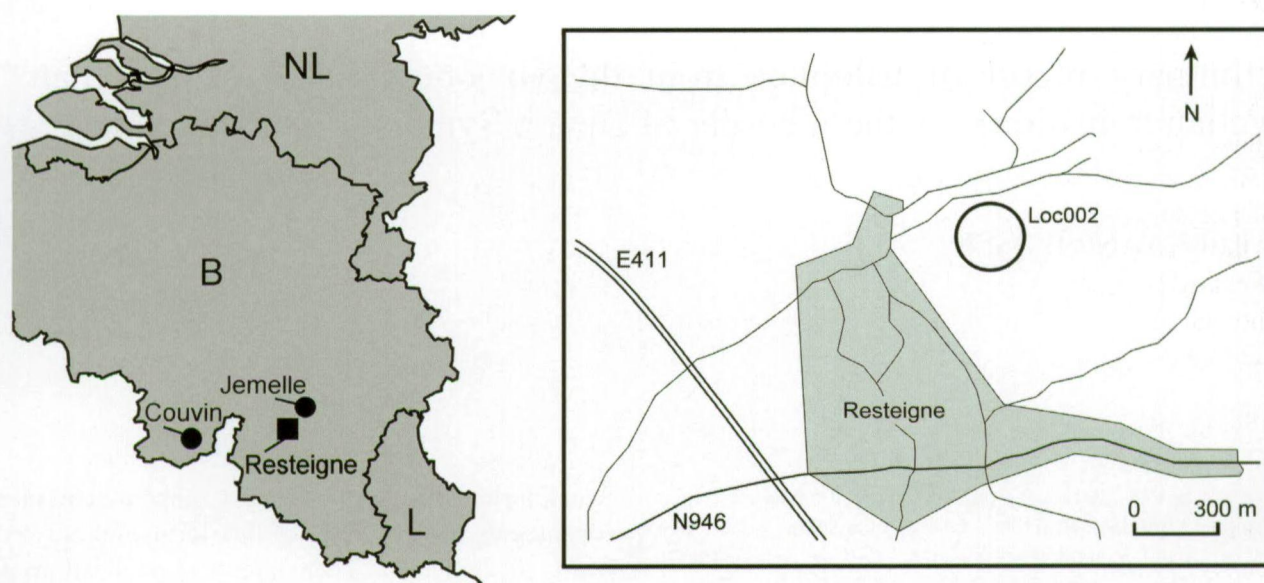


Fig. 1 — Location of abandoned quarry of Resteigne (Loc002) in southern Belgium. Square on overview map indicates position of local map within Belgium.

ensis conodont Zone). They are represented by the genera *Calycoscutellum*, *Dechenella*, *Dohmiella*, *Gerastos*, *Hypsipariops*?, *Nyterops* and Otarioninae gen. & sp. indet.

QUARRY LA COUVINOISE (Loc021, southern border of Dinant Synclinorium, Belgium; LECOMPTE, 1960, figs. 3, 7, pl. 4, figs. 1-4; BULTYNCK & HOLLEVOET, 1999, fig. 1)

An actively exploited quarry 400 m northeast of the Couvin railway station which has previously been called “Carrière Haine” and “Carrière Collard et Guillaume”. Sedimentology of the Hanonet Formation here has been described by BULTYNCK (1970) and PREAT (1989), among others. BULTYNCK & HOLLEVOET (1999, fig. 2) provided an overview of the stratigraphic succession of the upper part of the Jemelle Formation, the Hanonet Formation, and the lower part of the Trois-Fontaines Formation in the Couvin area. These workers also positioned the Eifelian – Givetian boundary within the lower part of the Hanonet Formation based on the first occurrence of the conodont *Polygnathus hemiansatus*.

During an excursion to the quarry of the Société Géologique de Belgique and the Société belge de Géologie, de Paléontologie et d’Hydrologie in 1959, a rich macrofauna was recovered from the “Upper Couvinian, niveau Co2d à *Cyrtoceras nodulosum*” (LECOMPTE, 1960). This horizon is now considered to belong to the Hanonet Formation (see, e.g., PREAT & TOURNEUR in BULTYNCK *et al.*, 1991, p. 45) and is of a late Eifelian or early Givetian age. LECOMPTE (1960, p. 52) recorded trilobites from a level within this horizon “Co2d” that he assigned to *Scutellum alutaceum*, *Scutellum flabelliferum*, *Harpes macrocephalus* and *Phacops latifrons* (a repository for the original material was not named and

thus none of the identifications can be corroborated). Two additional trilobite taxa, *Dechenella* aff. *verneuili* and *Scutellum*, were recorded together with *Stringocephalus burtini* from what was considered by LECOMPTE (1960, pp. 54-55) to be the summit of “Co2d.” Assuming that LECOMPTE’s (1960) specimens of *Stringocephalus burtini* were correctly identified and considering the stratigraphic range of this brachiopod (see STRUVE, 1961; BULTYNCK *et al.*, 2000, fig. 6), these records may be considered to be of early Givetian age and probably come from a basal horizon in the Trois-Fontaines Formation.

Preliminary collections at this locality comprise trilobite specimens from the Hanonet Formation but that were not found *in situ*. Hence, their age is approximately late Eifelian or early Givetian. Trilobites include the genera *Calycoscutellum*, *Cornuproetus*, *Dechenella*, *Gerastos*, *Hypsipariops*, *Nyterops*, and, assuming that LECOMPTE’s (1960) record is congeneric, *Harpes*.

While focus is currently on trilobites from Resteigne, the trilobite faunas of the Hanonet Formation at both localities are very similar at the genus level. *Calycoscutellum*, *Dechenella*, *Gerastos*, *Nyterops*, and probably also *Hypsipariops* are mutually represented. Specimens of at least *Nyterops* and *Calycoscutellum* are closely related at the species level and possibly conspecific. Other taxa, which are known only from one of these sites, are *Harpes* and *Cornuproetus* (Couvin) and *Dohmiella* and Otarioninae gen. & sp. indet. (Resteigne). The separate occurrences of these trilobites may be easily explained by the fact that they are very rare at their respective localities. Furthermore, similar relative rarities of these taxa are known from coeval strata in the adjacent Eifel (see, e.g., BASSE, 2002; BASSE & MÜLLER, 2004).

Systematic palaeontology

All trilobites described below are deposited in the Institut royal des Sciences naturelles de Belgique (Brussels), abbreviated IRSNB, except for one specimen which is in the collections of Forschungsinstitut und Naturmuseum Senckenberg (Frankfurt am Main), abbreviated SMF. All specimens were coated with ammonium chloride sublimate prior to photography. Terminology follows WHITTINGTON & KELLY (1997).

Family Phacopidae HAWLE & CORDA, 1847

Subfamily Phacopinae HAWLE & CORDA, 1847

Remarks

Phacops latifrons (BRONN, 1825) is a notorious species that has a persistent history of claimed records from the Belgian Lower to Middle Devonian (e.g. DEWALQUE, 1880; MAILLIEUX, 1904, 1919, 1933, 1938; VAN TUIJN, 1927; FOURMARIER, 1954; LECOMPTE, 1960) and especially from early Eifelian strata in the area between Treignes and Vireux-Molhain (see STRUVE, 1982 for remarks). Most of these records come without descriptions or illustrations but MAILLIEUX (1933, pl. 5, fig. 89) provided a line drawing of an outstretched specimen. The depiction is a chimaera, comprising features that typify different phacopines. It may be assumed that this reconstruction was based on multiple specimens belonging to different species and it eloquently illustrates how broad the concept of *Phacops latifrons* was at the time. What is more is that the high amount of records of *Phacops* from the Ardennes creates a skewed reflection of its actual occurrence. The genus is a rare component of Eifelian

trilobite faunas here, the phacopid part of which appears to be predominated by *Geesops* STRUVE, 1972 and *Pedinopariops* STRUVE, 1972 during the lower Eifelian (see, e.g., VAN VIERSEN, 2006a) and middle Eifelian, and *Nyterops* STRUVE, 1972 during the upper Eifelian and lower Givetian (see CRÔNIER & VAN VIERSEN, in press, for preliminary data). According to BASSE (1998, 2006) *Phacops latifrons* is in fact known exclusively from late half Eifelian strata in the Eifel and Sauerland (Rhenish Slate Mountains). Only *Phacops* cf. *imitator* STRUVE, 1970 (middle Eifelian, Jemelle; see Fig. 2) and *Phacops sartenaeri* STRUVE, 1985 (upper Eifelian, Petigny; see STRUVE, 1985) are currently known from the Ardennes with certainty. It is not inconceivable that *Phacops latifrons* occurs here as well but evidence for it remains elusive.

Genus *Nyterops* STRUVE, 1972

Type species: Phacops (Phacops) nyter STRUVE, 1970, from the Cürten Formation (Givetian) of the Eifel, Germany.

Nyterops hollandi n. sp.

Pl. 1, Figs 1-6

1995 — *Phacops* sp. — BLONDIEAU, pl. 12, fig. 6.

Derivation of name

After Dieter Holland, who generously prepared the material of this species.

Holotype

Cephalon IRSNB a12430 (Pl. 1, Figs 1-4).

Type locality

Southwestern slope of quarry of Resteigne (Loc002), Belgium.

Type horizon

Basal part of Hanonet Formation, uppermost Eifelian.

Material

Three cephalon (IRSNB a12430-a12432), two pygidia (IRSNB a12433-12434), from type locality and horizon.

Diagnosis

A species of *Nyterops* with the following characteristic features: Wide (tr.) cephalon with weakly sloped genal



Fig. 2 — *Phacops* cf. *imitator* STRUVE, 1970 (IRSNB a12449); Jemelle Formation, Chavées Member, middle Eifelian, from embankment south of the Jemelle railway station (see VAN VIERSEN, 2007 for further details on locality). Dorsal and oblique lateral views on silicone cast of partial external mould of cephalon, x 5.

fields and genal corners protruding far abaxially. Visual surface comprising fifteen dorsoventral files with maximally four lenses per file. Smallest distance between eye and lateral border about equal to maximum height of eye.

Description

Cephalic doublure bearing fine terrace ridges. Vincular furrow medially shallow; distally firmly impressed. Preglabellar furrow continuous; medially distinct; fine and weakly impressed anterolaterally near eye. Cephalic border rounded in section; bearing fine terrace ridges that disappear posterolaterally near sharp genal angle. Glabella anteriorly overhanging; strongly vaulted (tr.); bearing evenly spaced, coarse tubercles except anteriorly where tubercles are transversally expanded, narrow (sag., exsag.), and grouped into ridge-like structures. Highest point of glabella is lateral to γ and about equal to highest point of occipital ring when latter is held in the vertical plane. In dorsal view, eyes remain at a clear distance from lateral cephalic margin (easily obscured by tectonic deformation). Visual surface is comprised of 15 dorsoventral files of lenses, counting in examined specimens (from front to back): 3; 4; 4; 4; 4; 4; 3 or 4; 4; 3 or 4; 4; 4; 3; 2 or 3; 2 or 3; 2 lenses per file. Lenses in anterior and posterior few files usually protrude above sclera; remaining lenses slightly to deeply embedded. Intercalating ring accentuated by one or more large tubercles. Reniform palpebral lobe bearing tubercles that remain at a distance from abaxial margin of this lobe, especially in the middle (exsag.). Palpebral furrow anteriorly broad and shallow; posteriorly deep. Palpebral area of fixigena inflated, bearing up to about six tubercles. Axial furrows diverging at around 60°. Small, deep pits on genal field near lateral border that disappear posterolaterally. In anterior view, a wide genal field is visible lateral to the eye. Abaxial half of posterior border bearing a row of coarse, slightly acuminate tubercles with closely spaced smaller ones in front of them. Posterior border furrow reaching abaxially until posterior (exsag.) to abaxial margin of eye. Occipital furrow medially (tr.) slightly more distinct than distally. Several faint tubercles present medially (tr.) on occipital ring.

Thorax (based on examination of specimens in private collections): similar to that of *Nyterops nyter*.

Pygidium: similar to that of *Nyterops nyter*.

Comparison

Nyterops nyter from the lower Givetian of the Eifel differs from *Nyterops hollandi* n. sp. as follows:

maximum number of lenses per dorsoventral file varies from five to six; maximum height of eye clearly exceeds minimal distance between eye and lateral border; gena is steep and its abaxial development is strongly reduced as if this part of the cephalon is folded strongly ventrally; genal corner protrudes more posteriorly.

BASSE (2006) described a new species *Nyterops yetieifliensis* from the upper Eifelian of the Eifel. The German species differs from *Nyterops hollandi* n. sp. as follows: glabella slightly protrudes medially anteriorly; coarse, independent tubercles present on frontal part of glabella (instead of the "ridge complex" of transversally expanded tubercles that characterises *Nyterops nyter* and *Nyterops hollandi* n. sp.); genal field exceedingly rich in coarse tubercles.

Genus *Hypsipariops* STRUVE, 1982

Type species: Pedinopariops (Hypsipariops) lyncops Struve, 1982, from the Loogh Formation (Givetian) of the Eifel, Germany.

Remarks

STRUVE (1982, p. 488) erected *Hypsipariops* (= *eurycaulus* species group of *Phacops (Pedinopariops)* sensu STRUVE, 1972) as a new subgenus of *Pedinopariops* STRUVE, 1972. According to BASSE (2006, p. 106), the holotype of *Liolophops sublevatus* (STRUVE, 1970) (type species of *Liolophops* STRUVE, 1972) is exceedingly similar to *Hypsipariops*. STRUVE (1972, 1995) regarded the weak curvature (tr.) of L0 as one of the main characteristic features of *Liolophops*. BASSE (2006) however, suggested that this a feature that occurs in a late ontogenetic stage and, given the strong similarities between them, that both genera might be considered synonyms. Despite this, BASSE (2006) maintained *Hypsipariops* because both genera may have distinct phylogenetic origins: There seem to be two groups of a possibly paraphyletic *Pedinopariops* in the Eifelian of the Eifel, each of which with a distinct ontogeny but similar adult morphology (see *ibid.*, p. 106). *Liolophops* was placed in one group, characterised by transformation of granules into fine granules to more or less flat bladders during post-larval ontogeny, while *Hypsipariops* was tentatively placed in the other group, characterised by hardly any changes in prosopon during post-larval ontogeny. Thus, assuming this hypothesis is true, the similarities between adults of both genera might be regarded as homoplasies. While BASSE's (2006) suggestion seems credible, the accommodation of *Hypsipariops* and *Liolophops* in separate, as yet formally unrecognised

Pedinopariops groups does not imply monophyly for either *Hypsipariops* or *Liolophops*. All three taxa, as currently perceived, are ambiguous and should be subjected to a cladistic analysis. Following BASSE (2006) *Hypsipariops* is maintained here, although provisionally.

***Hypsipariops?* sp.**
Pl. 1, Figs 7-9

Material

One partially exfoliated cephalon (IRSNB a12435), from locality Loc002, Resteigne, basal part of Hanonet Formation.

Discussion

The preservation of the single cephalon that is available for study is inadequate to permit a detailed description or comparison. It is easily distinguished from co-occurring *Nyterops hollandi* n. sp. in Resteigne in having much larger eyes (18 dorsoventral files with maximally 7 lenses per file) that are positioned close to lateral border.

Specimens of this taxon from the Resteigne quarry can attain considerable sizes and are the largest trilobites known from the Belgian Devonian (with the exception of some Early Devonian homalonotids). The present author has examined several well-preserved cephalons [similar to *Hypsipariops eurycaulus* (STRUVE, 1970)] in private collections that are as wide (tr.) as 80 mm. These sizes strongly remind of large phacopid *Drotops* species described by STRUVE (1995) from the Moroccan Devonian.

BASSE (2006, pl. 23, fig. 228) illustrated a plaster cast of a cephalon from the Couvinoise quarry (site Loc021) that he assigned to *Hypsipariops* cf. *eurycaulus*. This cast is housed by the Senckenberg Museum; according to the latter author the original specimen is in the collections of the IRSNB.

Family Styginidae VOGDES, 1890

Subfamily Scutelluinae RICHTER & RICHTER, 1955

Genus *Calycoscutellum* ARCHINAL, 1994

Type species: *Brontes flabellifer* GOLDFUSS, 1839, from the Junkerberg Formation (Eifelian) of the Eifel, Germany.

***Calycoscutellum goolaertsii* n. sp.**

Pl. 2, Figs 2, 5-7; Pl. 3, Fig. 3; Fig. 3

Derivation of name

After Stijn Goolaerts, who generously provided the holotype.

Holotype

Pygidium IRSNB a12436 (Pl. 2, Fig. 5).

Type locality

Southwestern slope of quarry of Resteigne (Loc002), Belgium.

Type horizon

Basal part of Hanonet Formation, uppermost Eifelian.

Material

One pygidium (IRSNB a12436), one partially exfoliated pygidium (IRSNB a12437), one fragmentary pygidium (IRSNB a12438), one cranidium (IRSNB a12439), one partial librigena (IRSNB a12440), from type locality and horizon. One tentatively assigned incomplete pygidium (IRSNB a12441) (Pl. 3, Fig. 6), from locality Loc021, Couvin, Hanonet Formation.

Diagnosis

A species of *Calycoscutellum* with the following characteristic features: Pygidial median rib gradually

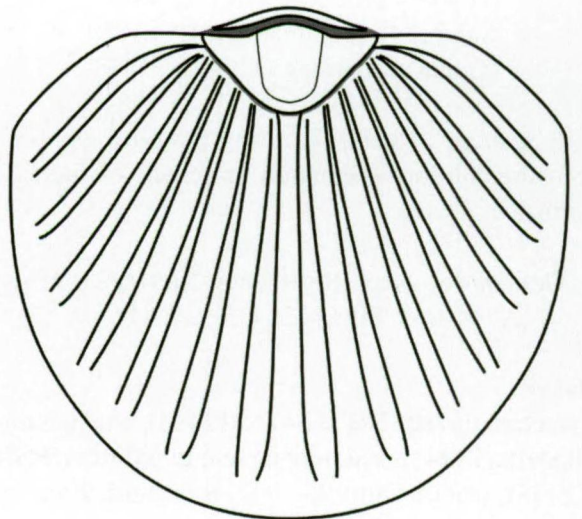


Fig. 3 — Line drawing of pygidium of *Calycoscutellum goolaertsii* n. sp.

narrowing towards anterior; proximally slightly widened and connected to axis. Pygidial pleurae distally slightly wider (tr.) than adjacent interpleural furrows.

Discussion

Calycoscutellum species from the Middle Devonian of the Rhenish Slate Mountains are morphologically similar enough for previous workers (e.g. ARCHINAL, 1994; BASSE & MÜLLER, 2004) to have restricted their descriptions to diagnostic features alone. Especially the pygidial median rib has been attributed significant diagnostic value and the present author follows this view. In addition to this, two closely related species from the Eifel that are similar in age to *Calycoscutellum goolaerti* n. sp. are contrasted below.

The pygidium of the type species of *Calycoscutellum*, *C. flabelliferum*, from the middle Eifelian of the Eifel is very similar yet distinctly differs from that of the new species in having a median rib that is proximally rudimentary and disappears before reaching the axis; more compacted (sag.) pygidial contour; wider interpleural furrows relative to pleurae.

The pygidium of *Calycoscutellum capitellum* ARCHINAL, 1994 from the lower Givetian of the Eifel comes close to the new taxon but is distinct in having a much more rounded outline of axis; proximally strongly widened (tr.) median rib; generally more strongly curved pleural ribs; denser tuberculation (also on cranium).

Family Proetidae SALTER, 1864
Subfamily Proetinae SALTER, 1864
Genus *Gerastos* GOLDFUSS, 1843

Type species: Proetus cuvieri STEININGER, 1831, from the Ahrdorf Formation (Eifelian) of the Eifel, Germany.

Gerastos* cf. *prox (RICHTER & RICHTER, 1956)
Pl. 3, Figs 1, 2, 4, 5, 7-9, 11

Material

Two cranidia (IRSNB a12442-a12443), one pygidium (IRSNB a12444), one incomplete pygidium (IRSNB a12445), from locality Loc002, Resteigne, basal part of Hanonet Formation.

Discussion

The specimens from the upper Eifelian of Resteigne

are exceedingly similar to topotypical material of *Gerastos prox* recorded from the Ahabach Formation (Eifelian – Givetian transition) of the Eifel by RICHTER & RICHTER (1956). BASSE (2002) reviewed *Gerastos prox* and reassigned a collection of early Givetian specimens from the Eifel to his new species *Gerastos eifliensis*. According to this last author *Gerastos eifliensis* is principally different from the slightly younger *Gerastos prox* in having smaller eyes; less distinct abaxial demarcation of subocular ridge; larger librigenal field usually bearing denser granulation; more firmly impressed pygidial border furrow (ibid., p. 22). The pygidia from Resteigne show the weakly impressed pygidial border furrow that was considered to be characteristic of coeval *Gerastos prox* by BASSE (2002), which suggests that they are conspecific. However, since no librigenae were recovered of the Belgian taxon, a more detailed comparison with the German species is impossible and thus the first is provisionally treated under open nomenclature.

Although some of the differences between *Gerastos prox* and *Gerastos eifliensis* may seem subtle, samples taken by the present author from a lower Givetian horizon in the Resteigne quarry that include a librigena exhibit a morphology close to that of *Gerastos eifliensis* and are distinctly different from the late Eifelian *Gerastos* specimens from this same site. This suggests that the differences between *Gerastos prox* and *Gerastos eifliensis* that were described by BASSE (2002) are correct and that both taxa are valid. The early Givetian specimens from Resteigne will be treated in a later paper.

Genus *Dohmiella* LÜTKE, 1990

Type species: Proetus (Euproetus) dohmi RICHTER & RICHTER, 1918, from the Junkerberg Formation (Eifelian) of the Eifel, Germany.

Remarks

Dohmiella has been considered a junior subjective synonym of *Gerastos* by ADRAIN (1997) and JELL & ADRAIN (2003). VAN VIERSEN (2006b) subsequently retained *Dohmiella* and suggested that the presence of distinct median nodes on at least the pygidial axis is a potential synapomorphy. This author also emended the generic diagnosis.

***Dohmiella* sp. 2**

Pl. 3, Fig. 10

v 2006 — *Dohmiella* sp. 2 – VAN VIERSEN, p. 234, pl. 2, fig. 10.*Material*

One librigena (SMF 58587), from locality Loc002, Resteigne, basal part of Hanonet Formation.

Discussion

This species is extremely rare and also represents the stratigraphically latest known occurrence of *Dohmiella* in Belgium. No new material has been recovered of *Dohmiella* sp. 2 and it is also absent among numerous trilobite specimens from Resteigne in private collections that have been investigated by the present author. *Dohmiella* has not been reported from the Couvinoise quarry (site Loc021).

Subfamily Dechenellinae PŘIBYL, 1946

Genus *Dechenella* KAYSER, 1880

Type species: Phillipsia verneuili BARRANDE, 1852, from the Givetian of the Eifel, Germany.

Remarks

According to BASSE (2002) the stratigraphically earliest records of *Dechenella* from Germany are of latest Eifelian age. In Belgium Dechenellinae possibly appear as early as in the middle Eifelian. BLONDIEAU (1995, pl. 12, fig. 3) illustrated a pygidium from the Jemelle Formation at the old railway section between Jemelle and Rochefort (see GODEFROID, 1968, pp. 60-62; GODEFROID in BULTYNCK *et al.*, 1991, p. 31; BLONDIEAU, 1995, p. 39) that may be tentatively assigned to Dechenellinae. Unfortunately, BLONDIEAU's (1995) specimen is a damaged internal mould lacking most of the axis and better preserved material will be required to make a definite identification.

***Dechenella* sp.**

Pl. 3, Fig. 12

Material

One incomplete pygidium (IRSNB a12446), from locality Loc002, Resteigne, basal part of Hanonet Formation.

Discussion

A substantial amount of *Dechenella* species has been described from latest Eifelian to Givetian strata in

the Rhenish Slate Mountains (see, e.g., STRUVE, 1992; BASSE, 2002). At least two *Dechenella* species occur in the upper Eifelian to lower Givetian of the Resteigne quarry. The inadequately preserved pygidium that is illustrated here reveals little about the morphology of this species and it is unfeasible to compare it with the broad variety of species from Germany. New collections of this comparatively rare genus at Resteigne will be required to properly describe it.

Subfamily Cornuproetinae RICHTER, RICHTER & STRUVE in MOORE, 1959

Genus *Cornuproetus* RICHTER & RICHTER, 1919

Type species: Gerastos cornutus GOLDFUSS, 1843, from the Ahrdorf Formation (Eifelian) of the Eifel, Germany.

Cornuproetus cornutus* (GOLDFUSS, 1843)Assigned taxa*

Five subspecies are included in this species, namely *cornutus cornutus* (middle Eifelian, Eifel, Ardennes); *cornutus pruemensis* BASSE, 2002 (upper Eifelian, Eifel); *cornutus* n. ssp. A of BASSE, 1997 (lower Eifelian, Sauerland); ssp. cf. *cornutus pruemensis* of BASSE, 2002 (middle Eifelian, Eifel); n. ssp. 1 herein (upper Eifelian or lower Givetian, Ardennes).

***Cornuproetus cornutus* n. ssp. 1**

Pl. 2, Figs 1, 3, 4

Material

One librigena (IRSNB a12447), one incomplete pygidium (IRSNB a12448), from locality Loc021, Couvin, Hanonet Formation.

Description

Librigena. Lateral border somewhat dorsally flattened; adaxially more vaulted than abaxially; anteriorly broader than posteriorly. In dorsal view, four border-parallel terrace ridges are visible anteriorly on lateral border which backwards disappear one by one, starting with the innermost ridge and abaxially; only the outermost ridge is extended posteriorly on the genal spine. Fine, short, asymmetric terrace ridges are present on lateral border where border-parallel ridges are absent, posterior border, genal spine and genal field. Posterior border as broad (exsag.) as anterior part of lateral border; bearing several granules. Genal field with coarse granules concentrated medially on

posterior half and several additional granules anterior to these. Posterior border furrow medially (tr.) somewhat broader (exsag.) and indenting librigenal field here. Adaxial half of genal spine bearing a single terrace ridge similar to, but slightly finer than those on lateral border.

Pygidial axis is comprised of four axial rings plus terminal axial piece, each of which remains of equal width (sag., exsag.) throughout their length (tr.). Second inter-ring furrow (counting from anteriorly) is broadest (sag., exsag.). Prosopon on axial rings consists of short terrace ridges on anterior half with medially (tr.) several granules; posterior half bears a transversal row of small tubercles. Terminal axial piece anteriorly demarcated by a transversal row of short transversal terrace ridges that laterally almost touch one another so that they verge to forming an uninterrupted ridge. Terminal axial piece covered with closely spaced granules. Three weakly curved pleurae are discernible on the pleural field that are covered with faint terrace ridges; several randomly scattered granules are present on anterior two pleurae. Border medially much broader (exsag., sag.) than distally (tr.); its ornament consists of granules and short terrace ridges. Pygidial margin with one or two border-parallel terrace ridges visible dorsally.

Comparison

Morphologically closest to *Cornuproetus cornutus* n. ssp. 1 is coeval *Cornuproetus cornutus pruemensis* from the Eifel. Among shared features is the proximally broad and distally narrow pygidial border. The German subspecies is clearly different in having the first pygidial inter-ring furrow broadest (sag., exsag.) and a posteriorly more strongly tapered (tr.) pygidial axis. BASSE (2002) did not give a detailed description with his subspecies and his illustrations are of inadequate quality to discern details of prosopon. This impedes further comparison of both subspecies at this time.

Well-preserved topotypical material of the nominal subspecies has been described and illustrated by previous workers (e.g. RICHTER & RICHTER, 1956; LÜTKE, 1990; BASSE, 1997, 2002) which is principally different from the subspecies from Couvin in having predominantly finely granulose librigenal and pygidial prosopon rather than the richer mixture of terrace ridges and granules in the latter.

Cornuproetus cornutus n. ssp. 1 shows some resemblance to *Diademaproetus rhenanus* BASSE, 2002 regarding its dorsal prosopon. Recently, CHATTERTON *et al.* (2006) emended the diagnosis

of *Diademaproetus* on the basis of well-preserved specimens from Germany and Morocco. None of the characters that were listed by the latter authors are exhibited by *Diademaproetus rhenanus* and the species is probably more suitably placed in *Cornuproetus*.

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Explanation of the plates

PLATE 1

- Figs 1-4 — *Nyterops hollandi* n. sp.; holotype cephalon (IRSNB a12430); Resteigne Loc002; Hanonet Fm.; 1: dorsal view, x 5; 2: oblique lateral view, x 7; 3: lateral view, x 7; 4: frontal view, x 5.
- Figs 5-6 — *Nyterops hollandi* n. sp.; Resteigne Loc002; Hanonet Fm.; 5: cephalon (IRSNB a12431), frontal view, x 3.
- Figs 7-9 — *Hypsipariops?* sp.; cephalon (IRSNB a12435); 7: frontal view, x 2; lateral view, x 2; 9: dorsal view x 2.

PLATE 2

- Fig. 1 — *Cornuproetus cornutus* n. ssp. 1; incomplete pygidium (IRSNB a12448); Couvin Loc021; Hanonet Fm.; dorsal view, x 18.
- Fig. 2 — *Calycoscutellum goolaerti* n. sp.; partially exfoliated cranidium (IRSNB a12439); Resteigne Loc002; Hanonet Fm.; ventral view (inversed photograph), x 4.
- Figs 3-4 — *Cornuproetus cornutus* n. ssp. 1; librigena. (IRSNB a12447); Couvin Loc021; Hanonet Fm.; 3: dorsal view, x 16; 2: oblique frontal view, x 11.
- Figs 5-7 — *Calycoscutellum goolaerti* n. sp.; Resteigne Loc002; Hanonet Fm.; 5: Holotype, pygidium (IRSNB a12436); dorsal view, x 4; 6: Mostly exfoliated pygidium with abnormal right lateral to posterolateral outline (IRSNB a12437); dorsal view, x 3; 7: pygidium (IRSNB a12438); dorsal view x 4.

PLATE 3

- Figs 1-2 — *Gerastos* cf. *prox* (RICHTER & RICHTER, 1956); pygidium (IRSNB a21444); Resteigne Loc002; Hanonet Fm.; 1: dorsal view, x 12; 2: lateral view, x 12.
- Fig. 3 — *Calycoscutellum goolaerti* n. sp.; incomplete librigena (IRSNB 12440); Resteigne Loc002; Hanonet Fm.; dorsal view, x 4.
- Figs 4-5 — *Gerastos* cf. *prox* (RICHTER & RICHTER, 1956); incomplete pygidium (IRSNB a12445); Resteigne Loc002; Hanonet Fm.; 4: dorsal view, x 9; 5: oblique lateral view, x 11.
- Fig. 6 — *Calycoscutellum* cf. *goolaerti* n. sp.; partial pygidium (IRSNB a12441); Couvin Loc021; Hanonet Fm.; dorsal view, x 3.
- Figs 7-9 — *Gerastos* cf. *prox* (RICHTER & RICHTER, 1956); cranidium (IRSNB a12442); Resteigne Loc002; Hanonet Fm.; 7: lateral view, x 8; 8: dorsal view, x 8; 9: frontal view, x 8.
- Fig. 10 — *Dohmiella* sp. 2 of VAN VIERSEN, 2006b; librigena with postdepositionally crushed eye (SMF 58587); Resteigne Loc002; Hanonet Fm.: Lateral view, x 7.
- Fig. 11 — *Gerastos* cf. *prox* (RICHTER & RICHTER, 1956); small incomplete cranidium (IRSNB a12443); Resteigne Loc002; Hanonet Fm.; dorsal view, x 14.
- Fig. 12 — *Dechenella* sp.; incomplete pygidium (IRSNB a12446); Resteigne Loc002; Hanonet Fm.; dorsal view, x 7.

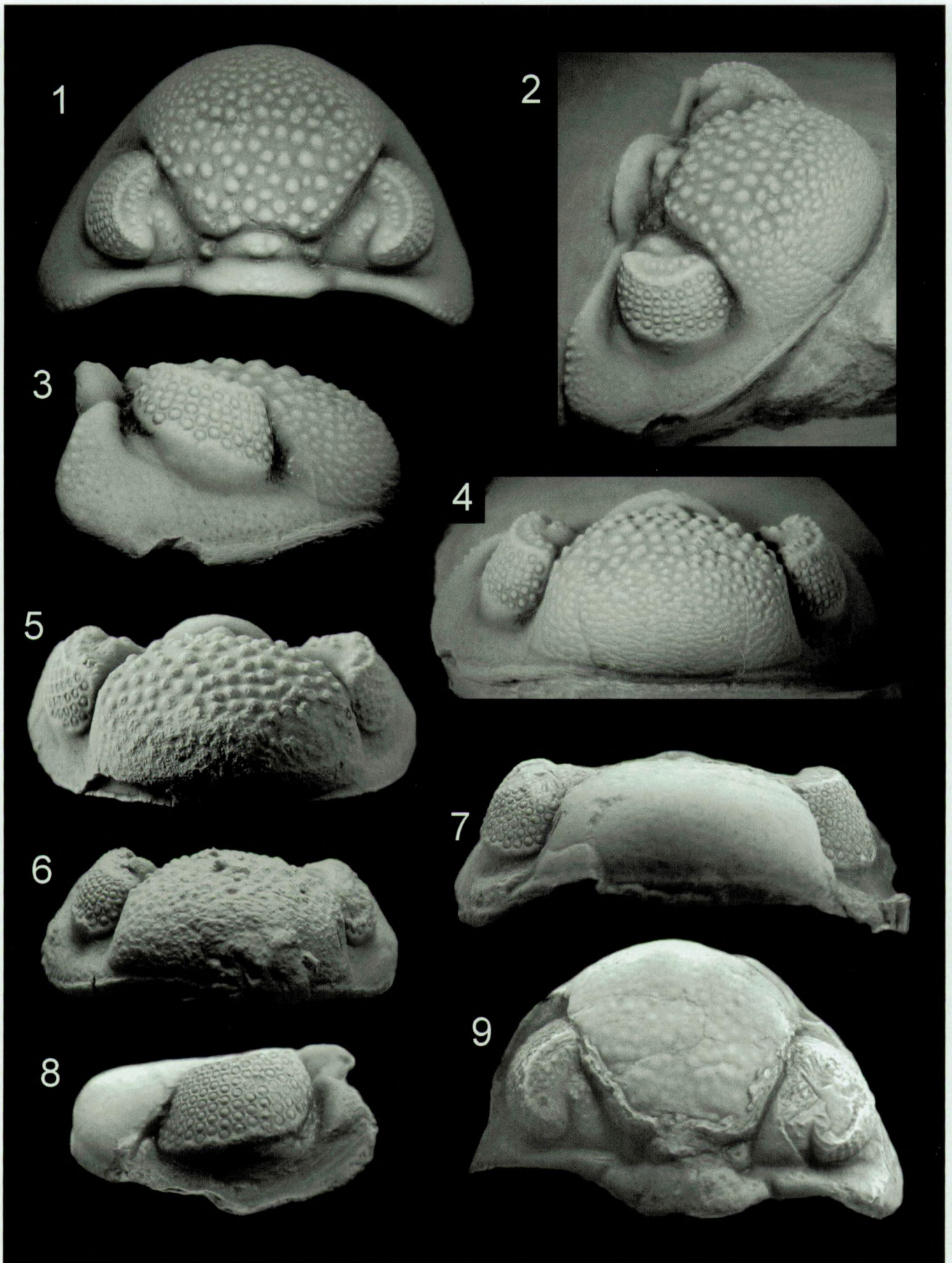


PLATE 1

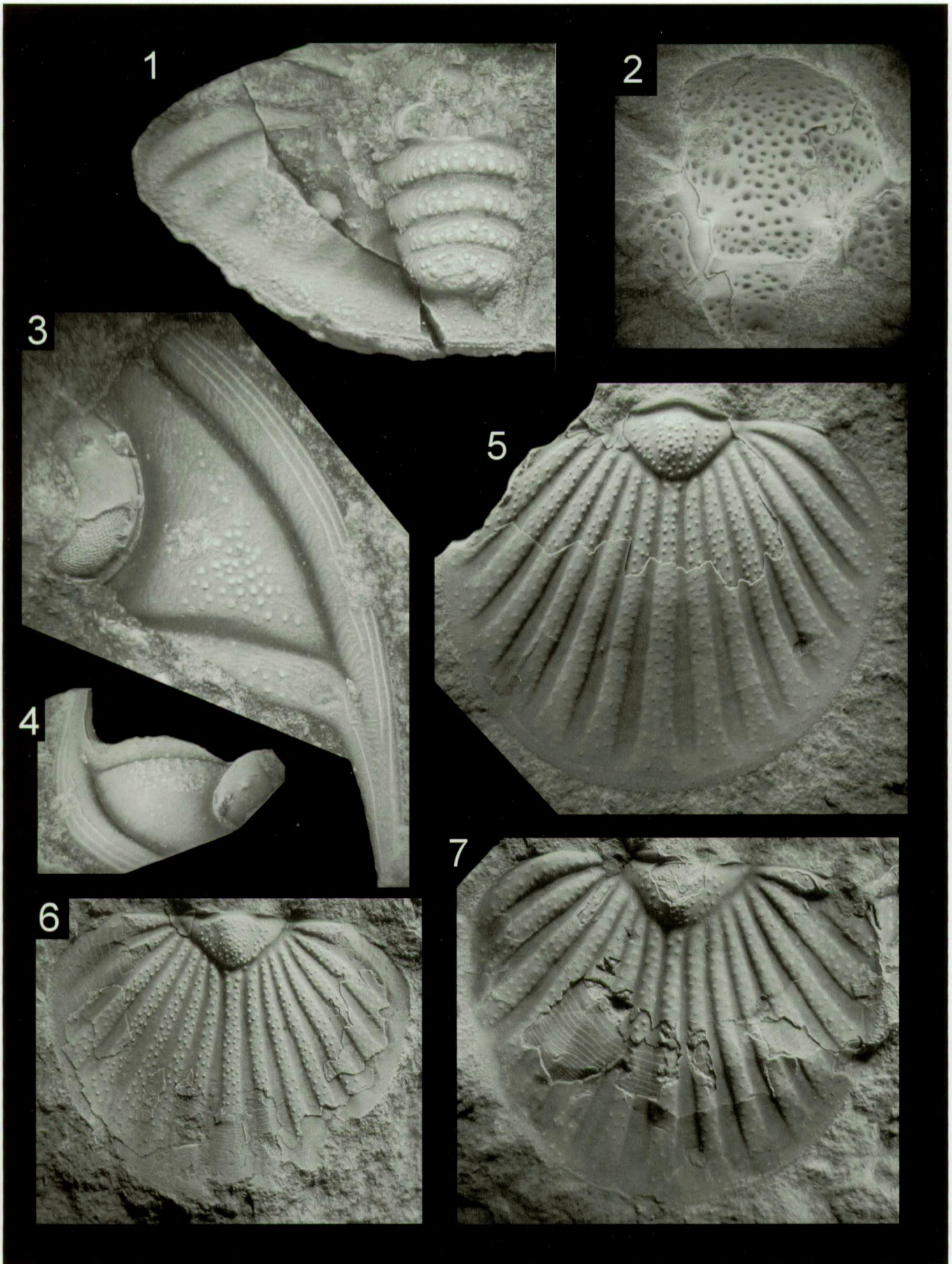


PLATE 2

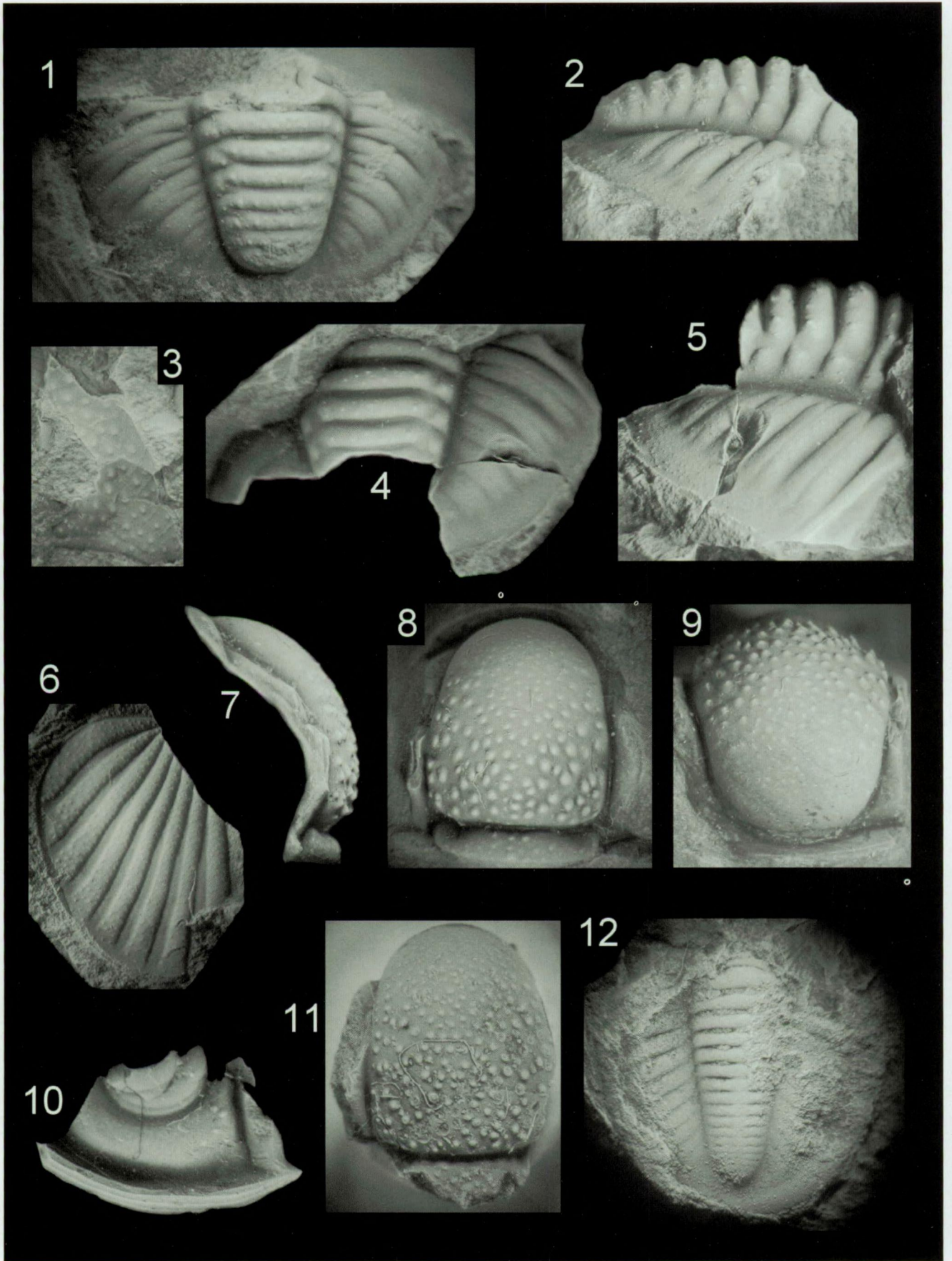


PLATE 3

