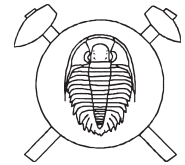


New finds of agnostid trilobites in the Skryje–Týřovice area (Middle Cambrian, Barrandian area, Czech Republic)

Nové nálezy agnostidních trilobitů ze skryjsko–týřovické oblasti
(střední kambrium, Barrandien, Česká republika)



(2 Figs, 1 Plate)

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Exceptionally well preserved internal moulds of three complete agnostid trilobite specimens, one of *Pleuroctenium granulatum granulatum* (Barrande, 1846) and two of *Skryjagnostus pompeckji* Šnajdr, 1957, expand the knowledge about the exoskeletal morphology in the holaspide ontogenetic stage of these species.

Key words: miomerid trilobites, Middle Cambrian, Barrandian area, Czech Republic

Introduction

Exoskeletons of agnostid trilobites represent an important part of faunal associations in Middle Cambrian successions of the Skryje–Týřovice Basin. In stratigraphically higher levels of the Skryje Shales (lithologically the finest member of the the Jince Formation in this area), exceptionally well preserved small to very tiny remains of an invertebrate skeletal fauna, including parts of exoskeletons or even complete specimens of agnostids, are quite common. One of these levels has been discovered and intensively studied at the classical Týřovice – “Pod hruškou” locality (= under the pear tree), already during middle of the 18th century. Common findings of different ontogenetic stages of *Sao hirsuta* Barrande, 1846 and some other polymeroid and miomeroid trilobites were studied and described already during the end of the first half of the 18th century by Hawle and Corda (1847) and also by Barrande (1846, 1852, 1872). Other fossiliferous localities at a similar stratigraphical level have been described by Jahn (1896), Jarka (1941), Prantl (1947), and Chlupáč *et al.* (1998). The stratigraphy of the Týřovice – “Pod hruškou” locality was discussed by Jahn (1896, p. 714), Příbyl and Jarka (1946, p. 286), Prantl (1947, p. 58), and Šnajdr (1958, p. 25). All the above-mentioned authors evaluated the general geological setting of this locality and/or analyzed the obtained fossil assemblage and finally agreed that upper part or even top of the Skryje Shales are exposed at the Týřovice – “Pod hruškou” locality (Fig. 1).

Extensive fossil collections were made by Barrande (1846, 1852), Hawle and Corda (1847), Kušta, Novák, Kuthan, Jahn (1896), Šuf (1926), Růžička (1943, 1944), Prantl (1947) and Šnajdr (1958). The list of identified fossil taxa contains more than 30 species, including sev-

eral species of hyolithids (*Slapyrites* Marek, 1981), various polymeroid trilobites (*Eccaparadoxides* Šnajdr, 1957; *Hydrocephalus* Barrande, 1846; *Luhops* Šnajdr, 1957; *Herse* Hawle et Corda, 1847; *Agraulos* Hawle et Corda, 1847; *Ctenocephalus* Hawle et Corda, 1847; *Conocoryphe* Hawle et Corda, 1847; *Parabailiella* Thoral, 1947; *Sao* Barrande, 1846 – some of them known from different ontogenetic stages), homalozoan echinoderms (*Trochocystites* Barrande, 1859; *Trochocystoides* Jaekel, 1918; *Etoctenocystis* Fatka et Kordule, 1985 and *Ceratocystis* Jaekel, 1901), rare inarticulate brachiopods (*Lingulella* sp.), problematica (*Volborthella* Schmidt, 1888), and commonly also miomeroid trilobites of the genera *Condylopyge* Hawle et Corda, 1847; *Phalagnostus* Howell, 1955; *Peronopsis* Hawle et Corda, 1847; *Diplorrhina* Hawle et Corda, 1847; *Phalacroma* Hawle et Corda, 1847; *Skryjagnostus* Šnajdr, 1957 and *Pleuroctenium* Hawle et Corda, 1847 (the list compiled from data by Barrande – 1846, 1852, 1872, 1887; Pompeckj – 1895; Jahn – 1896; Prantl – 1947, 1948; Příbyl and Jarka – 1941; Šnajdr – 1958; Friedrich – 1993; Mergl and Šlehoferová – 1990 and Fatka and Kordule – 1985).

Recently, one exceptionally well preserved and complete specimen of the relatively common species *Pleuroctenium granulatum* (Barrande, 1846) and two other nearly complete specimens of a rare agnostid species (*Skryjagnostus pompeckji* Šnajdr, 1957) were collected by the two junior authors. All three specimens are preserved as internal molds and are stored in collections of the Czech Geological Survey Prague under the following numbers:

Pleuroctenium granulatum (Barrande, 1846) – YA 604 (pl. 1, fig. 1, text-fig. 2),

Skryjagnostus pompeckji Šnajdr, 1957 – YA 605 and YA 606 (pl. 1, figs 2, 3).

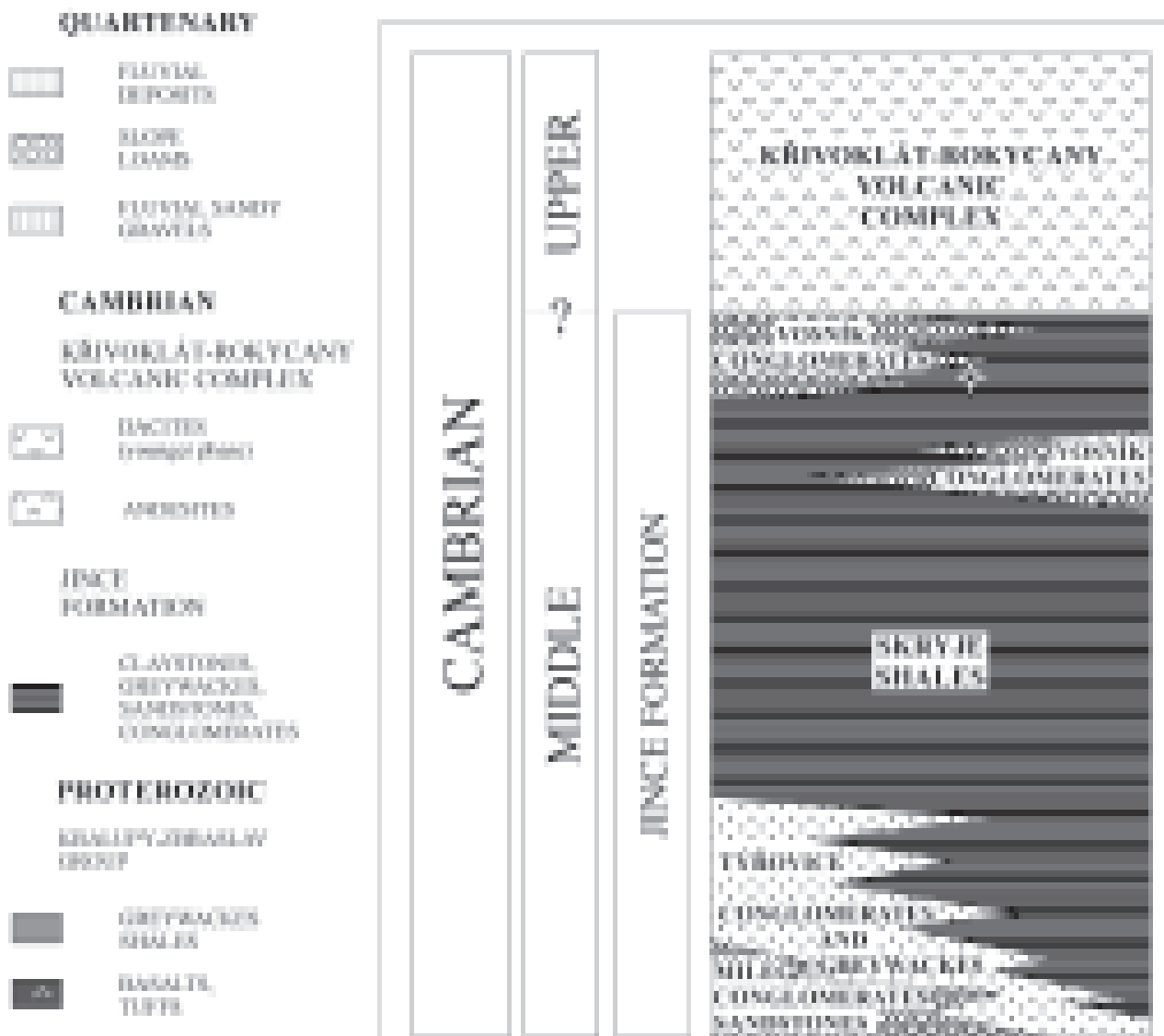
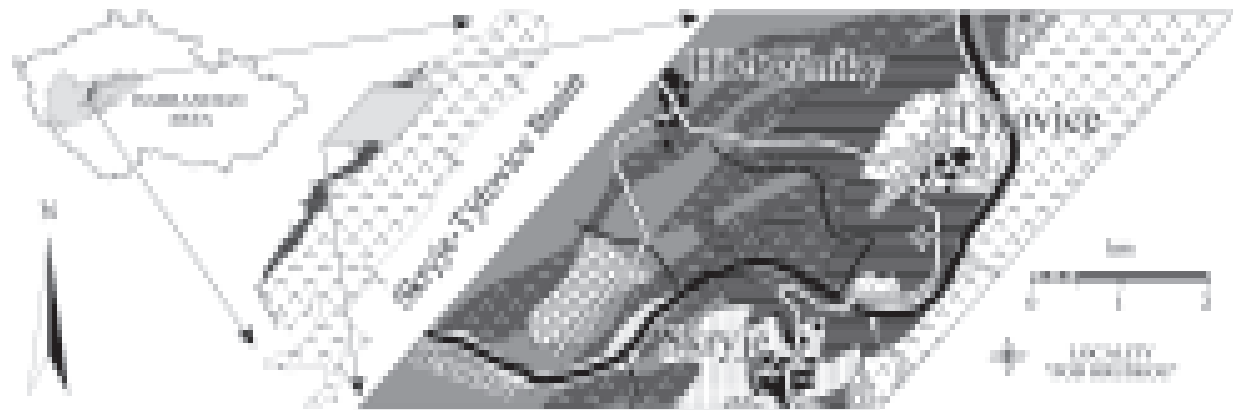


Fig. 1. Sketch map of the Skryje–Týrovice Basin (geology modified from Mašek et al., 1997) and lithostratigraphic subdivision of Cambrian rocks used in the Skryje–Týrovice Basin (modified after Havlíček, 1971).

Systematic part

Phylum Arthropoda
 Class Trilobita
 Order Agnostida
 Superfamily Uncertain
 Family Condylomygidae Raymond, 1913

Genus *Pleuroctenium* Hawle et Corda, 1847

Type species: *Battus granulatum* Barrande, 1846; Middle Cambrian, *Eccaparadoxides pusillus* Zone, Skryje–Týřovice Basin, Barrandian area, Czech Republic; by original designation.

Remarks: The following taxa are included in the genus *Pleuroctenium*:

Pleuroctenium granulatum (Barrande, 1846),
Pleuroctenium granulatum granulatum (Barrande, 1846),
Pleuroctenium granulatum pileatum Rushton, 1966,
Pleuroctenium granulatum scanense Westergård, 1946,
Pleuroctenium tuberculatum (Illing, 1916),
Pleuroctenium bifurcatum (Illing, 1916),
Pleuroctenium magnificum Howell, 1935,
Pleuroctenium sp. indet. in Sdzuy (2000).

***Pleuroctenium granulatum granulatum* (Barrande, 1846)**

Pl. 1, fig. 1, text-fig. 2

- 1846 *Battus granulatus*; Barrande, p. 15.
 1847 *Pl. granulatum* nob.; Hawle and Corda, p. 117 (p. 233) tab. VI, fig. 63).
 1847 *Pl. minutum* nob.; Hawle and Corda, p. 117 (p. 233).
 1852 *Agnostus granulatus* Barrande; Barrande, p. 991, pl. 49.
 1916 *Agnostus granulatus* Barrande (partim); Illing, p. 104, 419.
 1958 *Pleuroctenium granulatum* (Barrande, 1846); Šnajdr, p. 56, pl. 2, figs 5, 7–15. (here synonymy to date)
 1962 *Pleuroctenium* [sic] *granulatum* (Barrande, 1846); Hutchinson, 66, pl. 4, figs 10, 11, (non. 12, 13, 14).
 1966 *Pleuroctenium granulatum granulatum* (Barrande, 1846); Rushton, p. 33, fig. 13b.
 1970 *Pleuroctenium granulatum* (Barrande, 1846); Horný and Bastl, pl. 1, fig. 6.
 1979 *Pleuroctenium granulatum granulatum* (Barrande, 1846); Rushton, p. 46–47, figs 2A–B.
 1990 *Pleuroctenium granulatum* (Barrande, 1846); Shergold *et al.*, p. 57, fig. 19/3a.
 1997 *Pleuroctenium granulatum* (Barrande, 1846); Whittington *et al.*, p. 383, fig. 240, 4b.
 ? 1998 *Pleuroctenium granulatum* (Barrande, 1846); Landing and Westrop, p. 33, 51.
 2001 *Pleuroctenium granulatum* (Barrande, 1846); Vaněk and Valíček, p. 7.
 2003 *Pleuroctenium* Hawle et Corda, 1847 [*Battus granulatus* Barrande, 1846]; Jell and Adrain, p. 427.

Remarks to pygidial spines: Several of the earlier authors illustrated specimen with tiny, posteriorly directed second-order spines developed along the lateral margin of the pygidial shield (Barrande – 1846, 1852, Hawle and Corda – 1847, pl. VI, fig. 63, Rushton – 1966, Text-fig. 13 – b, Rushton – 1979, fig. 2 – A, B) but none of them discussed this morphological feature.

The recently collected internal mould shows the remains of at least 20 of such spines on the left pygidial margin and at least 16 spines on the right pygidial margin. The spines are not preserved along the entire length of the lateral margins, but they seem to be evenly distributed. In such case, the number of spines can be estimated at 22 to 30 on each side from the antero-lateral margin of the pygidium to the tip of the postero-lateral spine.

Discussion: Šnajdr (1957, p. 56–58) described the species in great detail and figured the lectotype with several well preserved skeletal parts of other specimens. All figured specimens represent internal molds only.

New observations on the skeletal morphology were published by Rushton (1966, p. 32–33), who separated the nominal subspecies, one of the predescribed species from Scandinavia transferred to a subspecies level based on observation of materials from Great Britain – *Pleuroctenium granulatum scanense* Westergård, 1946, and established a new subspecies – *Pleuroctenium granulatum pileatum* Rushton, 1966. Older materials of the subspecies *Pleuroctenium granulatum granulatum* (Barrande, 1846) from the Abbey Shales Formation were briefly discussed and figured by Rushton (1979, p. 46–47, fig. 2 – A, B).

Occurrence: The subspecies *Pleuroctenium granulatum granulatum* occurs commonly at higher stratigraphical levels of Skryje Shales (Jince Formation) in the Skryje–Týřovice Basin of the Barrandian area. It has been ascertained at the following localities: Týřovice – “Pod hruškou”, Týřovice – “lůmek”, Týřovice – “Karáskovská rokle”, Skryje – “Luh”, and Skryje – “Plazy”.

Outside of the type area *Pleuroctenium granulatum granulatum* has been documented from Great Britain – Abbey Shales Formation of Nuneaton (A4-D2 – *Paradoxides aurora* Zone to upper part of the *Paradoxides hicksii* Zone, see Rushton, 1979; lithostratigraphy after Rushton *et al.*, 1999).

This subspecies has been reported also from SE Newfoundland – Manuels River Formation, (*Paradoxides hicksii* Zone, see Hutchinson, 1962), *Pleuroctenium granulatum* has been plotted also by Landing and Westrop (1998).

It seems very probable that also the incompletely preserved material described and figured recently by Sdzuy (2000) from the Frankenwald area (Lippertsgrün Formation, Germany) belongs to the subspecies discussed.

One very similar specimen (determined as *Pleuroctenium granulatum*) has recently been recovered from the Příbram–Jince Basin. It occurs in the middle part of the *Eccaparadoxides pusillus* Zone (below the *Dawsonia bohémica* Horizon, see Fatka *et al.*, in press, table 3).

Family uncertain

Genus *Skryjagnostus* Šnajdr, 1957

Type species: *Skryjagnostus pompeckji* Šnajdr, 1957; Middle Cambrian, *Eccaparadoxides pusillus* Zone, Skryje–Týřovice Basin, Barrandian area, Czech Republic.

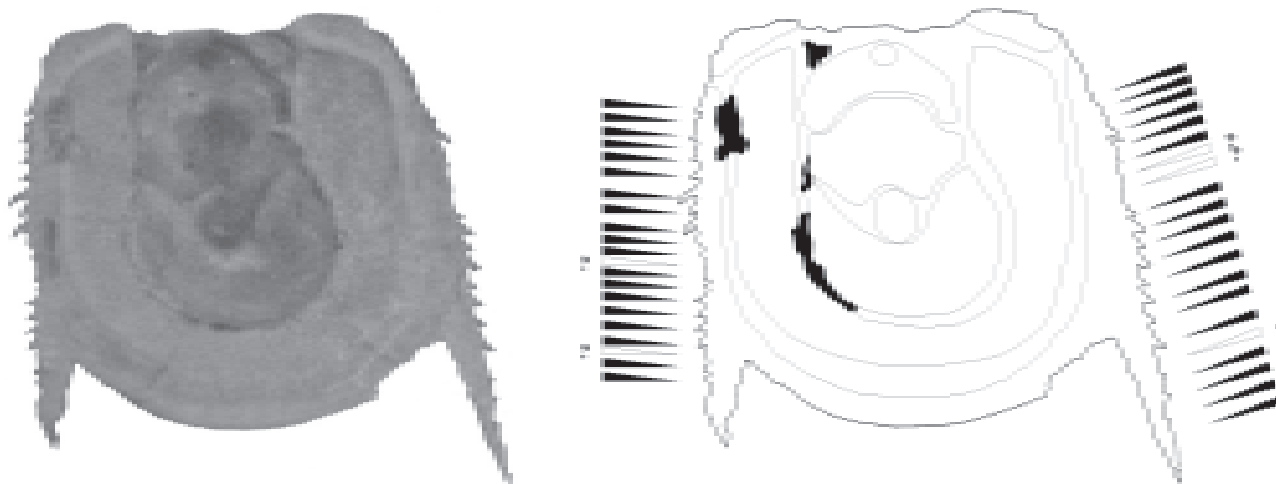


Fig. 2. *Pleuroctenium granulatum granulatum* (Barrande, 1846) – *Pleuroctenium granulatum granulatum* (Barrande, 1846) A – detail of pygidium with well visible second-order spines, 18x, YA 604, B – interpretative drawing of the pygidium with second-order spines marked by triangles.

Remarks: The species described and illustrated as *Phalacroma laevis* Pokrovskaya, 1958 by Pokrovskaya (1958, p. 56, pl. 4, figs 16–18) and Egorova et al. (1982, p. 75, pl. 11, figs 6, 7, pl. 12, fig. 4) most probably belongs to the monotypic genus *Skryjagnostus*.

Skryjagnostus pompeckji Šnajdr, 1957

Pl. 1, figs 2, 3

- 1957 *Skryjagnostus pompeckji* sp. n.; Šnajdr, p. 84, pl. 1, figs 9–12.
 1958 *Skryjagnostus pompeckji* Šnajdr, 1957; Šnajdr, p. 84, pl. 4, figs 4–5, 10, 12–20, text-fig. 13.
 1970 *Skryjagnostus pompeckji* Šnajdr, 1957; Horný and Bastl, pl. 1, fig. 3.
 1990 *Skryjagnostus pompeckji* Šnajdr, 1957; Shergold et al., p. 56–57, fig. 19/1.
 1997 *Skryjagnostus pompeckji* Šnajdr, 1957; Whittington et al., p. 380–381, fig. 238, 2.
 2001 *Skryjagnostus pompeckji* Šnajdr, 1957; Vaněk and Valíček, p. 9.
 2003 *Skryjagnostus* Šnajdr, 1957 [*pompeckji*]; Jell and Adrain, p. 446.

Occurrence: This species occurs sporadically in higher stratigraphical levels of the Skryje Shales (Jince Formation) in the Skryje–Týřovice Basin of the Barrandian area at two localities: Týřovice – “Pod hruškou” and Týřovice – “lůmek”.

Conclusion

Thorough and careful survey of fossil localities known for very long time (e.g. the Týřovice – “Pod hruškou” locality has been excavated for more than 150 years), could provide surprising new well preserved material, as presented in this contribution.

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Submitted April 20, 2004

Explanation of Plate

Plate I

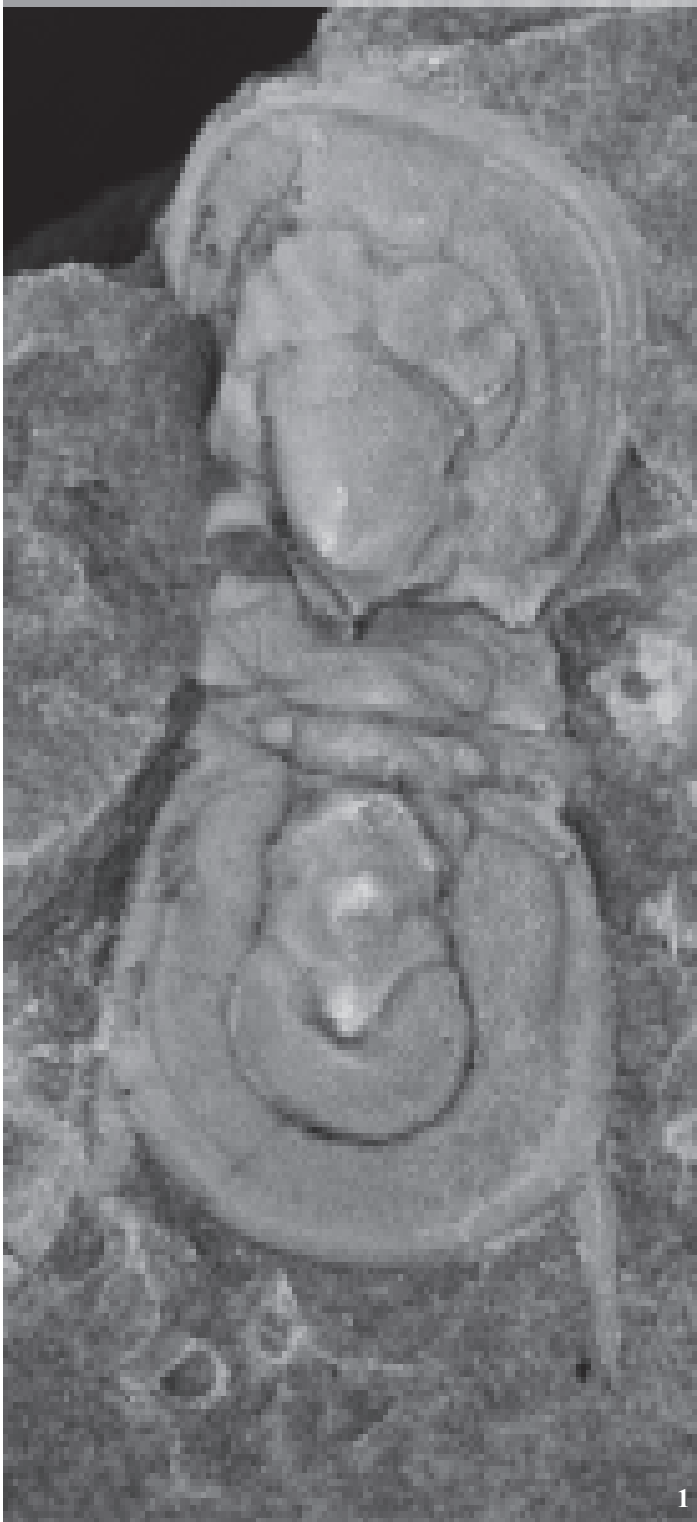
Internal molds coated with ammonium chloride. All specimens come from the Týřovice – “Pod hruškou” locality and are deposited in collections of the Czech Geological Survey Prague under designations YA 604–606.

1 – *Pleuroctenium granulatum granulatum* (Barrande, 1846), $\times 22.5$, YA 604.

2 – *Skryjagnostus pompeckji* Šnajdr, 1957, $\times 17$, YA 605.

3 – *Skryjagnostus pompeckji* Šnajdr, 1957, $\times 15$, YA 606.

O. Fatka – J. Herynk – P. Najman: New finds of agnostid trilobites in the Skryje–Týřovice area (Middle Cambrian, Barrandian area, Czech Republic) (Pl. I)



References

- Barrande, J. (1846): Notice préliminaire sur le système silurien et les trilobites de Bohême. – 1–97. Leipzig.
- (1852): Système silurien du centre de la Bohême: 1^{ère} partie, Crustacés: Trilobites. 1 – Praha. Paris: 1–935.
- (1872): Système silurien du centre de la Bohême: Supplément au vol. 1. Trilobites, crustacés divers et poissons. – Praha. Paris: 1–647.
- (1887): Système Silurien du centre de la Bohême. Volume VII. Classe des Echinodermes, Ordre des Cystidées. – Praha. Leipzig: 1–233.
- Chlupáč, I. – Fatka, O. – Prokop, R. J. – Turek, V. (1998): Výzkum klasické paleontologické lokality “Luh” ve skryjském kambriu (Research of the classical paleontological locality “Luh” in the Cambrian of Skryje). – Journal of the Czech Geological Society, 43(3): 169–173. (in Czech with English summary).
- Egorova, L. I. – Shabanov, Yu. Ya. – Pegel, T. V. – Savitsky, V. E. – Suchov, S. S. – Tchernysheva N. E. (1982): The Mayan Stage of the stratotype area (Middle Cambrian of the southeastern part of the Siberian Platform). – Mezhdromstvennyy stratigrafichskiy komitet, 8: 1–146. Nauka. (in Russian).
- Fatka, O. – Kordule, V. (1985): *Etoctenocystis bohemica* gen. et sp. nov. – new ctenocystoid from Czechoslovakia (Echinodermata, Middle Cambrian). – Věst. Ústř. úst. geol., 60(4): 225–229.
- Fatka, O. – Kordule, V. – Szabad, M. (in press): Stratigraphical distribution of Cambrian fossils in the Příbram–Jince Basin (Barrandian area, Czech Republic). – Senckenbergiana lethaea.
- Friedrich, W.–P. (1993): Systematik und Funktionsmorphologie mittelkambrischen Cincta (Carpoidea, Echinodermata). – Beringeria, 7: 1–190.
- Havlíček, V. (1971): Stratigraphy of the Cambrian of Central Bohemia. – Sbor. geol. Věd, G, 20: 7–52.
- Hawle, A. – Corda, I. (1847): Prodom einer Monographie der böhmischen Trilobiten. – Abh. Kön. Böhm. Gesell. Wiss., V, 5: 117–292.
- Horný, R. – Bastl, F. (1970): Type specimens of fossils in the National Museum Prague, I. Trilobita. – Přírodovědecké muzeum: 1–356.
- Hutchinson, R. D. (1962): Cambrian stratigraphy and trilobite faunas of southeastern Newfoundland. – Bull. Geol. Surv. Canada, 88: 1–156.
- Jahn, J. J. (1896): Ueber die geologischen Verhältnisse des Cambrium von Tejšovic und Skrej in Böhmen. – Jahrbuch der k. k. geol. Reichsanstalt, 1895, 45(4): 641–790.
- Jarka, J. (1941): Příspěvek k poznání stratigrafie skryjských břidlic cb'_2 (Ein Beitrag zur Kenntniss der Stratigraphie der Skreier Schiefer (cb'_2)). – Věst. Čes. spol. nauk: 1–17. (in Czech with German summary).
- Jell, P. A. – Adrain, J. M. (2003): Available generic names for trilobites. – Mem. Queensland Museum, 48 (2): 331–553.
- Illing, V. C. (1916): The Paradoxidian fauna of a part of the Stockingford Shale. – Q. Jl. Geol. Soc. London, 71: 386–450.
- Landing, E. – Westrop, S. R. (1998): Cambrian faunal sequence and depositional history of Avalonian Newfoundland and New Brunswick: Field Workshop. – In: E. Landing – S. R. Westrop (eds). Avalon 1997, The Cambrian Standard. New York State Museum Bulletin 492: 5–70.
- Mergl, M. – Štehoferová, P. (1990): Middle Cambrian inarticulate brachiopods from Central Bohemia. – Sborník geologických Věd, Paleontologie, 31: 67–104.
- Mašek, J. – Stratka, J. – Hrazdírka, P. – Pálenský, P. – Štěpánek, P. – Hůla, P. (1997): Geological and nature conservation map. Protected landscape area and biosphere reserve Křivoklátsko. – Czech Geological Survey.
- Pek, I. – Vaněk, J. (1989): Index of Bohemian trilobites. – Krajské vlastivědné muzeum: 1–68.
- Prantl, F. (1947): O nalezišti zkamenělin Pod hruškou v skryjsko-týřovickém kambriu (On the “Pod Hruškou” locality in the Skryje–Týřovice Cambrian). – Věst. Musejního spolku královského města Rakovníka a politického okresu rakovnického, 32: 53–58. (in Czech).
- (1948): Výskyt rodu *Volborthella* Schmidt v Čechách (Nautiloidea). [On the occurrence of the genus *Volborthella* Schmidt in Bohemia (Nautiloidea)]. – Sb. národ. Mus, řada 4B, 5: 3–13.
- Příbyl, A. – Jarka, J. (1946): Profil nejmladšími vrstvami skryjsko-týřovického kambria v okolí Vosníku a naleziště “Pod Hruškou” (Section through the youngest beds of the Cambrian of Skryje–Týřovice in the neighbourhood of Vosník and the fossiliferous locality “Pod Hruškou”). – Věst. Stát. Geol. Úst., 21: 286–292. (in Czech).
- Rushton, A. W. A. (1966): The Cambrian trilobites from the Purley Shales of Warwickshire. – Palaeontographical Society: 1–56.
- (1979): A review of the Middle Cambrian Agnostida from the Abbey Shales, England. – Alcheringa, 3: 43–61.
- Rushton, A. W. A. – Owen, A. W. – Owens, R. M. – Prigmore, J. K. (1999): British Cambrian to Ordovician stratigraphy. – Geological Conservation review series: 1–435.
- Růžička, R. (1943): Příspěvek k ontogenii českých Paradoxidů a rodu *Sao* (Beitrag zur Ontogenie der böhmischen Paradoxiden und der Gattung *Sao*). – Věst. Král. česk. spol. nauk: 1–43. (in Czech and German).
- (1944): O některých význačných trilobites skryjského kambria (Über einige bezeichnende Trilobiten des Skreier Kambriums). – Věst. Král. česk. spol. nauk: 1–26. (in Czech and German).
- Sdzuy, K. (2000): Das Kambrium des Frankenwaldes. 3. Die Lippertsgrüner Schichten und ihre Fauna. – Senckenbergiana lethaea, 79 (2): 301–327.
- Shergold, J. H. – Laurie, J. R. – Sun Xiaowen (1990): Classification and review of the trilobite order Agnostida Salter, 1864: an Australian perspective. – Bur. Miner. Resour. Geol. Geophys., Report 296: 1–93.
- Šnajdr, M. (1957): O nových trilobitech z českého kambria (On new trilobites of the Cambrian of Bohemia). – Věst. Ústř. Úst. geol., 32: 235–244. (in Czech with English summary).
- (1958): Trilobiti českého středního kambria (The trilobites of the Middle Cambrian of Bohemia). – Rozpr. Ústř. Úst. geol., 24: 1–280. (in Czech with English summary).
- (1984): Revision of the trilobite type material of I. Hawle and A. J. C. Corda, 1847. – Sbor. Národního muzea, B, 39(3): 129–212.
- Šuf, J. (1926): O českých Paradoxidech se zvláštním zřetelem k jejich vývoji. – Sbor. Stát. Geol. Úst., 6: 31–67.
- Vaněk, J. – Valíček, J. (2001): New index of the genera, subgenera, and species of Barrandian trilobites. Part A–B (Cambrian and Ordovician). – Paleontologia Bohemiae, 7: 1–49.
- Westergård, A. H. (1946): Agnostidea of the Middle Cambrian of Sweden. – Sveriges Geologiska Undersökning, (C), 477: 1–140.
- Whittington, H. B. – Chang, W. T. – Dean, W. T. – Fortey, R. A. – Jell, P. A. – Laurie, J. R. – Palmer, A. R. – Repina, L. N. – Rushton, A. W. A. – Shergold, J. H. (1997): Systematic description of the class Trilobita – Suborder Agnostina. – In: R. C. Moore – R. L. Kaesler (eds.). Treatise on Invertebrate Paleontology, Part O Arthropoda 1 Trilobita, Revised: O331–O383, text-figs 217–240; Lawrence/Kansas.

Nové nálezy agnostidních trilobitů ze skryjsko-týřovické oblasti (střední kambrium, barrandien, Česká republika)

V současné době nalezená vnitřní jádra tří úplných jedinců agnostidních trilobitů doplňují naše znalosti o morfologii exoskeletů holospidních vývojových stádií u druhů *Pleuroctenium granulatum granulatum* (Barrande, 1846) a *Skryjagnostus pompeckji* Šnajdr, 1957. U prvního ze jmenovaných druhů byla dokumentována morfologie trnů lemujících laterální a posterolaterální okraj pygidiálního štítu.