Ann. Soc. Géol. du Nord.
T.19 (2ème série), p. 137-143, Octobre 2012.

THE ACTUALLY BEST-PRESERVED SPECIMEN OF LOWER DEVONIAN DALMANITID TRILOBITE OF THE PRAGUE BASIN (CZECH REPUBLIC) WITH ARTICULATED HYPOSTOME

Le spécimen le mieux préservé actuellement, avec son hypostome articulé, de trilobite Dalmanitide du Dévonien inférieur du Bassin de Prague (République Tchèque)

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(Planche IX)

Abstract. — A rare, complete specimen of *Zlichovaspis* (*Zlichovaspis*) *rugosa rugosa* (Hawle & Corda, 1847) with *in situ* articulated hypostome is described from the locality Tetín Hill near Beroun (Bohemia). This unique sample is stored in the Musée d'Histoire Naturelle de Lille (France). Dalmanitid trilobites with articulated hypostome represent very rare findings worldwide, although these trilobites show the conterminant type of the hypostome. Although these trilobites are a common component of Devonian communities inhabiting Prague Basin, only eight specimens with hypostome attached to the doublure and/or hypostome preserved very close to the doublure have been described; they all belong to the common species *Zlichovaspis* (*Zlichovaspis*) *rugosa rugosa* and *Odontochile cristata* Hawle & Corda, 1847, respectively. The newly described specimen represents most probably a carcass. It is the best preserved specimen of this species with hypostome *in situ* and provides the opportunity to reconstruct the 3D orientation of the hypostome and its relation to the cephalon for the first time. The possible causes of the apparent paucity of specimens with hypostome *in situ* in Devonian dalmanitid trilobites are discussed.

Résumé. — *Un rare spécimen complet de* Zlichovaspis (Zlichovaspis) rugosa rugosa *(Hawle & Corda, 1847) avec son hypostome articulé provenant de la localité de Tetín Hill près de Beroun (Bohême) est décrit. Cet exemplaire unique est conservé au Musée d'Histoire Naturelle de Lille (France). Les trilobites dalmanitides avec un hypostome articulé représentent de rares découvertes à l'échelle mondiale, malgré la présence d'un hypostome de type conterminant. Bien que constituant une composante commune des communautés dévoniennes du Bassin de Prague, seuls huit spécimens avec un hypostome attaché à la doublure et/ou un hypostome préservé à proximité de la doublure ont été décrits ; ils appartiennent tous à l'espèce commune* Zlichovaspis (Zlichovaspis) rugosa rugosa. *Le nouveau spécimen représente très probablement une carcasse. C'est le spécimen le mieux préservé de cette espèce avec son hypostome* in situ. *Il fournit ainsi pour la première fois l'opportunité de reconstruire l'orientation 3-D de l'hypostome et sa relation avec le céphalon. Les causes possibles de cette rareté apparente de trilobites dalmanitides dévoniens ayant conservé un hypostome* in situ *sont également discutées.*

Keywords : Trilobita • Phacopida • Lower Devonian • Prague Basin • Barrandian area

Mots clés *: Trilobita • Phacopida • Dévonien inférieur • Bassin de Prague • Aire Barrandienne*

I. — INTRODUCTION

Devonian dalmanitid trilobites with articulated hypostome represent exceptional findings worldwide. This is surprising, because these trilobites possess the conterminant type (Fortey & Owens 1999a) of hypostome, attached by the hypostomal suture to the doublure. In many trilobites showing this attachment type, the hypostome is even ankylosed with the doublure (see Fortey & Owens 1999a, b). Obviously, the large dimensions of these trilobites - some specimens exceeding 40 cm in length (see Šnajdr 1987; Budil *et al.* 2009a) - very probably caused certain taphonomic constraint and resulted in the predisposition to a relatively rapid decomposition of their exoskeletons. This explanation is indirectly supported by the rarity of articulated exoskeletons, as well as by the extremely rare finds of enrolled specimens (see Budil *et al.* 2008). Even

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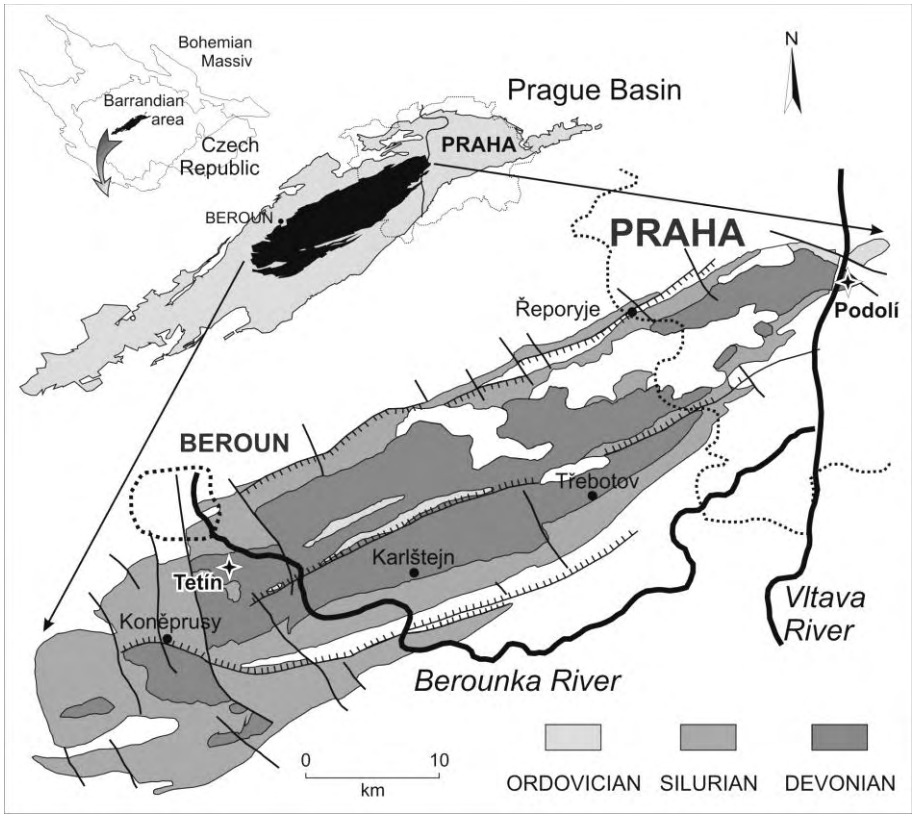

Fig. 1. — Distribution of Ordovician, Silurian and Devonian rocks in the Prague Basin (including the position of selected important localities discussed in the text). Modified after Chlupáč (1993) and Budil *et al.* (2009a).

Fig. 1. — Répartition de l'Ordovicien, du Silurien et du Dévonien dans le Bassin de Prague, y compris la localisation de sites sélectionnés importants qui sont discutés dans le texte. Modifié d'après Chlupáč (1993) et Budil et al. *(2009a).*

though the dalmanitids are a common component of Devonian trilobite communities in the Prague Basin (see Fig. 1), only eight specimens with hypostome attached to the doublure and/or lying very close to the ventral surface of the cephalon in more or less "living position" have been described. Three of them - two cephala with parts of articulated thoraxes and one entire but very poorly preserved specimen supplemented by the cement often used in late 19th century in Bohemia called the "Fritsch matter" - are stored in collections of the National Museum, Prague; next one poorly preserved cephalon with attached hypostome is stored at the Museum of Comparative Zoology, Harvard University, U.S.A. All these specimens belong to the generally common species *Zlichovaspis* (*Zlichovaspis*) *rugosa rugosa* (Hawle & Corda, 1847) of Lower Devonian Pragian age (Budil *et al.* 2008, 2009a).

In four other specimens of this species, disarticulated hypostomes occur close to the isolated cephalon. Such cephalon with hypostome preserved nearby, but clearly disarticulated is known also in *Odontochile cristata* Hawle & Corda, 1847 of Pragian age (see Budil 2005; see also Fig. 3 herein). Barrande (1852, Pl. 1, figs. 1-6; Pl. 2A, figs. 13-14; see also Fig. 2 herein) figured, however, exact and correct reconstruction of the cephalic ventral side with attached hypostome of *Dalmania hausmanni* Brongniart, 1822 (= *Odontochile hausmanni*). However, it is not proven if Barrande (1852) had at disposal another, nowadays unknown specimen of *Odontochile hausmanni* (perhaps from some private collection, such as the count of Sacher-Masoch, see "Observation" mentioned in explanation remarks to the plates of Barrande, 1852) and/or if his reconstruction is based solely on his interpretation. Only one specimen at disposal, NML 17012 (AD Barrande, 1852; Pl. 2A, fig. 13) is an incomplete dorsal exoskeleton with ventral side covered by the rock (see also Horný & Bastl 1970; Budil *et al.* 2009a; Figs. 4F and 4e herein). Following the Barrande's handwriting preserved on the rock sample (Tetin) and because of the remains of red ink below the locality name (used by Barrande to mark the figured specimens), it is not excluded that Barrande (1852) used the specimen NM L30261, *Zlichovaspis* (*Z.*) cf. *rugosa* for the reconstructions published on the Pl. 1, fig. 4 and Pl. 2A, fig. 14 (determined by Barrande as *Odontochile hausmanni*), respectively. The preservation of the specimen NM L30261 is so poor (Pl. IX, G-J herein) that this mismatch is quite understandable.

The newly discussed complete specimen has a great importance, being the only one entire, well-preserved specimen of the Lower Devonian representative with hypostome preserved *in situ* known from the Prague Basin. The unique sample is currently stored in the Musée d'Histoire Naturelle de Lille, France (MGL). This specimen MGL92636-1 (Pl. IX, L-P) belongs to *Zlichovaspis* (*Zlichovaspis*) *rugosa rugosa* (Hawle & Corda, 1847) - for the reconstruction of this species, see Fig 3. *Zlichovaspis* (*Z.*)

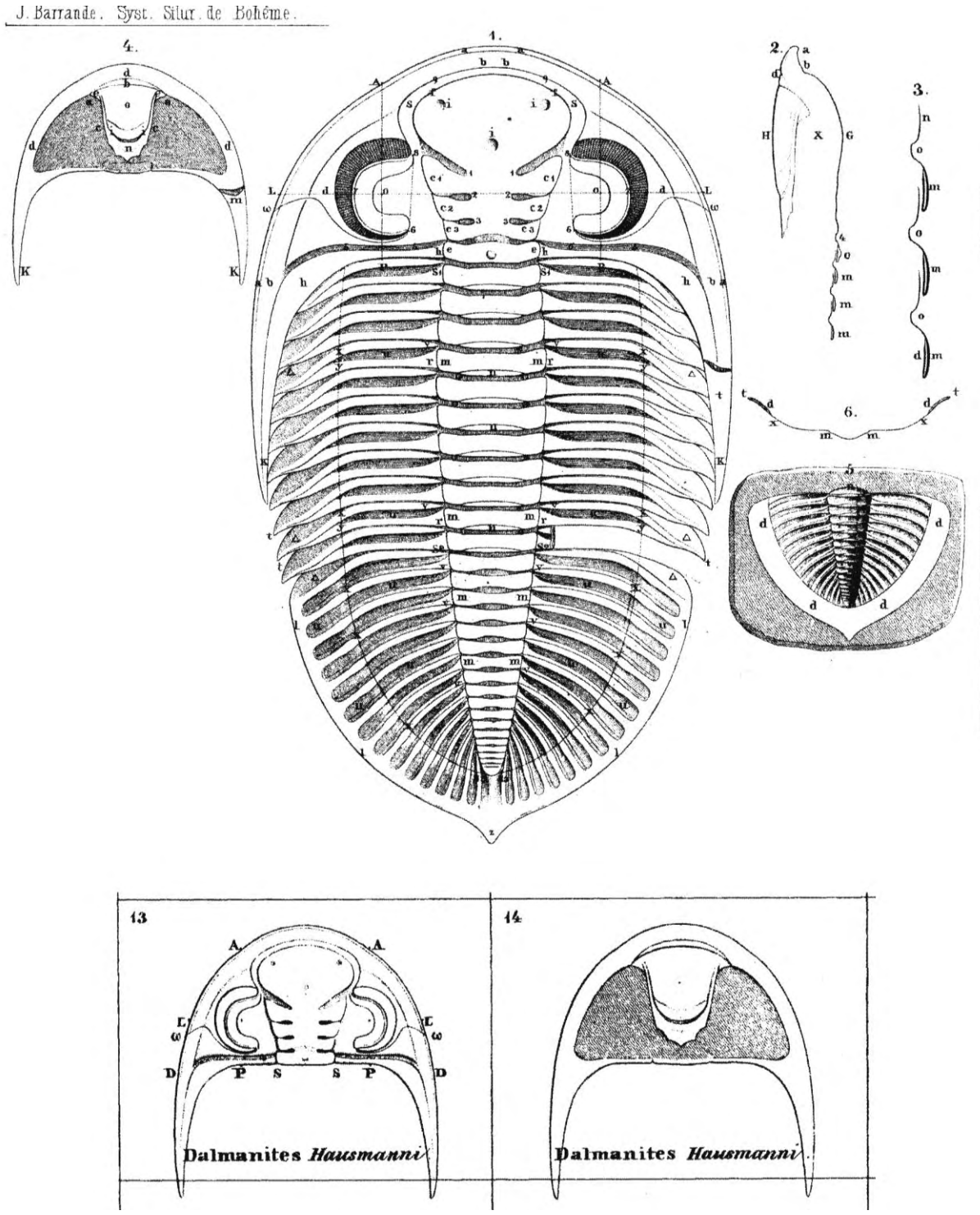

Fig. 2. — Reconstruction of the hypostome attachment in *Odontochile hausmanni* (Brongniart, 1822); compiled from Barrande (1852, Pl. 1, figs. 1-4; Pl. 2A, figs. 13-14).

Fig. 2. — Reconstitution de l'insertion de l'hypostome d'Odontochile hausmanni *(Brongniart, 1822); compilé d'après Barrande (1852, Pl. 1, figs. 1-4; Pl. 2A, figs. 13-14).*

rugosa rugosa is the most common dalmanitid species in the upper half of the thickness of the Praha Formation, especially in the micritic facies, e.g. in the Dvorce-Prokop Limestone (= lowermost Emsian, see Hladil *et al*. 2011). The specimen from Lille (Pl. IX, L-O) comes from the locality Tetín Hill near Beroun (Bohemia; Fig. 1) - wrongly transliterated as "Fetín" at the included label (Pl. IX, P). The sample was collected apparently in the second half of the 19th century, in

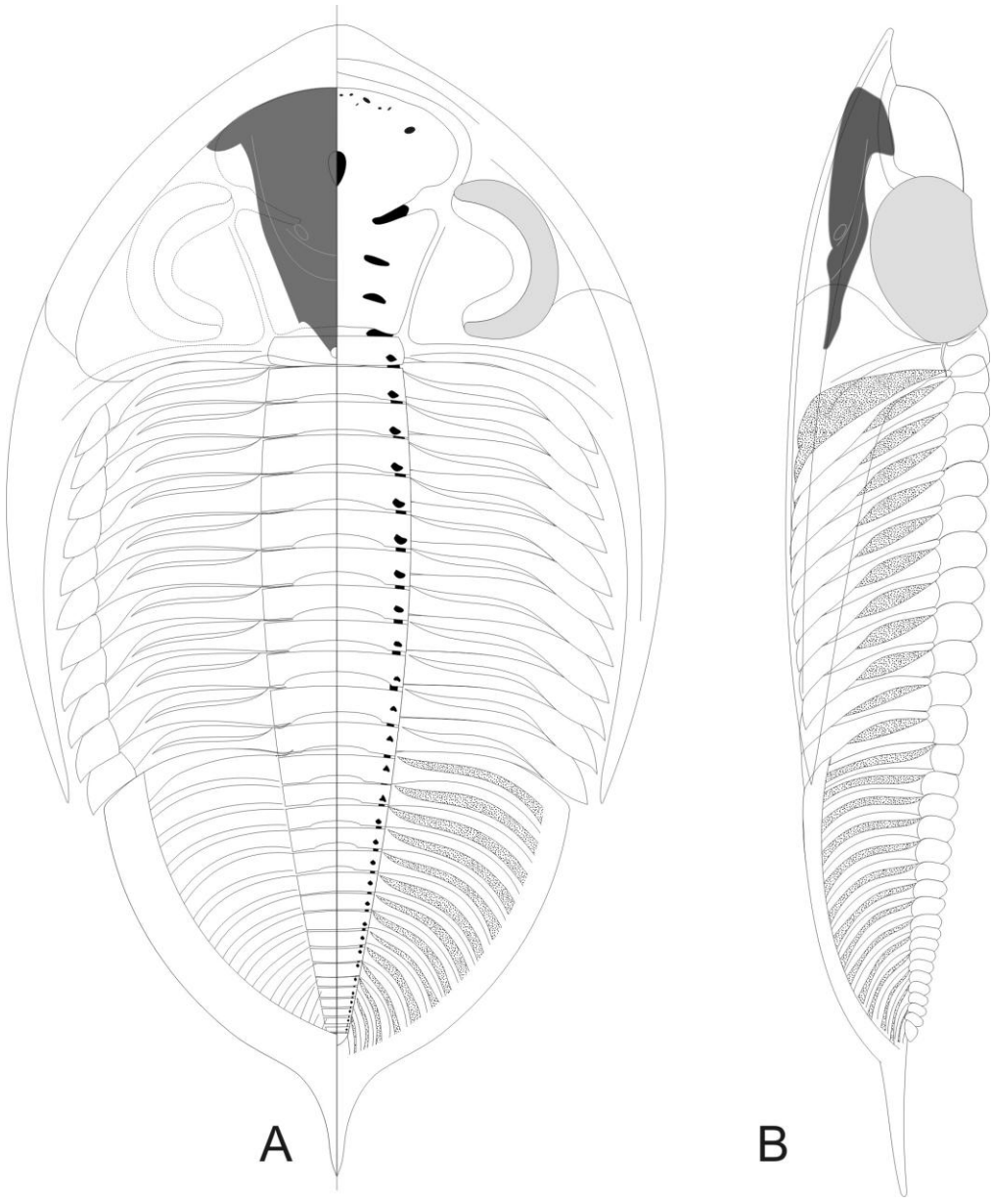

Fig. 3. — Reconstruction of *Zlichovaspis* (*Zlichovaspis*) *rugosa rugosa* (Hawle & Corda, 1847) with the hypostome *in situ*. Modified after Budil *et al.* (2009a). A: dorsal view, B: lateral view.

Fig. 3. — Reconstitution de Zlichovaspis (Zlichovaspis) rugosa rugosa *(Hawle & Corda, 1847) avec son hypostome en place. Modifié d'après Budil* et al. *(2009a). A: vue dorsale, B: vue latérale.*

the time of the most intensive mining activities and thus the acme of fossil findings at the locality. Very probably, the specimen was unknown to local palaeontologists and was sold directly to some private collection and/or directly to the museum (Lille?). One can speculate that the specimen could have been collected after the death of Joachim Barrande (1883) and Otomar Pravoslav Novák (1894), when the quarryman lost the most important customers. For the short time, the quarryman tried to sell their findings directly abroad, before the onset of important decline of collecting activities in Bohemian Devonian (Budil *et al.* 2009b). It could not be excluded, that the part of palaeontological samples of the Barrandian provenience, stored at the Musée d'Histoire Naturelle de Lille, were originally a part of the collection of Ch. Barrois, gathered between 1900 and 1905. During the cataloguing in the French collection, probably thanks to the missing contacts with the native speaker, the wrong transliteration of the generally well-known locality Tetín (into the "Fetín", see Pl. IX, P) had happened.

II. — **DESCRIPTION OF THE SPECIMEN**

The specimen corresponds well with the diagnosis of *Z.* (*Zlichovaspis*) *rugosa rugosa* (see Budil *et al.* 2009a),

showing a moderately subtriangular cephalon of length/width ratio approximately 0.55; an anterior cephalic border with a prominent concave (sag.) precranial median process; thoracic and pygidial pleural furrows deep, flat-bottomed; a pygidium rounded subtriangular in outline, of length/width ratio approximately 0.7 (estimated in the studied sample); an axis with 16-18 rings plus subtriangular terminal piece; a postaxial ridge vaulted, crossing border furrow; 13 to 14 (?15) pleural furrows; anterior pleural bands strongly vaulted, inflated distally above the inner margin of doublure; posterior pleural bands vaulted; the whole exoskeleton excluding the apodemal pits covered by dense granules, coarsest on axial rings (especially in their posterolateral parts) and postaxial region; pleural furrows very densely granulated.

The internal mould with relics of the exoskeleton is preserved in gray biomicritic limestone corresponding to the Dvorce-Prokop Limestone Facies (Lower Devonian, Pragian). However the specimen is damaged, the genal spines, eyes similarly as the posterior part of the pygidium are broken off, in addition, both cephalon and pygidium have been slightly disarticulated from the thorax during the decomposition of the specimen. The anterior cephalic part of the specimen is broken; it has been glued by a glue of poor quality; thanks to this fact, the specimen fall apart into two pieces during the manipulation. This broken-off part shows the hypostome *in situ*, mostly covered, however, by the rock. The rock sample is penetrated by a series of numerous subparallel fractures. Any mechanical preparation would lead to its disintegration and thus we decided not to risk this irretrievable step. The hypostome is oriented sub-parallel with the dorsal exoskeleton. It is obvious that the hypostome is still positioned very close to the doublure and its orientation is original. The surface of the hypostome body is densely pitted.

III. — CONCLUSIONS

Because of the *in situ* hypostome preserved under the entire specimen, which is extremely rare exoskeleton configuration in Lower Devonian dalmanitids of the Bohemian facies development (= ”odontochilids”), the sample MGL92636-1 plays an important role.

The only slightly *post-mortem* disarticulated exoskeleton most probably represents a carcass. Together with specimens MCZ 172840, NML 30261 and NM 22578, the sample provides a direct evidence of the type of hypostome articulation (Fig. 2); which was supposed already by Barrande (1852, 1872), Šnajdr (1987) and Budil *et al.* (2008, 2009a) in these trilobites.

Acknowledgement. — The study was supported by grant from the Contact Mobility – Barrande Program (Project N° MEB 021122 – PHC Barrande 24465SH) and by the Grant Agency of the Czech Republic (Project N° P210/12/2018), respectively. We would like to express many thanks to staff of the Palaeontological Department of the National Museum, Prague, namely V. Turek and M. Valent, for very enthusiastic help in searching the possible additional Barrande’s figured specimens and comparative material, far beyond the curatorial responsibilities; and T. Oudoire, the curator of the Musée d’Histoire Naturelle de Lille (France).

Abbreviations: NML, National museum, Prague, Czech Republic; MGL, Musée d'Histoire Naturelle de Lille, France; MCZ, Museum of Comparative Zoology at Harvard University Boston, U.S.A.

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EXPLANATIONS OF PLATE IX

EXPLICATIONS DE LA PLANCHE IX

All scale bar represent 5 mm.

Toutes les barres d'échelle représentent 5 mm.

A-B, D-F, L-P – *Zlichovaspis (Zlichovaspis) rugosa rugosa* (Hawle & Corda, 1847). Lower Devonian, Pragian Stage, Praha Formation, Dvorce-Prokop Limestone, Damil Hill near Tetín.

A – incomplete, compressed cephalic doublure with hypostome *in situ*, MCZ 172840, ventral view, figured by Budil *et al*. (2008, fig. 4K);

B – corroded doublure with hypostome *in situ* of the entire, poorly preserved specimen cemented by the "Fritsch matter", NM 30323, ventral view;

D-F – incomplete cephalon with part of articulated thorax and the disarticulated hypostome in the near *in situ* position, NM 22578. Figured by Šnajdr (1987, Pl. 12, fig. 1) and Budil (2005, fig 4J). D – dorsal view, E – ventral view, F – anterolateral view;

L-P – damaged entire specimen with hypostome preserved *in situ*, MGL92636-1. L – dorsal view, M – dorsal view of specimen with displaced anterior part of the cephalon, showing part of the hypostome *in situ*, N – detail of the hypostome fragment (counterpart) at the broken anterior part of the cephalon, ventral view, O – detail of the hypostome fragment (positive), dorsal view, P – label of the specimen with the erroneously written locality as "Fetín".

G-J – *Zlichovaspis (Zlichovaspis)* cf. *rugosa* (Hawle & Corda, 1847). Lower Devonian, Pragian Stage, Praha Formation, Dvorce-Prokop Limestone, Tetín. Incomplete cephalon with part of thorax and hypostome attached *in situ*. G – dorsal view, H – ventral view, I – anterolateral view, J – part of doublure with hypostome attached *in situ*, lateral view. NML 30261, figured by Budil *et al*. (2008, fig. 4J) - possibly the specimen AD of Barrande (1852, Pl. 1, fig. 4 and Pl. 2A, fig. 14). **C** – *Odontochile hausmanni* (Brongniart, 1822), specimen NML 17012, AD specimen of Barrande (1852, Pl. 2, fig. 13), figured also by Budil *et al.* (2009a, fig. 4F). **K** – *Odontochile* cf. *cristata* Hawle & Corda, 1847. Cephalon with the closely lying hypostome. Lower Devonian, Pragian Stage, Praha Formation, Dvorce-Prokop Limestone, lower to middle part, Praha-Podolí, NML15027, figured by Budil (2005, Pl. 1, fig. 7).

A-B, D-F, L-P – Zlichovaspis (Zlichovaspis) rugosa rugosa *(Hawle & Corda, 1847). Dévonien inférieur, Praguien, Formation de Prague, Calcaire de Dvorce-Prokop, colline de Damil près de Tetín.*

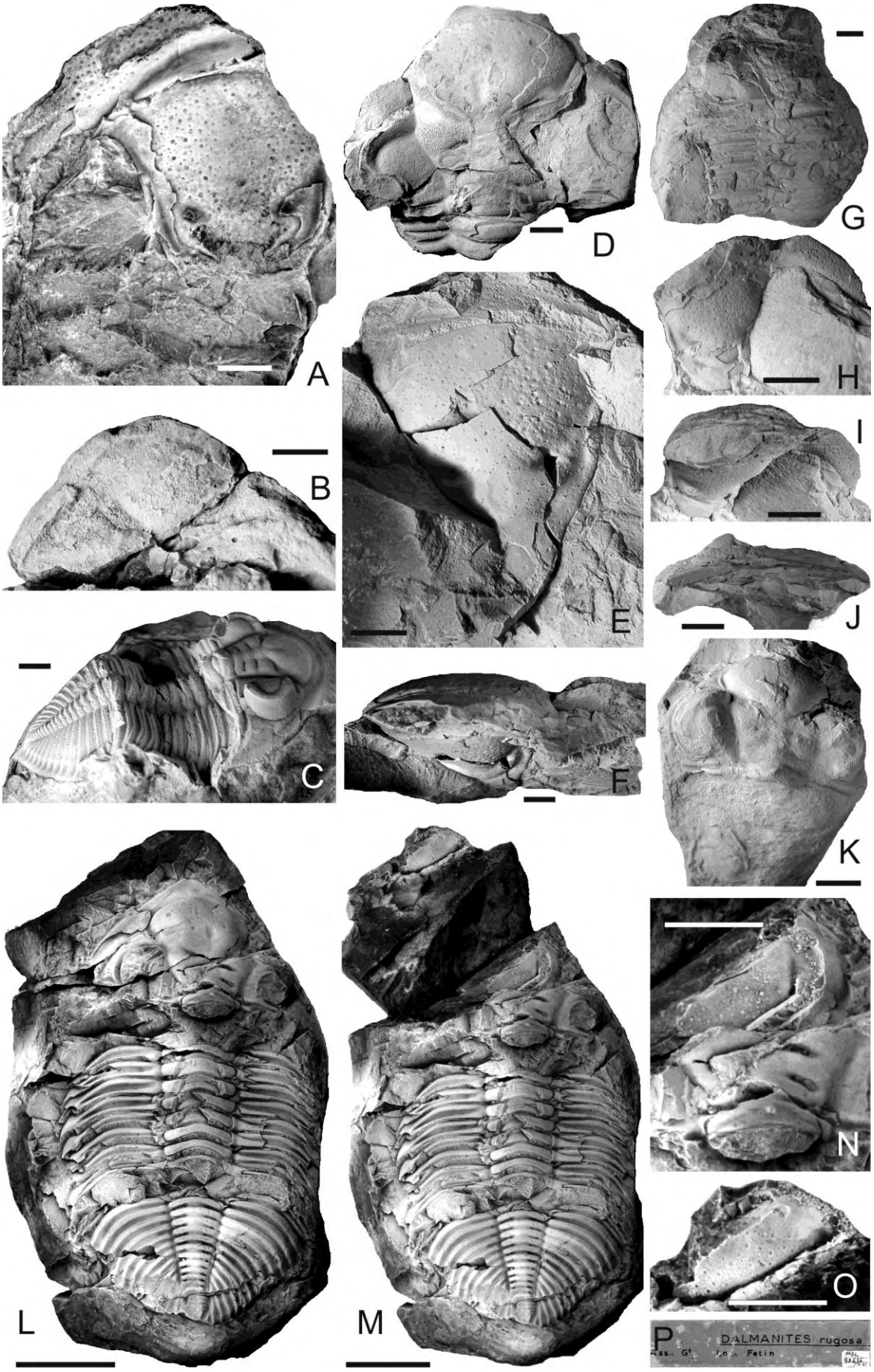
A - doublure céphalique comprimée incomplète avec son hypostome en place, MCZ 172840, vue ventrale figurée par Budil et al. *(2008, fig. 4K);*

B – doublure céphalique corrodée avec l'hypostome en place d'un spécimen mal conservé cimenté, NM 30323, vue ventrale;

D-F – céphalon incomplet avec une partie du thorax articulé et l'hypostome désarticulé presque en place, NM 22578. Figuré par Šnajdr (1987, Pl. 12, fig. 1) et Budil (2005, fig 4J). D – vue dorsale, E - vue ventrale, F - vue antérolatérale;

L-P – spécimen complet abîmé avec son hypostome en place, MGL92636-1. L – vue dorsale, M - vue dorsale du spécimen avec la partie antérieure du céphalon déplacée, montrant une partie de l'hypostome en place, N - détail d'un fragment de l'hypostome (contre-partie) à la partie antérieure cassée du céphalon, vue ventrale, O - détail d'un fragment de l'hypostome en positif, en vue dorsale, P - étiquette du spécimen avec l'indication erronée de la localité "Fetín".

G-J – Zlichovaspis (Zlichovaspis) *cf.* rugosa *(Hawle & Corda, 1847). Dévonien inférieur, Praguien, Formation de Prague, Calcaire de Dvorce-Prokop, Tetín. Céphalon incomplet avec une partie du thorax et de l'hypostome en place. G - vue dorsale, H - vue ventrale, I - vue antérolatérale, J - partie de la doublure céphalique avec l'hypostome en place, en vue latérale. NML 30261, figuré par Budil* et al. *(2008, fig. 4J) - peut-être le spécimen AD de Barrande (1852, Pl. 1, fig. 4 et Pl. 2A, fig. 14).* ***C*** – Odontochile hausmanni *(Brongniart, 1822), spécimen NML 17012, spécimen AD de Barrande (1852, Pl. 2, fig. 13), refiguré par Budil* et al. *(2009a, fig. 4F).* ***K*** – Odontochile *cf.* cristata *Hawle & Corda, 1847. Céphalon avec l'hypostome situé tout à côté. Dévonien inférieur, Praguien, Formation de Prague, Calcaire de Dvorce-Prokop, partie inférieure à moyenne, Praha-Podolí, NML15027, figuré par Budil (2005, Pl. 1, fig. 7).*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DALMANITES rugosa