

## Two new species of scutelluid trilobites formerly known as *Scutellum costatum* from Frasnian bioherms in Belgium

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VIERSEN, A.P. VAN & PRESCHER, H., 2011 – Two new species of scutelluid trilobites formerly known as *Scutellum costatum* from Frasnian bioherms in Belgium. *Bulletin de l'Institut royal des Sciences naturelles de Belgique, Sciences de la Terre*, **81**: 55-61, 3 figs, Brussels, November 30, 2011 – ISSN 0374-6291.

### Abstract

*Scutellum decipulum* n. sp. and *Scutellum protrusifrons* n. sp. are described from the Frasnian Moulin Liénaux and Grands Breux Formations respectively in the Couvin area. Until recently, scutelluids from this time interval in Belgium were commonly identified as the Polish species *Scutellum costatum* PUSCH but these assignments are now revised. *Scutellum* is poorly defined so that present assignments to this genus remain open for debate.

**Keywords:** Trilobita, Scutelluidae, Upper Devonian, Ardennes.

### Résumé

*Scutellum decipulum* n. sp. et *Scutellum protrusifrons* n. sp. sont décrites dans les formations frasnienne de Moulin Liénaux et des Grands Breux, dans la région de Couvin. Jusqu'à présent, les scutelluidés frasnien de Belgique étaient habituellement rapportés à l'espèce polonaise *Scutellum costatum* PUSCH, mais ces identifications sont maintenant révisées. *Scutellum* reste mal défini et l'attribution des nouvelles espèces à ce genre peut toujours être discutée.

**Mots-clefs:** Trilobita, Scutelluidae, Dévonien supérieur, Ardennes.

### Introduction

For more than eighty years RICHTER & RICHTER's (1926) monograph on Late Devonian trilobites has contained some of the most accurate descriptions of Devonian trilobites from Belgium. Recent investigations on Frasnian members of Aulacopleuridae (VAN VIERSEN & PRESCHER, 2007) and Acastidae (VAN VIERSEN & BIGNON, 2011), however, have demonstrated that the identification of these taxa has become seriously

outdated. The same applies to members of a third family, Scutelluidae, which are occasionally found in the Frasnian bioherms of Belgium (for a geological setting reference is made to VAN VIERSEN & BIGNON, 2011, and papers cited therein). Unfortunately most of the discovered trilobite specimens are loose sclerites which reside in private collections and often lack precise information about their stratigraphic and geographic origins (see, e.g. BASSE *et al.*, 2007). Obviously, this renders them of limited use to scientific publications.

Two new species of *Scutellum* are recorded from Frasnian bioherms in the Couvin area (southern border of the Dinant Synclinorium), both of which were commonly identified as *Scutellum costatum* PUSCH, 1833 in the literature (e.g. MAILLIEUX, 1927; HAHN & HAHN, 1975) following RICHTER & RICHTER (1926), or as *Goldius flabelliferum* (GOLDFUSS, 1839) in even older works (e.g. DEWALQUE, 1880; ASSELBERGHS, 1912; MAILLIEUX, 1913). The purpose of this brief note is to (1) increase our knowledge of scutelluid diversity on the outer shelf of Laurussia during the Frasnian and (2) document taxa that may help in the future to resolve the ambiguous relationships of *Scutellum* and similar taxa from the Middle to Upper Devonian.

### Locations and stratigraphy

*Loc037, Cimetièrre Quarry, Boussu-en-Fagne, Belgium.*

The studied specimens of *Scutellum protrusifrons* n. sp. were collected by the authors in the Cimetièrre Quarry, situated just east of Boussu-en-Fagne (see, e.g. LECOMPTE, 1960; COEN-AUBERT, 1992, 1994; MOTTEQUIN, 2005). They come from a pocket in the Lion Member of the Grands Breux Formation (Fig. 1), which is middle Frasnian in age (transition *hassijamieae* conodont zones).

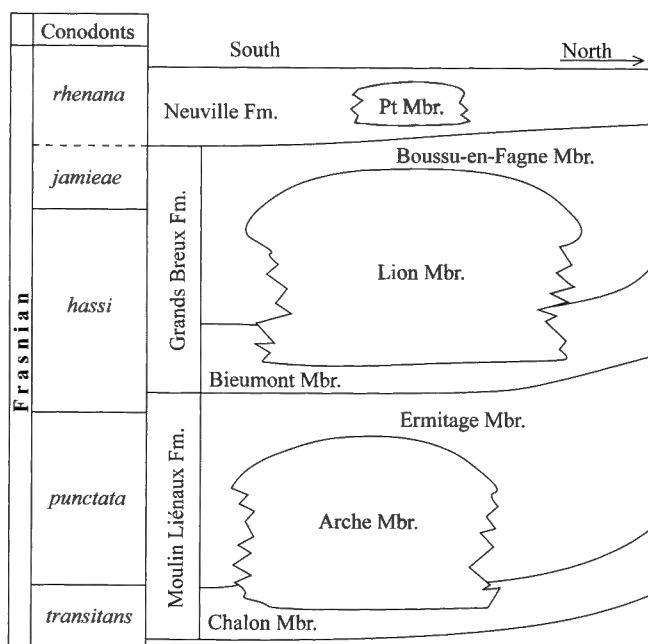


Fig. 1 – Frasnian formations in Belgium, adopted from VAN VIERSEN & BIGNON (2011). Abbreviation: Pt Mbr. (Petit-Mont Member).

#### *Loc051, Arche Quarry, Frasnes, Belgium.*

Quarry just south of Frasnes described by BULTYNCK & MOURAVIEFF (1999) and papers cited therein. The studied material of *Scutellum decipulum* n. sp. was collected by the couple Vanherle (Koersel) from the Arche Member of the Moulin Liénaux Formation (Fig. 1), with the exception of two specimens (IRSNB a7782A, a7782B), which are from the old Maillieux collections of the Institut royal des Sciences naturelles de Belgique. The age of the specimens is approximately early middle Frasnian (*punctata* conodont Zone).

#### Systematic palaeontology

All of the specimens are deposited in the collections of the Institut royal des Sciences naturelles de Belgique (IRSNB) and were coated with ammonium chloride sublimate prior to photography. Morphological terminology follows WHITTINGTON (1999).

Family Scutelluidae RICHTER & RICHTER, 1955  
Subfamily Scutelluinae RICHTER & RICHTER, 1955

Genus *Scutellum* PUSCH, 1833

*Type species: Scutellum costatum* PUSCH, 1833 from the Iberger Kalk (Frasnian) near Kadzielnia in the Holy Cross Mountains.

#### Discussion

Many authors (WRIGHT & CHATTERTON, 1988; HOLLOWAY, 1996; BASSE *in* BASSE & MÜLLER, 2004; MCNAMARA & FEIST, 2006; BASSE *et al.*, 2007; BASSE, 2010) commented on the problems with *Scutellum costatum* which is inadequately known, so that it is not only difficult to assess the identity of this species but also the genus to which it belongs. RICHTER & RICHTER (1926) selected a pygidial fragment as the neotype (see ARCHINAL, 1994, pl. 1, fig. 4; BASSE *in* BASSE & MÜLLER, 2004, pl. 12, fig. 138). RICHTER & RICHTER also included additional scutelluid specimens from various countries in *S. costatum* despite the poor preservation of the neotype and the fact that the cephalon of this species was (and still is) unknown. During the decades that followed this classification was widely and rather loosely adopted by other workers in assigning Givetian to Frasnian scutelluids from various countries to *S. costatum*. CHLUPÁČ (1993) recorded specimens from Frasnian strata in the Holy Cross Mountains that he identified as *S. costatum* while pointing out that the type horizon of this species is not known precisely [“early Frasnian bioherm versus later Frasnian detrital limestones” (*ibid.*, p. 404)]. Based on the incompletely preserved cephalic remains that he recorded, CHLUPÁČ corroborated the representation of the cephalon of *S. costatum* by RICHTER & RICHTER (1926, p. 118, pl. 7, figs 18a-c). We believe that this representation is inaccurate because the RICHTERS had (1) based it upon a cephalon (IRSNB a7782A) and a cranidium (IRSNB a7782B) from Belgium (these specimens are herein transferred to *Scutellum decipulum* n. sp.) and (2) idealised it, albeit slightly, possibly with an aim to better encompass all of the taxa included by these authors in *S. costatum* (cf., e.g. the distance between the eye and the posterior border in RICHTER & RICHTER’s and our figures). Furthermore, we agree with BASSE *in* BASSE & MÜLLER (2004) who doubted whether CHLUPÁČ’s (1993) specimens were correctly identified. Our assignments of species to *Scutellum* are based on similarities to the neotype of *S. costatum* and CHLUPÁČ’s (1993) material from Poland, assuming that the latter at least belongs to this genus. Whether distinction should continue to be made between the morphologically similar *Scutellum* and *Goldius* DE KONINCK, 1841 (see VAN VIERSEN & DE WILDE, 2010, and papers cited therein) remains open to debate.

*Scutellum protrusifrons* n. sp.

Fig. 2

e.p. 1927 — *Scutellum costatum* PUSCH – MAILLIEUX, p. 79 [only “Boussu-en-Fagne, carrière du cimetière”].

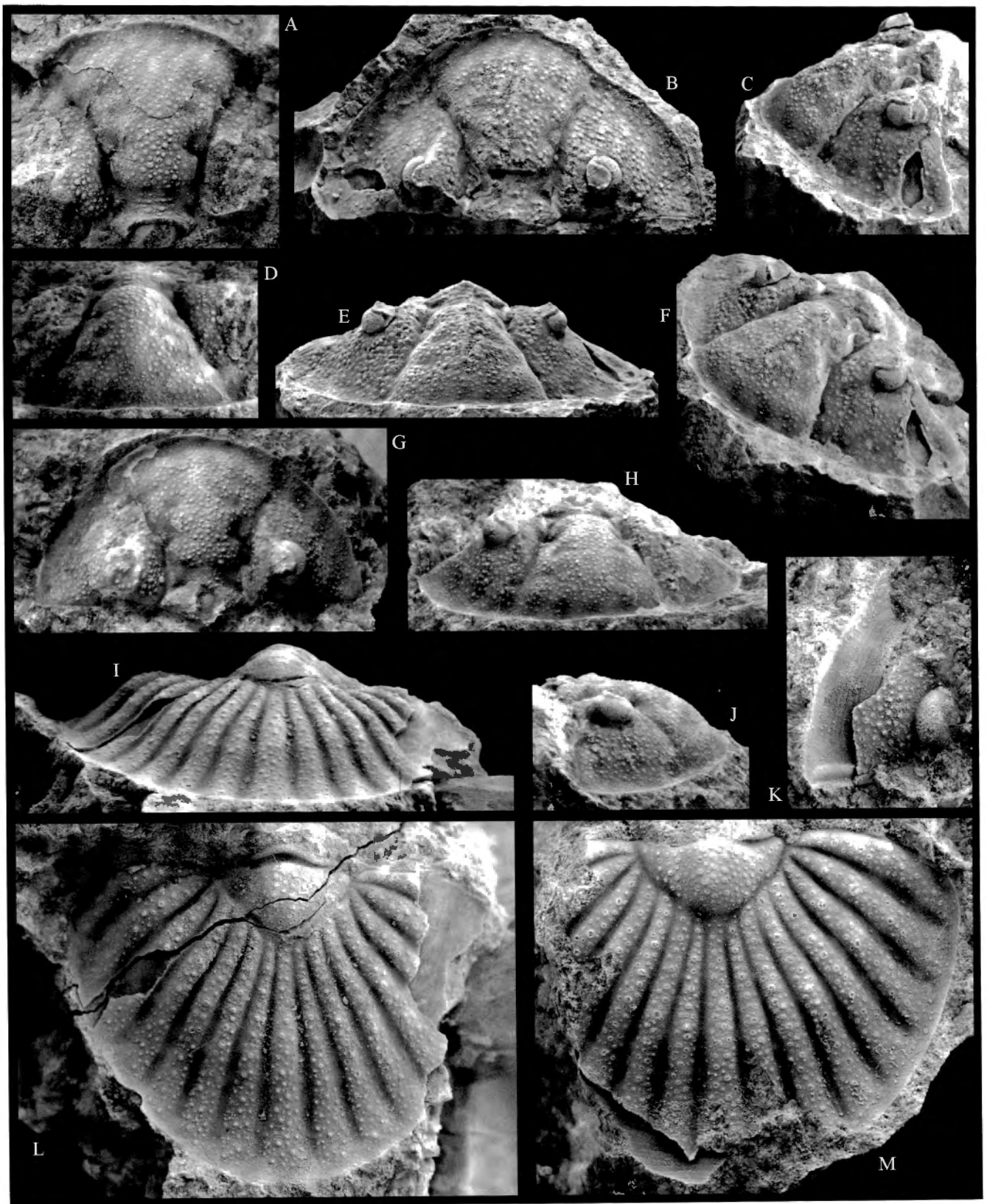


Fig. 2 – *Scutellum protrusifrons* n. sp., Lion Member of the Grands Breux Formation, Boussu-en-Fagne: Cranidium IRSNB a12794, in (A) dorsal and (D) anterior views, x 3.0. Exceptionally large cephalon IRSNB a12795, in (B) dorsal, (C) lateral, (E) anterior and (F) oblique anterolateral views, x 1.5. Holotype cephalon IRSNB a12796, in (G) dorsal, (H) anterior and (J) lateral views, x 3.0. Pygidium IRSNB a12797, in (I) posterior and (L) dorsal views, x 3.0. Librigena IRSNB a12798, in (K) dorsal view, x 2.0. Pygidium IRSNB a12799, in (M) dorsal view, x 5.5.

2007 — *Scutellum?* sp. H – BASSE *et al.*, p. 312, figs 1-3.

#### *Derivation of name*

From *protusus* and *frons* (Lat.) in reference to the protruding forehead (glabella and anterior cephalic border) of this species.

#### *Holotype*

Cephalon IRSNB a12796 (Figs 2G, 2H, 2J).

#### *Type locality*

Loc037, Boussu-en-Fagne, Belgium.

#### *Type horizon*

Lion Member of the Grands Breux Formation.

#### *Paratypes*

One cephalon (IRSNB a12795), one cranidium (IRSNB a12794), one librigena (IRSNB a12798), two pygidia (IRSNB a12797, a12799); all from type locality and horizon.

#### *Diagnosis*

A species of *Scutellum* with a combination of the following features: anterior border of cranidium protruding slightly (in smaller specimens) to distinctly (in large specimens) from cephalic outline along with anterior margin of glabella. Frontal glabellar lobe laterally expanded; having indistinct, rounded anterolateral corners. S3 weakly impressed, especially abaxially. Small eyes. Abaxial half of lateral portion of pygidium distinctly protrudes laterally from parabolic outline of axis. Of all ribs, pair adjacent to median rib has narrowest proximal half. Interpleural furrows widening quickly between anterior pleural ribs but widening from nearby margin of elevated central area of pygidium between remaining ribs.

#### *Description*

Cephalon twice as wide (tr.) as long (sag.); moderately strongly vaulted (tr.); highest point is medially (tr.), adjacent to L1. Border moderately broad (sag., exsag.) and dorsally flattened in front of glabella; lateral border from anterolateral corner of glabella to lateral to  $\gamma$  broad (tr.) with upturned margin; weakly sloping towards genal angle. Occipital ring medially as long (sag., exsag.) as minimal distance between S1 and S3; only towards lateral extremes becoming markedly narrower (exsag.); well-developed except for median anterior portion; posteromedial part not well-preserved in the studied material but a median node seems to be developed (Fig. 2B). Posterior part of glabella

wholly strongly vaulted (tr.). Axial furrows convergent from posterior margin on S0; slightly divergent until posterior branch of S1; from there making an angle of 50° yet smoothly curving around adaxial extremities of frontal glabellar lobe; very deep near L1; very shallow near frontal glabellar lobe. Isolated, rudimentary lateral occipital lobes. S0 shallow; medially as broad (sag.) as abaxial part of L1 (exsag.); widened (exsag.) near axial furrow. L1 smoothly sloped abaxially; depicts a 90° overturned trapezoid. Horseshoe-shaped S1 embracing small, weakly inflated median node. Longitudinal glabellar furrow indiscernible. L2 and L3 adaxially separated by moderately weakly impressed, pit-like to slightly drawn out (tr.) S2. S3 weakly impressed adaxially; becoming faint abaxially but reaching axial furrow; slightly more elongate (tr.) than S2; obliquely oriented, parallel to nearby anterior border. Fixigenal impression feeble. Fixigena excluding palpebral lobe dropping in height drastically from adjacent to S1; uniformly broad (tr.) between  $\epsilon$  and S3; slowly tapering upon approaching anterior margin of cephalon. Small, subsemicircular palpebral lobe bearing a short, dorsally directed, thorny tubercle on posterior margin (e.g. Fig. 2E). Preocular suture running straight towards  $\gamma$  without distinct curves. Postocular suture flexes adaxially and faintly anteriorly from  $\epsilon$ , then curves posteriorly towards  $\omega$ . Fulcral socket discernible dorsally as a narrow (exsag.) flange. Eye is small; contiguous area of librigenal field strongly vaulted (exsag., tr.) and considerably downward sloping towards border. Lateral and posterior borders make a close to 90° angle near genal angle. Genal spine not developed.

Pygidium wider than long (length/width  $\approx$  0.75); of parabolic outline; moderately angular anterolateral corner positioned lateral to posterior half of axis. Central area of pygidium subhorizontal with moderately steeply sloping margins towards smoothly upturned lateral to posterior pygidial borders. Wide axis (width axis/width pygidium  $\approx$  0.30) showing faint longitudinal lobation. Medial portion of axis strongly vaulted (tr.); raised high above the pleural fields; slightly wider (tr.) than lateral portions. Median rib proximally wider and less strongly vaulted (tr.) than adjacent pleural rib pair; gradually widening and flattening posteriorly. Rib pair adjacent to median rib straightened. Next three rib pairs increasingly posterolaterally curved proximally. Anterior three rib pairs proximally narrow but widening quickly; anteriormost of these is smoothly posterolaterally curved. Interpleural furrows proximally narrow.

Almost the entire dorsal surface of cephalon and pygidium covered with densely spaced, verrucous

tubercles which are smaller and more widely spaced on cephalic borders, on palpebral lobes, on median anterior portion, and abaxially on lateral portions of pygidial axis, but they are absent on pygidial border.

#### Comparisons

The neotype pygidium of *Scutellum costatum* is principally different from both Belgian species in having fewer, larger tubercles; a sharply triangular axis; and a narrower median rib. For a comparison of *S. protrusifrons* n. sp. with *Scutellum decipulum* n. sp. see below.

#### *Scutellum decipulum* n. sp.

Fig. 3

- v 1926 — *Scutellum costatum* PUSCH – RICHTER & RICHTER, pl. 7, figs 18a-c [drawing of holotype].
- e.p. 1927 — *Scutellum costatum* PUSCH – MAILLIEUX, p. 79 [only “Pl. Couvin, 6149”].
- v 1975 — *Scutellum costatum costatum* PUSCH – HAHN & HAHN, pl. 1, fig. 1a [drawing of holotype].
- v 2004 — *Scutellum?* sp. – BASSE in BASSE & MÜLLER, pl. 12, fig. 139 [plaster cast of holotype].
- 2007 — *Calycoscutellum* – VAN VIERSEN & PRESCHER, p. 158 [reference to “an unidentified species”].

#### Derivation of name

From *decipulum* = trap (Lat.), for having been the basis of the long-established yet misleading cephalic reconstruction of *Scutellum costatum* by the RICHTERS.

#### Holotype

Cephalon IRSNB a7782A (Fig. 3A).

#### Type locality

Loc051, Frasnes, Belgium.

#### Type horizon

Arche Member of the Moulin Liénaux Formation.

#### Paratypes

One cranidium (IRSNB a7782B), two pygidia (IRSNB a12800, a12801); all from type locality and horizon.

#### Diagnosis

Large *Scutellum* species with the following combination of features: pygidia easily attaining 30 mm in sagittal length. Cephalon wholly moderately weakly vaulted (tr.) and of widely and smoothly rounded outline. Axial furrows making an angle of 60° from L1. Border

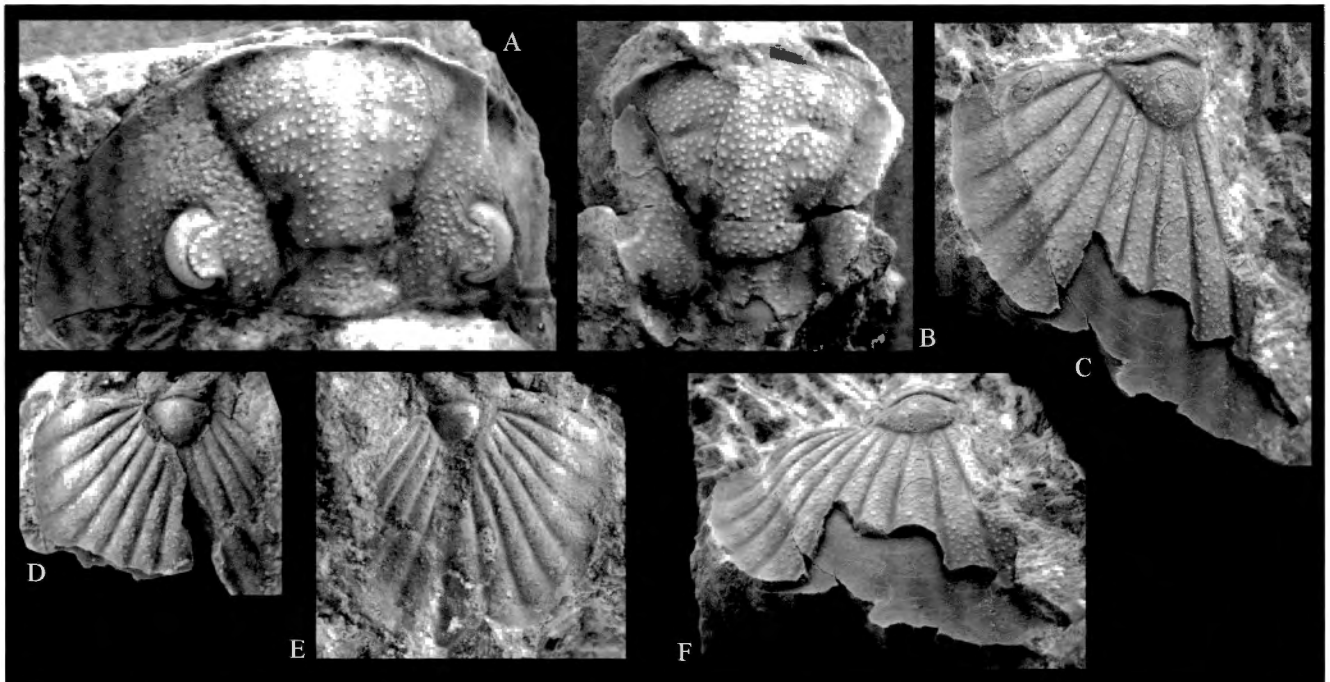


Fig. 3 — *Scutellum decipulum* n. sp., Arche Member of the Moulin Liénaux Formation, Frasnes: Holotype cephalon IRSNB 7782A, in (A) dorsal view, x 2.5. Cranidium IRSNB 7782B, in (B) dorsal view, x 2.0. Pygidium IRSNB a12800, in (C) dorsal and (F) posterior views, x 1.5. Pygidium IRSNB a12801, in (D) dorsal view on positive print and (E) dorsal view on negative print, x 1.0.

moderately narrow (sag., exsag.) and clearly upturned in front of glabella. Librigenal field slopes smoothly abaxially. Sharp, posteriorly directed genal angle. Median rib proximally as wide as, and less vaulted (tr.) than, adjacent pleural rib pair.

#### Comparison

*Scutellum decipulum* n. sp. is similar enough to *Scutellum protrusifrons* n. sp. to contrast instead of fully describe it. The former is differentiated from the latter as follows: glabella with widely rounded anterior margin and clearly demarcated, angular anterolateral corners. Elongated S3 that is moderately firmly impressed throughout and connected to axial furrow. Occipital ring of uniform broadness (sag., exsag.). Posterior part of glabella is wholly moderately strongly vaulted (tr.). Axial furrows straight between L1 and anterior border. S0 medially as broad (sag.) as abaxial part of L2+L3 (exsag.). Moderately large palpebral lobe lacking a thorn on posterior margin. Eye fairly large; contiguous area of librigenal field weakly vaulted (exsag., tr.). Distance (exsag.) from eye to posterior border small. Distance (tr.) from eye to lateral border equals that from eye to anterolateral border (exsag.). Genal angle is somewhat protracted posteriorly and ends into a sharp tip. Pygidium slightly wider than long (length/width  $\approx 0.90$ ); of high parabolic outline. Medial portion of axis moderately strongly vaulted (tr.); not very clearly protruding dorsally from, and being about as wide (tr.) as, lateral portions. Abaxial half of lateral portion slightly protrudes laterally from parabolic outline of axis. Anteriormost rib and especially neighbouring interpleural furrow is subtly curved. Interpleural furrows proximally narrow; slowly widening from nearby margin of elevated central area of pygidium. Dorsal surface of cephalon and pygidium bears small, somewhat pointed tubercles. Librigena bears few, tiny tubercles, especially abaxially.

#### Acknowledgements

The authors are grateful to A.J. Wright (University of Wollongong) and A. Bignon (USTL) for reading the manuscript and making helpful suggestions, and to W. and M. Vanherle (Koersel) for kindly donating some of the trilobite specimens described.

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Typescript submitted: January 12, 2011  
Revised typescript received: March 18, 2011

