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Middle Devonian trilobites from Čelechovice in Moravia (Czechoslovakia)

Trilobiti středního devonu od Čelechovic na Moravě

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Abstract: The trilobite fauna of the Čelechovice Limestone (late Eifelian or early Givetian) in central Moravia consists of *Schizoproetus celechovicensis* (Smyčka, 1895) — type species of the genus, *Dechenella rittbergensis* Zimmermann, 1892, *Gerastos* (*Longiproetus*) *moravicus* (Smyčka, 1895), *Cyphaspis ceratophthalmoides* Richter, 1914, *Scutellum flabelliferum* (Goldfuss, 1839) and *Ancyropyge sola* sp. n. — first record of the genus outside North America. All described trilobites have closely related species in other world regions. The environment of expressively shallow-water impure carbonate deposits with coral-stromatoporoid biostromes and only subordinate trilobites, as represented in Moravia by the Čelechovice Limestone, has also many analogies in roughly coeval strata of other areas; proetids (dechenellids) accompanied by scutelluids constitute here the most characteristic components of trilobite assemblages. The lack of phacopids is discussed.

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Introduction

The occurrences of Devonian rocks near Čelechovice in central Moravia, NW of the town of Prostějov, belong to classical Devonian localities, as their Devonian age was recognized as early as 1844 by E. Beyrich and confirmed at the joint excursion of J. Barrande, R. I. Murchison, P. E. de Verneuil and A. Keyserling in 1847 (comp. Murchison 1848).

Although the rich and common coral, brachiopod and other Middle Devonian fauna from Čelechovice has attracted attention of many authors since the half of the 19th century and was described in many separate works, trilobites – as a subordinate component of the whole assemblage, were dealt with only in few systematic papers, e.g. by ZIMMERMANN (1892), SMYČKA (1895a, b, 1904), R. RICHTER (1912, 1914) and REMEŠ (1913).

The keen activity of geologists and particularly fossil collectors, namely F. Smyčka, M. Remeš and F. Ficner, yielded remarkable trilobite finds which together with new materials allowed a new study of the trilobite fauna to be made. For this work, collections housed in the following institutions have been used: National Museum, Prague (old collections of F. Smyčka, new material collected by the present author, all invent. numbers prefixed by L); Geological Survey, Prague (coll. F. Ficner, abbr. FF); Moravian Museum, Brno (coll. F. Smyčka, abbr. MM); Naturhistorisches Museum, Wien (mostly coll. F. Smyčka, abbr. W); Faculty of Sciences, Charles University, Prague (coll. M. Remeš, abbr. KU); District Museum of Olomouc (coll. V. Strnad, abbr. MO). Also some specimens from private collections, namely those of Dr. J. Dvořák, Dr. J. Marek and others were kindly offered for study.

For the sake of abbreviation, the following symbols are used in the systematic part:

AB	– anterior border
ABF	– anterior border furrow
CL	– cephalic length (sag.)
GL	– glabellar length (sag.)
GW	– glabellar width (transv.)
IPF	– interpleural furrow
L1 to L3	– lateral glabellar lobes
LB	– lateral border
LBF	– lateral border furrow
PB	– posterior border
PBF	– posterior border furrow
PF	– pleural furrow
PL	– length of pygidium
PW	– width of pygidium (transv.)
RF	– ring furrow
S1 to S4	– lateral glabellar furrows (numbered from the back).

Otherwise, some current abbreviations are used, namely adax. – adaxially, abax. – abaxially, sag. – sagittally, exsag. – exsagittally, tr. – transversely, ant. – anterior, post. – posterior.

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Localities and stratigraphy

The fossils studied derive from isolated Devonian limestone occurrences cropping out from the Tertiary and Quaternary cover in the SW vicinity of the town of Olomouc (NW of Prostějov), namely from Vápenice hill situated 1 to 1.5 km NW of the village of Čelechovice. The material comes from quarries, now abandoned. Of many old quarries, only two larger ones are still accessible for study of the fossiliferous beds – i.e. the Státní lom quarry E of the monument of Palacký at Vápenice, and the Růžičkův quarry situated south-eastwards. For topographic situation see KOVERDYNSKÝ (1961).

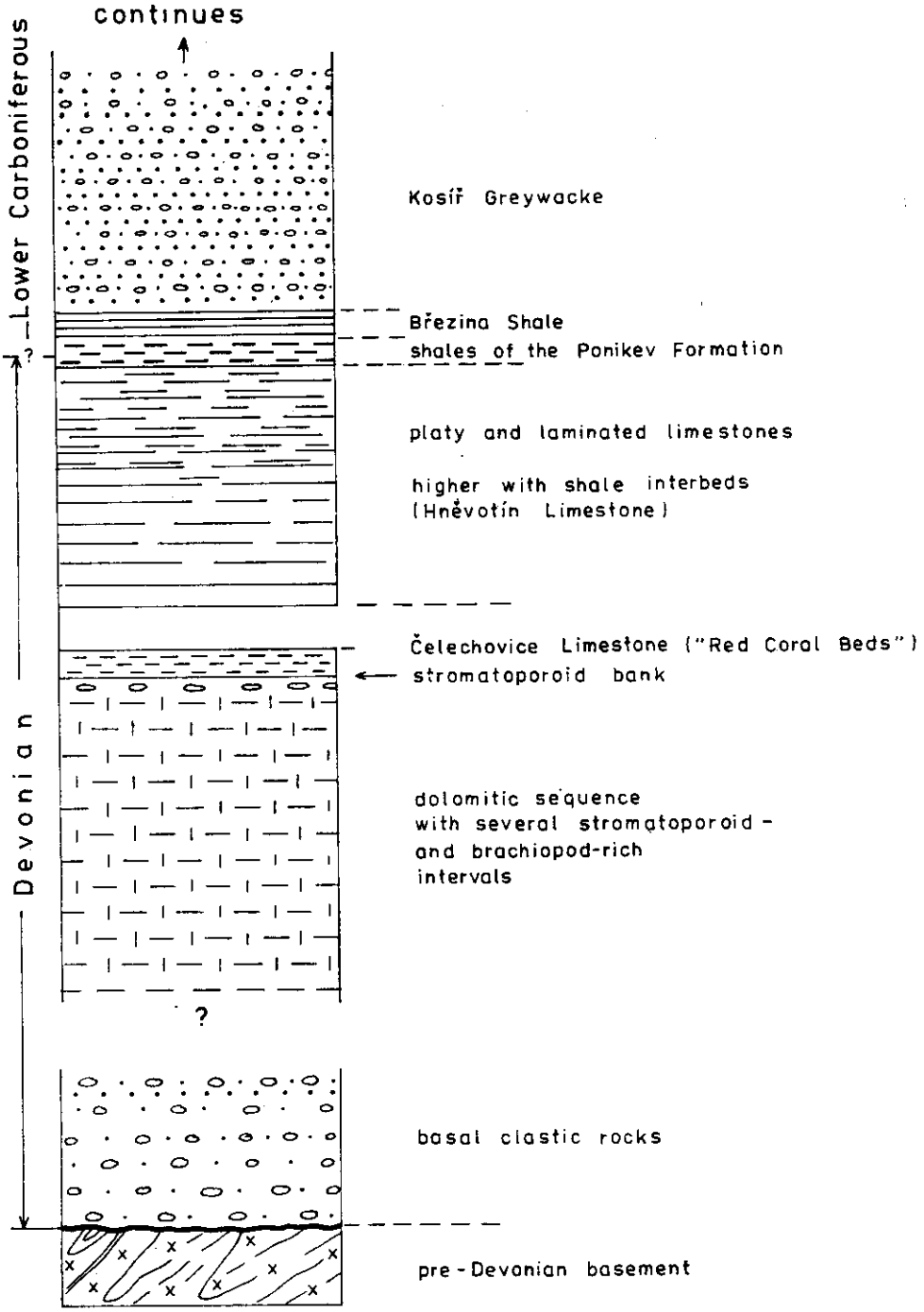
The stratigraphy was studied particularly by REMEŠ - KETTNER (1922), KETTNER (1932), KOVERDYNSKÝ (1961), FICNER (1961), FICNER - HAVLÍČEK (1978) and HLADIL (in CHLUPÁČ et al. 1986). According to these studies and author's own observations, the local stratigraphy N of Čelechovice may be summarized as follows:

1. Basal siliciclastic rocks: variegated conglomerates and quartzites of uncertain age and thickness resting unconformably on pre-Devonian (probably Proterozoic) granitoids and phyllites.

2. The dolomitic sequence: dark grey and grey, mostly well-bedded dolomites and dolomitic limestones with locally common diagenetic brecciate structure and with several less dolomitized intervals rich in stromatoporoids, corals or "stringocephalid" brachiopods; laminites and micrites with marly intercalations indicate the "Lower Red Horizon". Thickness of the whole dolomitic sequence exceeds 100 m, lower limit is not exposed, the sequence is lithologically comparable with the Lažánky Limestone of the Moravian Karst, the age being probably Eifelian ("Horizons" 2 to 6 in FICNER - HAVLÍČEK 1978, upper part best exposed in the Státní quarry – see KOVERDYNSKÝ 1961, fig. 3, HLADIL in CHLUPÁČ et al. 1986, fig. 19).

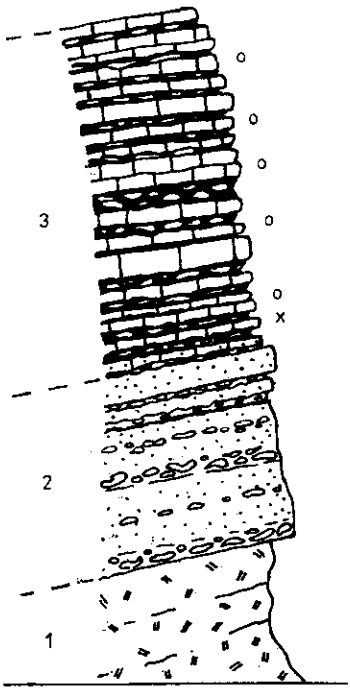
The dolomitic sequence is terminated by layers rich in *Amphipora ramosa Phill.* passing upwards in massive bank rich in stromatoporoids (Nos. 7 and 8 in FICNER - HAVLÍČEK 1978).

3. Above the stromatoporoid-rich bank, a gradual increase of clayey and micritic components is observable (see fig. 2): thicker bedded fine to medium-grained sparry limestone with several rhythmically repeating layers of accumulated corals and stromatoporoids grade upwards in markedly thinner and irregularly bedded dark grey up to dark biomicrites and micrites rhythmically alternating with layers rich in grey



1. Simplified stratigraphical column of the Devonian and adjacent stratigraphical units at Čelechovice

up to violet or reddish marlstones. This sequence, up to 8 m thick, represents the proper Čelechovice Limestone (= "Red Coral Layers" in older literature, No. 9 in FICNER - HAVLÍČEK 1978) from which the famous Čelechovice fauna including the here described trilobites derives.



2. Lower part of the Čelechovice Limestone and closely underlying beds exposed on the W face of the Státní lom quarry near Čelechovice (exposed thickness 8.6 m)
1 — massive dolomitic bank with stromatoporoids, *2* — dark grey dolomitic limestones (mostly medium to fine-grained) rhythmically alternating with layers enriched with large stromatoporoid and tabulate colonies, often overgrowing, *3* — Čelechovice Limestone: dark grey biomicritic and bioclastic limestones rhythmically alternating with less regular layers enriched with clayey substance (calcareous mudstones with calcified organic remains and limestone nodules), *x* — bed with remain of *Scutellum flabelliferum*, *o* — beds where other trilobites were found

The upper limit of the Čelechovice Limestone was not well exposed in the time of the author's investigation. Previous authors report massive dark or light grey limestones with *Coenites* and other corals and stromatoporoids (No. 10 in FICNER - HAVLÍČEK 1978) but KOVERDYNSKÝ (1961) regards the upper contact of the Čelechovice Limestone (= "Red Coral Beds") as a tectonic one which confirms the author's observations in outcrops now accessible.

4. The next exposed part of the sequence consists of grey, thinner bedded up to laminated carbonates in which the proportion of clayey shale interbeds increases upwards (the total thickness may exceed 50—100 m, intervals 11 and 12 in FICNER - HAVLÍČEK 1978). This sequence (or at least its higher part) may be ranged with the Hněvotín Limestone of the Líšeň Formation (sensu ZUKALOVÁ - CHLUPÁČ 1982), the age being most likely Upper Devonian. Dacryoconarid tentaculites found in laminites point to a level not higher than Frasnian but the upper part remains without sufficient biostratigraphic documentation.

5. Variegated clayey and siliceous shales with laminated cherts, at Čele-

chovice only several metres thick, represent a tongue of rocks of the Ponikev Formation whose age is documented in other areas as Upper Devonian to Tournaisian.

6. The overlying few metres thick greenish silty shale and siltstones yielded trilobites and other fossils of the *Spinibole olgae* Biozone of early Viséan age (CHLUPÁČ 1969) being equivalent of the Březina Shale of the Moravian Karst region.

7. The sequence at Čelechovice is terminated by the thick Kosíř Greywacke of the Lower Carboniferous Culm facies (DVOŘÁK 1966).

As a whole, the Devonian at Čelechovice belongs to the rather shallow-water development of the Moravian Karst type which is distinguished by siliciclastic rocks transgressively overlying the metamorphic pre-Devonian basement and by the dominance of carbonates in the Middle and Upper Devonian. The early onset of carbonate deposition (the First or Čelechovice Cycle in concept of HLADIL 1986), the non-reefoid Upper Devonian and the presence of the rocks of the Ponikev Formation are marked local deviations differing from the typical Moravian Karst Facies type and pointing to basinal influences.

Occurrence and environment

The remains of Middle Devonian trilobites occur at Čelechovice exclusively in the Čelechovice Limestone Member (= "Red Coral Beds", No. 9 in FICNER - HAVLÍČEK 1978).

The lithology is distinguished by dark grey and dark biomicrites and micrites with variable amount of skeletal detritus, larger bioclasts and scattered or clustered remains of benthic organisms. Grey to varicoloured calcareous mudstones with very common calcified organic remains constitute interbeds of generally subordinate thickness. Although the bedding is less regular, bedding planes uneven and lenticular layers common, a small-scale rhythmicity is manifested by alternation of limestone and marl-rich layers. HLADIL (in CHLUPÁČ et al. 1986) recognized generally five, usually around 2 m thick cycles within the Čelechovice Limestone, each cycle starting with marlstones or laminated limestone layers and upwards passing in bindstones with common corals and other fossils. Generally, the micrite components dominate in limestones, and remains of sessile benthic organisms do not form continuous layers.

The fauna of the Čelechovice Limestone is very common and diversified. Although sessile benthic forms, especially corals, stromatoporoids, crinoids and brachiopods are most conspicuous, the frequency of accompanying vagile components – especially ostracods, gastropods, bivalves and other groups cannot be neglected. Organic remains generally show no marked traces of reworking and transport over longer distances. Even very fine surface structures, dendriform colonies or spines are well preserved and overgrowing phenomena are common, all pointing to autochthoneity

of the whole assemblage. The distinct bedding, composition of the whole assemblage with great proportions of sessile benthic forms and the mode of occurrence and preservation point to a biostromal character of the Čelechovice Limestone, although organisms in growth position do not form continuous layers.

Trilobites constitute merely a subordinate component of the assemblage. They are contained mostly in biomicritic dark layers and only sporadically in mudstone marly interbeds. Though subordinate, trilobites cannot be designated as rare (their remains have been found at every author's visit of the locality). Trilobite exoskeletons are generally found disarticulated but only in some cases fragmented – e.g. thinner cranidia of *Dechenella,* larger remains of *Scutellum* etc. Finds of librigenae attached to cranidia and rare articulated and even complete exoskeletons point to autochthoneity of trilobite remains.

The preservation is fairly good: exoskeletal parts of trilobites are fossilized by carbonate enriched with organic matter and obviously show the original convexity. Pressure deformations, however, are frequent especially in larger exoskeletal parts of *Dechenella,* remnants in mudstone are obviously flattened.

The general environment of the Čelechovice Limestone fauna may be regarded as expressively shallow-water. This is stressed by the dominant occurrence of corals, stromatoporoids and other sessile benthic forms. The variable morphology of coral and stromatoporoid colonies (platy, bulbous, dendriform) and rich development of solitary rugoses reflect variable energy conditions. Also common brachiopods belong, according to FICNER - HAVLÍČEK (1978) to various ecotypes of pedunculate and free-lying forms, the latter postulating an environment sheltered from wave action.

The general lithology and composition of fauna of the Čelechovice Limestone shows a great similarity to Middle Devonian shallow-water and biostromal facies widely distributed in Europe (e.g. in the Ardenno-Rhenish area, Russian platform) and other world regions. Typical examples are some formations and members of the Traverse Group of Michigan or the Silica Formation of Ohio and Michigan. An environment of shallow-water shelf, carbonate platform deposits within the sub-turbulent life zone under moderate terrigenous clayey influx may be inferred.

The trilobite assemblages of coral-stromatoporoid facies of Middle Devonian age are generally characterized by dominant proetids of which dechenellids are typical. A rather constant component are scutelluids, particularly the *Scutellum flabelliferum-costatum* group of species. Other trilobites may be present but they are obviously less common and only locally well represented (odontopleurids, harpids, cheirurids, lichaids etc.).

The presence of phacopids – after proetids the second most common group of Middle Devonian trilobites, is markedly variable. Although some biostromes and similar facies contain phacopids (usually less diversified – e.g. in the Traverse Group), other analogous facies lack this group of trilobites entirely or exhibit only rare finds. The Čelechovice Limestone belongs to the latter case, and, in spite of an efficient collecting activity for more than hundred years, no remain of phacopids has been

found. It should be remembered that phacopids are lacking in some true reef (esp. reef-core) facies of Devonian times (CHLUPÁČ 1977, 1983). All this suggests that some so far unknown factors (life activity of corals or stromatoporoids?) prevented the development of phacopids in these biotopes.

The age of fauna

Although the local stratigraphy of the Devonian at Čelechovice is well known and has been studied since the 19th century, the chronostratigraphic assignment of the main fossiliferous unit – the Čelechovice Limestone – is under discussion.

The earlier authors obviously regarded the "Red Čelechovice Coral Beds" (= Čelechovice Limestone) as late Givetian, having been influenced by the occurrence of thick-shelled stringocephalid brachiopods in underlying part of the sequence and the presence of *Calceola sandalina westphalica* LOTZE (determined by R. Richter, 1928) in the fossiliferous layers (KETTNER 1932, KETTNEROVÁ 1932, ŠPINAR 1941, HAVLÍČEK 1951, POKORNÝ 1951).

Based on the occurrence of *Schizoproetus celechovicensis* (SMYČKA) and the correlation with the Moravian Karst area, CHLUPÁČ (1964) regarded the lower Givetian age as appropriate and the same age was deduced from the study of *Alpenoceras* (MAREK 1976) and from the revision of brachiopods by FICNER and HAVLÍČEK (1978).

HLADIL (1983, 1984, 1986) placed the Čelechovice Limestone to the late Eifelian or near the Eifelian-Givetian boundary (tabulate Zone with *Spongioalveolites intermixtus*) and an analogous position was inferred from the study of rugose corals by Galle (1985, *Cyathophyllum dianthus-Thamnophyllum caespitosum* Assemblage Zone).

As the internationally accepted Eifelian-Givetian boundary has not been reached as yet, the exact chronostratigraphical assignment is difficult and so far depends on indirect biostratigraphical indications.

Trilobites themselves cannot resolve in the present stage of knowledge the problem of the Eifelian-Givetian boundary, as most species of the broader boundary interval occur either in both late Eifelian and lower Givetian strata, or their exact occurrence in relation to conodont zonation is unknown (this concerns most of the older European and other collections).

The stratigraphical value of trilobites here described may be summarized as follows:

Schizoproetus celechovicensis: Known only from the Čelechovice Limestone or its equivalents at Čelechovice, Přerov and in the Moravian Karst; related species known from Eifelian and possibly lower Givetian strata.

Dechenella rittbergensis: Known with certainty only from the Čelechovice Limestone (Čelechovice, Grygov, Přerov), occurrences in other regions questionable; closely related species in the late Eifelian and early Givetian.

Gerastos (*Longiproetus*) *moravicus:* Occurs in the Čelechovice Limestone (Čelechovice, Přerov) and in the lower part of the Skaly Formation of the Holy Cross Mts. (intervals XIII–XVII according to PAJCHLOWA, 1957, presumed P. ensensis Zone, J. MALEC, letter of October, 1989).

Cyphaspis ceratophthalmoides: Known only from the Čelechovice Limestone of the type locality. *Cyphaspis* is a conservative genus of long range (Silurian to Frasnian).

Scutellum flabelliferum: A widely distributed species with maximum development in the late Eifelian but presence in the lower Givetian also known.

Ancyropyge sola: North American occurrences of the genus in the Middle Devonian, closely related *A. manitobensis* occurs in the Winnipegosis Formation of Manitoba which is ranged with the late Eifelian to lower Givetian by NORRIS et al. (1982), by JOHNSON et al. (1985) correlated with the *pseudofoliatus* interval.

The stratigraphical relationships of the trilobite fauna from the Čelechovice Limestone point to the Eifelian-Givetian boundary interval (most probably the equivalent of the Polygnathus ensensis Zone).

Relative frequency of occurrence

The relative frequency of occurrence of trilobites from the Middle Devonian of Čelechovice is shown on fig. 3 which is based on all specimens available.

Regarding the objectivity of data depicted, it should be remembered that best part of the material was collected by private collectors or workers in the quarries who paid attention particularly to conspicuous and mostly larger fossils. Exceptions in this respect are represented by large collection of F. Ficner who collected all specimens gained by washing of clayey layers (these, however, are not suitable for preservation of larger specimens of trilobites).

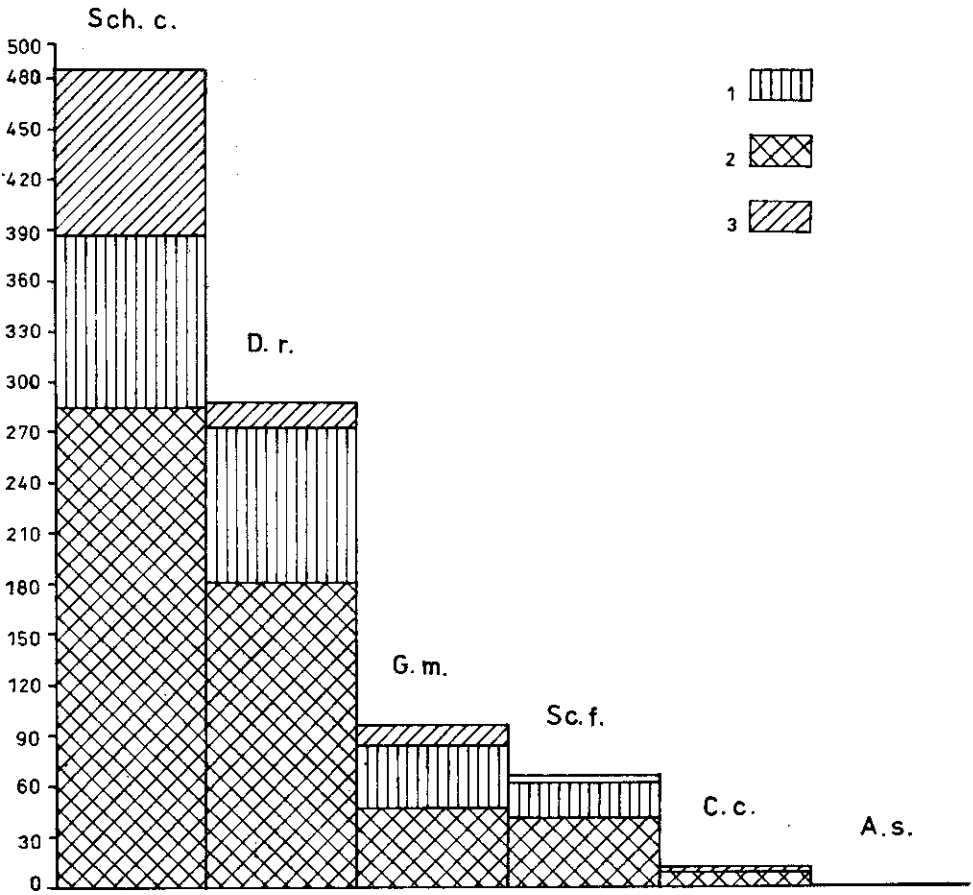
Author's own collections during which all trilobite remains were registered, show that *Schizoproetus celechovicensis* is by far the most common trilobite at Čelechovice. Its frequency markedly dominates over other species differing from that of *Dechenella rittbergensis* in a greater degree than shows the diagram on fig. 3.

Dechenella rittbergensis seems to be less frequent than is the case in *Gerastos moravicus* and small dimensions of the latter may be responsible for its much poorer representation in old collections.

Scutellum flabelliferum is rather rare but its fragments are more frequent than it might be concluded from published data. Systematic search for trilobites leads to discovery of its remains almost every day of thorough investigation.

Cyphaspis ceratophthalmoides is rare but evidently underestimated in its frequency due to small dimensions.

Ancyropyge sola is the unique trilobite at Čelechovice and belongs to expressive rarities. (The same concerns *Ancyropyge* sp.).



3. Quantitative representation of so far known remains of trilobites from the Čelechovice Limestone at Čelechovice
1 — cranidia, *2* — pygidia, *3* — other parts of the exoskeleton, Sch. c. — *Schizoproetus celechovicensis*, D. r. — *Dechenella rittbergensis*, G. m. — *Gerastos* (*Longiproetus*) *moravicus*, Sc. f. — *Scutellum flabelliferum*, C. c. — *Cyphaspis ceratophthalmoides*, A. s. — *Ancyropyge sola* and *Ancyropyge* sp.

Author's field observations result in the following row of descending frequency of trilobites in the Čelechovice Limestone: 1. *Schizoproetus celechovicensis* (dominant), 2. *Gerastos moravicus* (rather frequent), 3. *Dechenella rittbergensis* (less frequent), 4. *Scutellum flabelliferum* (rather rare), 5. *Cyphaspis ceratophthalmoides* (rare), 6. *Ancyropyge sola* (unique).

Systematic part

Family *Dechenellidae* PŘIBYL, 1946

Genus *Schizoproetus* RICHTER, 1912

Type species: *Proetus čelechovicensis* SMYČKA, 1895

Schizoproetus celechovicensis (SMYČKA, 1895)

Text-figs. 4, 5; pls. I, II

1892 *Proetus* sp.; ZIMMERMANN, p. 119.
1895a *Proetus čelechovicensis* nov. sp.; SMYČKA, p. 11—12, pl. 1, fig. 3a—c.
1895b *Proetus čelechovicensis* nov. sp.; SMYČKA, p. 6—7, pl. 1, fig. 3a—c.
— *Cyphaspis* sp.; SMYČKA, p. 9.
1895c *Proetus čelechovicensis* nov. sp.; SMYČKA, p. 136—137, figs. 42, 3e, f, g.
1901 *Proetus čelechovicensis* SMYČKA; SMYČKA, p. 3.
1904 *Proetus čelechovicensis* SMYČKA; SMYČKA, p. 313—314., pl. 1, figs. 1—3.
1906 *Proetus čelechovicensis* SMYČKA; SMYČKA, p. 60, 63.
1912 *Schizoproetus čelechovicensis* (SMYČKA); R. RICHTER, p. 331—334, pl. 20, figs. 10—16.
1913 *Schizoproetus čelechovicensis* (SMYČKA); REMEŠ, p. 5—6.
1950 *Schizoproetus čelechovicensis* (SMYČKA); RICHTER et RICHTER, p. 179.
1955 *Schizoproetus čelechovicensis* (SMYČKA); HUPÉ, p. 207, fig. 181, 2.
1957 *Schizoproetus čelechovicensis* (SMYČKA); STRNAD, p. 55.
1959 *Schizoproetus celechovicensis* (SMYČKA); MOORE et al., p. 089, fig. 297 (4a, b).
1964 *Schizoproetus celechovicensis* (SMYČKA); CHLUPÁČ, p. 442—444, 447, pl. 1, figs. 1—6, pl. 2, figs. 1—5.
1985 *Schizoproetus celechovicensis* (SMYČKA); KUPKOVÁ et PEK, p. 25—26.

Lectotype: Pygidium (S1844) figured by Smyčka (1895) on pl. 1, fig. 3c, refigured here on pl. I, figs. 13, 14.

Type locality: Čelechovice, Moravia.

Type horizon: Čelechovice Limestone, Middle Devonian.

Material: 2 almost complete exoskeletons, 103 cranidia, 94 librigenae, 285 pygidia, all preserved in limestone less affected by deformation.

Description: Anterior border of cranidium sag. narrow, strongly convex, semicircular in sag. cross-section, with fine terrace lines (4—5 on dorsal surface, some of them gently undulate); ABF sharp, very deep in front of glabella, preglabellar field absent.

Glabella subquadrate in outline, parallel-sided, broadly rounded anteriorly, slightly constricted between γ, strongly convex sag. and tr., maximum width between posterolat. corners of L1; GL/GW ratio around 1.3. Four pairs of glabellar furrows: S1 deep, in post. section almost parallel with sag. line, connected with the occipital furrow; transversally directed auxiliary impressions connected with S1. S2 almost parallel with ant. section of S1, shallower, connected with dorsal furrow abax. S3 shallower and shorter than S2, directed transversally, abax. connected with dorsal furrow. S4 parallel with S3 but markedly shallower and shorter, distant from dorsal

furrow. Lateral lobe L1 markedly convex, totally separated from median area, tr. narrower than 1/3 of glabellar width. Occipital furrow deep, transversal medially, bifurcated abax., sharply delimiting markedly convex small occipital lobes. Occipital ring strongly convex tr., in lateral view not exceeding the convexity of glabella, median node situated close to post. margin.

Fixigenae very narrow, anterior part steeply slopes anterolat., with a narrow posterolaterally widening ridge. Palpebral lobe rather small, strongly curved and thickened abax., sloping adax. in anterior view. Facial suture: anterior section $\beta-\gamma$ slightly divergent (around 20° from exsag. line), β broadly arcuate, not reaching the dorsal furrow, γ strongly approached to dorsal furrow, section $\varepsilon-\zeta$ parallel with the dorsal furrow for a long distance, from PBF abax. strongly divergent and reaching the post. margin far abax. Dorsal furrow of moderate depth, shallowed at occipital ring.

Librigena: Eye large, high and reniform visual surface strongly convex abax., smooth in $\times 20$, separated from genal field by unsharp furrow. Genal field subdivided by narrow raised ridge (keel) in a markedly smaller concave inner platform and broader, markedly abax. sloping outer part. Inner platform and outer slope with radiating pattern of genal caeca, ridge (keel) broadened at genal angle. Rather deep LBF sharply delimits the narrow and convex lateral border; LB with terrace lines concentrated at outer margin (6–8, some gently undulate). PBF very deep, V-shaped in cross-section; PB strongly convex., slightly broadened abax.; short genal spine with longitudinal groove.

Outer cephalic doublure gently convex ventrally, with terrace lines parallel with outer margin.

Thorax of 10 segments. Axis semicircular in tr. cross-section, very gently tapering post. (last ring only slightly narrower tr. than the first). Axis slightly broader tr. than pleurae in dorsal view, narrower than tr. width of pleurae if measured dorsolaterally. Dorsal furrow unsharp. Pleurae in adax. part horizontal, in abax. parts steeply sloping laterally. PF obsolete adax., deepened and slightly widened abax., anterior bands markedly sag. narrower and less convex than the posterior ones. Abax. tips of pleurae broadened and rounded.

Pygidium large, semioval in outline, PL/PW ratio around 0.8 (see fig. 5). Strongly convex axis with parabolical tr. cross section tapers moderately post., postaxial area steeply slopes toward PBF. 13 up to 14 axial rings + articulating halfring and almost vertically falling terminal piece. Rings transversal, RF very deep adax. and of U-shaped cross-section medially, markedly shallowed near dorsal furrows and between posterior rings. RF do not reach the dorsal furrows in posterior 4 to 5 rings. Lateral parts of rings with shallow, less conspicuous appodemal impressions. On internal moulds, rings markedly narrower sag. than extremely wide RF, shallowed near dorsal furrows, apodemal impressions distinct.

Pleural region gently convex in adax. part, abax. part falls almost vertically to the border. Generally 9 (exceptionally 10) ribs and a small free space or indication of

additional posterior rib. PF very deep, U-shaped in sag. cross-section, two posterior PF shallowed adax. Ribs sigmoidal, abax. parts of anterior ribs distinctly curved backwards. IPF narrow and fine, in well preserved specimens perceptible from dorsal furrow up to the border furrow (except the last one or two ribs). Slightly abax. deepened IPF subdivide ribs in sag. broader anterior and narrower posterior bands (on internal moulds PF distinctly broader than ribs, ribs markedly flattened, near dorsal and border furrows form narrow ridges with rounded crests and slight indications of IPF). Border furrow broad and unsharp, noticeably shallowed at two ant. ribs where IPF continue to border. Border markedly convex and moderately wide, clearly differentiated by its convexity from pleural regions; its width is constant in the whole course (internal mould: border narrower and less convex, PF continue as shallow depressions to border). Pygidial doublure narrow, ventrally convex, with fine terrace lines.

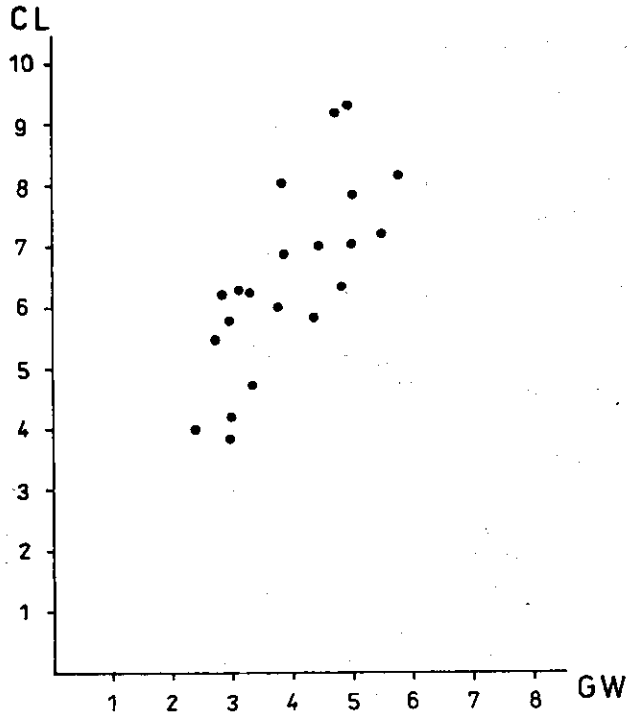
Sculpture: Glabella coarsely tuberculated, largest tubercles in frontomedian part where they show flattened tops and asymmetrical, scaly pattern; all tubercles die out in proximity of dorsal furrows. Occipital ring with tubercles of unequal size concentrated in posteromedian area, palpebral lobes with one row of small granulae at abax. margin. Inner platform of genal field with radiating pattern of genal caeca combined with sparse granules, genal ridge (keel) with one row of prominent granules, distant granules of unequal size combined with genal caeca in the outer part of genal field. Thoracic segments with unequal granules concentrated in post. part of rings, one row of less expressive granules on both bands of pleurae. Pygidium: granulae in adax. parts of rings form 3 to 5 longitudinal rows on axis; rather distant granulae of unequal size form single tr. row on each pleural band (larger and more distant on the anterior, smaller and closer on the posterior bands); irregularly scattered granulae on the border. Longitudinal and oblique fine ridges near ventral margin of the border.

Dimensions: Two almost complete exoskeletons show total sag. length 21 mm (W 1901.II.19), and 17.5 mm (L28850 – cephalon somewhat flexed anteroventrally, reconstructed total length 20 mm). The lectotype shows PL = 5.3 mm, PW = 6.4 mm. Dimensions of other measurable cephala and pygidia are shown in figs. 4 and 5.

Ontogeny: The smallest cranidium found (FF52, MM Ge25642) having sag. length 4 mm and GL = 2.9 mm shows a lesser tr. and sag. convexity of glabella, simply adaxially bent S1, imperceptible auxiliary impressions and S4, less divergent ant. sections of facial sutures (5–10° to the exsag. line), fewer terrace lines on the ant. border and more prominent occipital node (pl. I, fig. 5).

The smallest pygidium (FF7) of PL = 2.3 mm, PW = 3.8 mm shows 11 complete rings and 7 to 8 ribs; border is relatively wider, steeply sloping abax. Somewhat larger pygidia of PL = 3 mm and PW about 4 mm have 12 complete axial rings and 8 to 9 ribs, the general convexity being smaller than in later ontogenic stages. Pygidia of PL = 4 mm agree in most features with adult specimens, although their general convexity is smaller.

Individual variability expressed in specimens of analogous dimensions con-



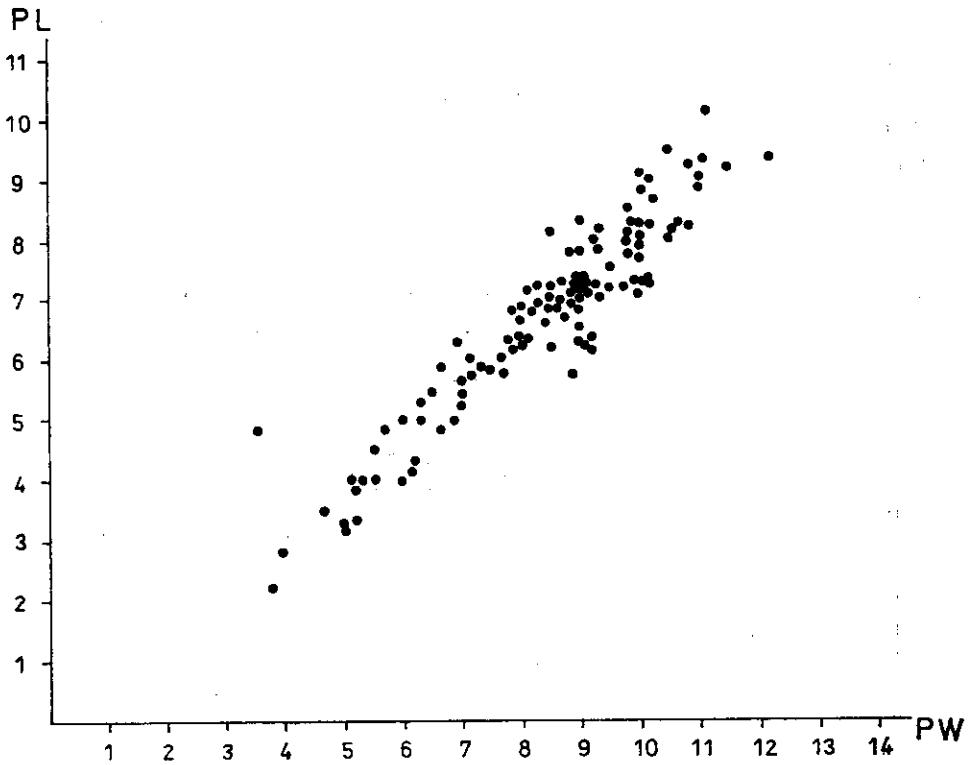
4. *Schizoproetus celechovicensis*, dimensions of measurable cranidia CL — length of cranidium (sag.), GW — width of glabella

cerns the development of S4 (not always perceptible), number of terrace lines on dorsal side of AB (5 to 10) and minor differences in sculpture. Pathologic feature is seen in pygidium MM23196 which possesses a medially interrupted eighth ring (pl. II, fig. 7).

Remarks: Diagnostic features of *S. celechovicensis* may be seen particularly in markedly convex and narrow AB, subparallel-sided and coarsely tuberculated glabella, pronounced genal caeca on genal field, large number of pygidial rings, broad RF and PF on pygidium and clearly differentiated convex border.

Of the other representatives of the genus, only *S. baschkiricus* and *S. salairicus* show marked resemblances.

S. baschkiricus MAKSIMOVA, 1955 from the Bija Formation of the South Ural Mts. (according to MAKSIMOVA lower Givetian, Eifelian according to recent correlations, comp. RŽONSNICKAJA 1983), differs in glabella markedly narrowed ant., S1 simply arcuate and shallower, not connected with the occipital furrow, more divergent ant. section of facial suture, tr. broader ant. part of fixigenae, absence of genal caeca on librigenae, pointed post. pygidial border behind axis, equal sag. width of pleural



5. *Schizoproetus celechovicensis*, dimensions of measurable pygidia
PL — length of pygidium (sag.), PW — width of pygidium (tr.)

bands on pygidium, generally finer granulation on glabella and pygidium and in presence of pitting on ant. part of fixigenae and on the genal field.

S. salairicus (TCHERNYSHEVA, 1951) from the Pesterev Limestone of the Mamontovo Formation of Salair (originally referred to the lower Givetian, later correlated with the Eifelian, e.g. JËLKIN 1983) differs – according to the description by JËLKIN (1968) – in less convex glabella of subcylindrical outline, simply arcuate and post. shallowed S1, larger occipital lobes, less convex AB and LB on cephalon, absence of genal caeca, sag, longer pygidium with narrower RF, less distinct post. ribs, shallower BF and less upraised border. Sculpture is represented by finer granulation of cranidium and pygidium and pitting of ant. part of fixigena and genal field.

Other representatives of the genus, namely *S. onyx* (R. RICHTER, 1912), *S. podgornensis* MAKSIMOVA, 1977 and *S. dechenelloides* MAKSIMOVA, 1977 differ markedly from *S. celechovicensis* in the configuration of cephala and pygidia and probably do not belong to the same lineage. The Silurian "*Proetus*" *delicatus* HEDSTRÖM, 1923 referred to *Schizoproetus* by OWENS (1973), shows markedly different outline of glabella, broad S1, two pairs of auxiliary impressions, large occipital lobes, no

raised ridge on genal field and different sculpture; in spite of some analogy in configuration of pygidium, a different genus seems to be involved.

Occurrence: Fairly common in the Čelechovice Limestone at Čelechovice and in its equivalent at Zrcadla near Lažánky in the Moravian Karst (CHLUPÁČ 1964); rare in coeval limestones in borehole Př III near Přerov (CHLUPÁČ 1966).

Genus *Dechenella* KAYSER, 1880

Type species: *Phillipsia verneuili* BARRANDE, 1852, Middle Devonian, Germany.

Dechenella rittbergensis ZIMMERMANN, 1892

Text-fig. 6, pls. III, IV, V

1892 *Dechenella Verneuili* BARRANDE; ZIMMERMANN, p. 118—119, pl. 1, fig. 3.
— *Dechenella rittbergensis* ZIMMERNMAN; ZIMMERMANN, p. 119, pl. 1, fig. 4.
1895a *Dechenella Verneuili* (BARRANDE); SMYČKA, p. 9—11, pl. 1, figs. 2a—d.
1895b *Dechenella Verneuili* (BARRANDE); SMYČKA, p. 5—6, pl. 1, figs. 2a—d.
1895c *Dechenella Verneuili* (BARR.); var. *moravica* m.; SMYČKA, p. 136, figs. 42, 1a.
1901 *Dechenella Verneuili* (BARRANDE); SMYČKA, p. 2—3.
1904 *Dechenella Verneuili* (BARRANDE); SMYČKA, p. 13.
1907 *Dechenella Verneuili* BARRANDE; SMYČKA, p. 60, 63.
1912 *Dechenella* (*Eudechenella*) *rittbergensis* ZIMMERMANN; R. RICHTER, p. 307—310, pl. 20, figs. 1—7.
1913 *Dechenella* (*Eudechenella*) *rittbergensis* H. ZIMMERMANN (emend. Rud. RICHTER); REMEŠ, p. 6.
1950 *Dechenella* (*Dechenella*) *rittbergensis* ZIMMERMANN; RICHTER et RICHTER, p. 177.
aff. 1955 *Dechenella* (*Dechenella*) aff. *rittbergensis* ZIMMERMANN; MAKSIMOVA, p. 70—71, pl. 3, fig. 1.
1957 *Dechenella* (*Eudechenella*) *rittbergensis* ZIMMERMANN; STRNAD, p. 55, fig. 2.
non? 1968 *Dechenella rittbergensis* ZIMMERMANN; CAMUZARD et al., p. 471.
non? 1969 *Dechenella* (*Dechenella*) *rittbergensis* ZIMMERMANN; PILLET in CAMUZARD et RIVIÉRE, p. 49—50, pl. 2, figs. 1—5.
1970 *Dechenella* (*Dechenella*) *rittbergensis* ZIMMERMANN; HORNÝ et BASTL, p. 323.
1985 *Dechenella* (*Dechenella*) *rittbergensis* ZIMMERMANN; KUPKOVÁ et PEK, p. 34—35, 36—37.

Lectotype: Cranidium with articulated librigena (W1901.II.15) figured by R. RICHTER (1912) on pl. 20, fig. 2a, b; refigured here on pl. IV, figs. 1, 2.
Type locality: Čelechovice, Moravia.
Type horizon: Čelechovice Limestone, Middle Devonian.
Material: 1 enrolled specimen, 8 cranidia with attached librigenae, 24 isolated cranidia, 8 isolated librigenae, 2 posterior thoracic segments with pygidium, 181 pygidia. All preserved in limestone, gently deformed in some cases.

Description: Anterior border of cranidium flat, gently sloping post., attaining one sixth to one seventh of the sag. cranidium length, with less expressive terrace lines on outer margin. ABF shallow and unsharp, preglabellar field narrow, flat and slightly inclined anteriorly. Glabella pear-shaped, parabolically rounded ant., constricted

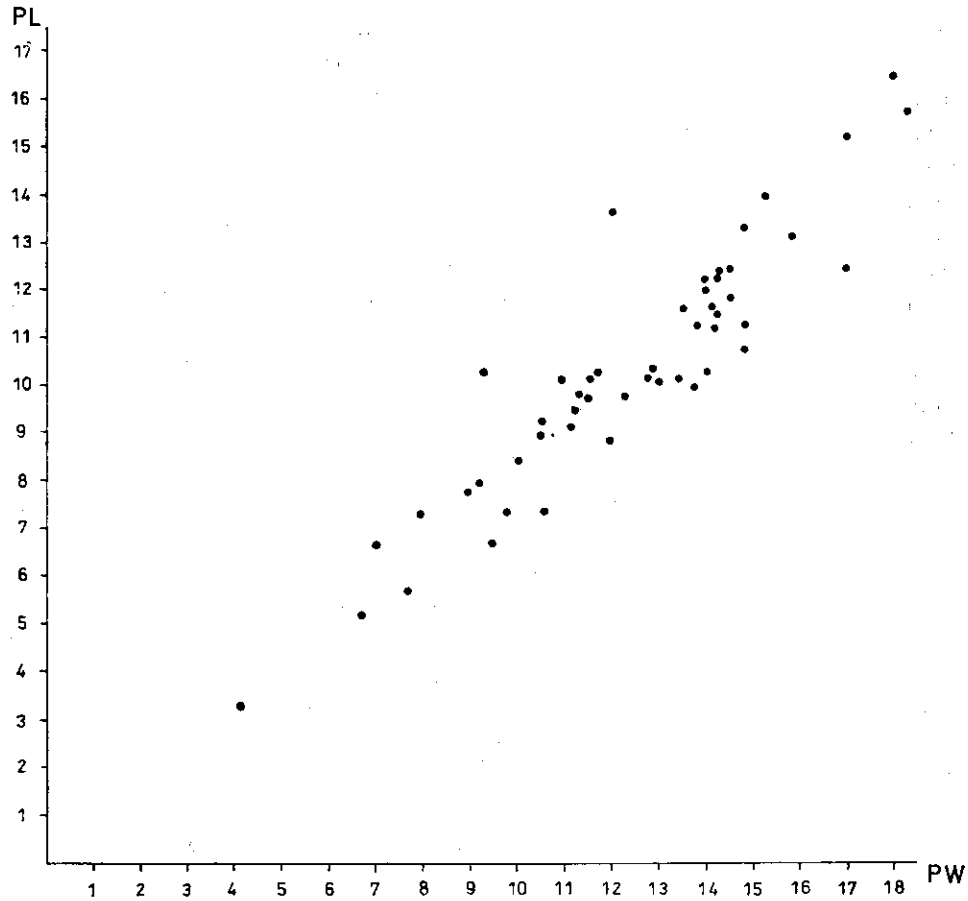
between γ, maximum tr. width between anterolat. corners of L1. Glabella generally longer than wide (GL/GW = 1.3 on average, often deformed), moderately vaulted longitudinally, low-arcuate transversely. Glabellar furrows: S1 markedly deeper than other, arcuate, widened and deepened in ant. section, abax. ending at a very short distance from dorsal and greater distance from occipital furrows. Auxiliary impressions incised as short depressions either prolonged parallel with the adax. part of S1 or directed transversely and connected with S1 (L23190), S2 shallower than S1, parallel with ant. section of S1, abax. ending close to dorsal furrow. S3 parallel with S2, shallower and markedly shorter, abax. reaching the dorsal furrow. The distance between S1 and S2 is about 1/3 greater than that between S2 and S3. S4 marked as a short and very faint depression prolonged parallel with S3, distant from dorsal furrow (not perceptible in some specimens). Lateral lobes low, not exceeding from low convexity of glabella. Some specimens show a keel-like longitudinal elevation in post. part of glabella, completely absent in others (generally well perceptible on internal moulds – e.g. MM23229). Occipital furrow narrow and deep, flexed anteriorly in median part and near dorsal furrows. Occipital lobes subtriangular, prolonged tr., lower than L1; small median tubercle close to post. margin.

Dorsal furrows narrow, incised near palpebral lobes. Anterior part of fixigena flat and gently sloping anterolat. Palpebral lobe of medium size, strongly curved abax., lower than glabella in ant. view. Facial suture: Anterior section between β and γ moderately divergent (angle of divergence from exsag. line around 30–35°), rather rectilinear, β and γ rounded, γ approaches the dorsal furrow at a small distance, δ closer to sag. axis than β, section $\varepsilon-\zeta$ parallel with dorsal furrow, strongly diverging posterolat. from PBF.

Librigena: Eye large, with reniform abax. convex visual surface extending from a point opposite to S3 to the post. quarter of L1. Lenses not seen at $\times 20$. Genal field gently convex, divided by unsharply indicated keel in flatter inner platform and lat. sloping outer part; inner platform with weakly expressed radiating pattern of genal caeca. LBF broad and unsharp, shallowing towards genal angle, PBF narrower and sharper. LB gently convex, of equal width within its whole course; PB moderately convex and widened abax. Genal spine short with less marked longitudinal groove.

Thoracic segments (only 6 exposed for study, L28864, MM23271) show strongly convex axial rings (tr.) and rather narrow pleurae with deeply incised PF dividing pleurae in narrower ant. and wider post. bands (sag.); tips of pleurae broadly rounded.

Pygidium large, semioval in outline, PL/PW ratio averages 0.7 or 0.8. Strongly tr. convex axis gradually tapers post. being distinctly narrower than lateral lobe (about 2/3) and ending ant. to PBF. 15 to 16 complete axial rings and further slight indications of up to 3 posterior partly fused rings diminishing backwards. RF deep, in post. part shallowing medially and interrupted in last 3 to 4 rings. RF reach the dorsal furrows in about 12 rings, posterior RF dying out at a distinct distance from dorsal furrows. Terminal piece slopes very steeply post. and passes into weakly indicated and narrow postaxial ridge. On internal mould, RF broad and deep, medially



6. *Dechenella rittbergensis*, dimensions of measurable pygidia (explanations of symbols as in fig. 5)

shallowed up to interrupted in post. rings; rings sag. narrow and crest-like. Shallow apodemal impressions form a longitudinal row in lateral area of axis.

Pleural region broad, moderately convex; 11 to 12 complete ribs (+ empty space or indication of another post. rib) delimited by very narrow and sharp PF (shallower at posterior 3–4 ribs). On internal moulds, PF wider than ridge-like rib elevations continuing as very shallow impressions on the border – L23223). Ribs low, only very slightly widened abax., post. 4–5 ribs retain equal sag. width within the whole course. IPF very narrow and shallow, usually defined on 6 to 7 (in some specimens even 9 to 10) anterior ribs, slightly deepened at dorsal furrows and to a minor extent at the border furrow, in anterior two to three ribs continuing on border. Adax. deepening of IPF perceptible even in internal moulds. Anterior and posterior pleural bands of equal low convexity, sag. length of both bands equal in ant. ribs, in post.

ribs ant. bands wider. BF broad and shallow, unsharp; border differentiated and accentuated by ends of ribs and furrows. Border rather broad, slightly convex and sloping abax. On internal moulds (e.g. MM 23223) PF continue even on the border as shallow impressions dying out abax.; similar impressions are present even in postaxial region where no true PF appear.

Sculpture: Exoskeleton superficially smooth, no granulation. Surface (except furrows) finely pitted – pits distant, unequal in size and rather irregularly spaced (distinct especially on cephalic and pygidial borders, glabella and genal field). Irregular oblique and subparallel fine ridges near outer margins of cephalon and pygidium. In some specimens, fine radiating ridges observed at LBF of librigena (MM1134).

Dimensions: The lectotype (W 1901.II.9) shows CL = 15 mm, GL = 11.1 mm. Dimensions of measurable pygidia are shown in fig. 6.

Ontogeny: Ontogenic changes are seen in glabella which is wider in younger specimens (GL/GW ratio about 1) and possesses a longitudinal sag. keel – e.g. L28847. The smallest pygidium known (S1839) has PL = 3.4 mm and PW = 4.1 mm; its post. termination is broken off and only 13 rings and 11 ribs are preserved (pl. V, fig. 3). Distinct IPF are developed on 6 ant. ribs, most part of the border is covered by oblique ridges. Other small pygidia (MM23264, MM25641) of PL = 4.7 to 5 mm and PW = 5 to 5.8 mm (slightly deformed) have already a full number of axial rings and 11 ribs. The only difference from larger specimens seems to be sharper IPF and abax. more steeply inclined and less differentiated border.

Pathologic features: The pygidium MM23216 shows strong modification of posterior ribs: the sixth and seventh ribs on the left pleural lobe are partially fused and the seventh rib interrupted by an asymmetrical arcuate incision, whilst the eighth rib is sag. broadened. On the right pleural lobe, a similar malformation is seen on the sixth and seventh rib. Some irregularities are seen on the axis – the tenth axial ring is thickened and posterior RF are less regular (internal mould) – see pl. V, fig. 9. A slighter malformation is shown in MM25632 which exhibits an interrupted and less regular PF between the fourth and the fifth ribs on the left pleural lobe.

Remarks: SMYČKA (1895–1906) regarded this species as conspecific with *D. verneuili* (BARRANDE), but later study by R. RICHTER (1912) proved its separate position. The lectotype was selected by RICHTER et RICHTER (1950: 177).

The specimens from the type locality show some differences which may reflect either individual variability or discrete differences in preservation, i.e. somewhat changing GL/GW ratio, varying distinctness of auxiliary impressions on glabella and of genal caeca on librigena. Differences in sag. length of preglabellar field are most probably caused by secondary deformation.

D. rittbergensis was reported by CAMUZARD et al. (1968) and PILLET (1969) from the impure Givetian limestone at Villedé d'Ardin (Vendée Massif, France). A direct comparison of specimens (pygidia) housed in the collections of the Université Catholique d'Angers and kindly loaned for study by Prof. H. Lardeux (Rennes), shows a wider and more convex border and deeper border furrow than is the case in speci-

mens from Moravia. Although these differences are probably accentuated by flattening, the identity of species cannot be regarded as proved.

D. rittbergensis shows close affinities to several other species. *D. setosa* Whidborne, 1889 from Chercombe Quarry, Devonshire (late Eifelian or lower Givetian) shows, according to SELWOOD (1965), a high degree of variability. Among differentiating features of *D. setosa* there are: weakly impressed glabellar furrows, sag. wider ant. cephalic border, more convex post. end of pygidial axis, less abax. sloping pygidial border, somewhat post. constricted axis, fine granulation on rings and pygidial border.

D. polonica GÜRICH, 1896 from the lower Givetian strata of Skaly, Holy Cross Mts., Poland (intervals XV–XVIII in PAJCHLOWA, 1957) differs, according to the redescription by KIELAN (1954), in a shorter and wider glabella with markedly shorter frontal lobe, wider ant. cephalic border, larger palpebral lobe, more ant. convex occipital furrow, sag. shorter pygidium with a smaller number of rings (14) and ribs (8–10), and in a flatter border.

D. alpenensis STUMM, 1953 from the Middle Devonian Traverse Group of Michigan shows close similarities but differs especially in having shorter S3, absent S4, larger eyes, longer genal spines, absent occipital node, sag. shorter frontal lobe and smaller convexity of pygidium.

D. maclareni ORMISTON, 1967 from the Blue Fiord Formation (Eifelian) of the Bathurst Island, Canadian Arctic, thoroughly described by ORMISTON (1967), shows a shorter and wider glabella, curved S2 and S3, larger occipital and palpebral lobes, shorter and more divergent ant. section of facial suture, medially fused axial rings in a substantial part of pygidial axis, broader PF on pygidium, more convex and less sloping pygidial border and smooth exoskeleton surface.

The comparison with *D. verneuili* (BARRANDE, 1852) from the Middle Devonian of Germany (Fleringer Formation, lower Givetian) was presented by R. RICHTER (1912: 309–310).

Occurrence: Rather common in the Čelechovice Limestone at Čelechovice, rare in coeval strata at Přerov (borehole Př III, CHLUPÁČ 1966) and at Grygov.

Family *Proetidae* HAWLE et CORDA, 1847

Genus *Gerastos* GOLDFUSS, 1843

Subgenus *Gerastos* (*Longiproetus*) CAVET et PILLET, 1958

Type species: *Proetus tenuimargo* RICHTER, 1909; Middle Devonian, Germany.

Gerastos (*Longiproetus*) *moravicus* (SMYČKA, 1895)

Text-fig. 7, pl. VI

1895a *Proetus moravicus* nov. sp.; SMYČKA, p. 12–13, pl. 1, figs. 4a–d, text-fig. on p. 13.

1895b *Proetus moravicus* nov. sp.; SMYČKA, p. 7—9, pl. 1, figs. 4a, b, d, text-fig. 4c.
1901 *Proetus moravicus* SMYČKA; SMYČKA, p. 3.
1904 *Proetus moravicus* SM.; SMYČKA, p. 14—15.
1907 *Proetus moravicus* SM.; SMYČKA, p. 60, 63.
1913 *Proetus moravicus* SMYČKA; REMEŠ, p. 5.
1954 *Proetus* (*Proetus*) *moravicus* SMYČKA; KIELAN, p. 11—13, pl. 2, figs. 5—7, text-figs. 5, 6.
1969 *Proetus* (*Proetus*) *moravicus* SMYČKA; ALBERTI, p. 74, 446.
1970 *Proetus* (*Proetus*) *moravicus* SMYČKA; HORNÝ et BASTL, p. 209.

Lectotype: Cranidium (with exoskeleton) S1848, figured by SMYČKA (1895) on pl. 1, fig. 4a; refigured here on pl. VI, figs. 1—3.
Type locality: Čelechovice, Moravia.
Type horizon: Čelechovice Limestone, Middle Devonian.
Material: 37 cranidia, 12 librigenae, 46 pygidia; all preserved in limestone, mostly without marked deformations.

Description: Exoskeleton thick-shelled. Cranidium with sag. narrow, moderately convex AB (arcuate in sag. cross-section), 5—7 terrace lines near outer margin at rather regular distances. ABF deep, preglabellar field absent.

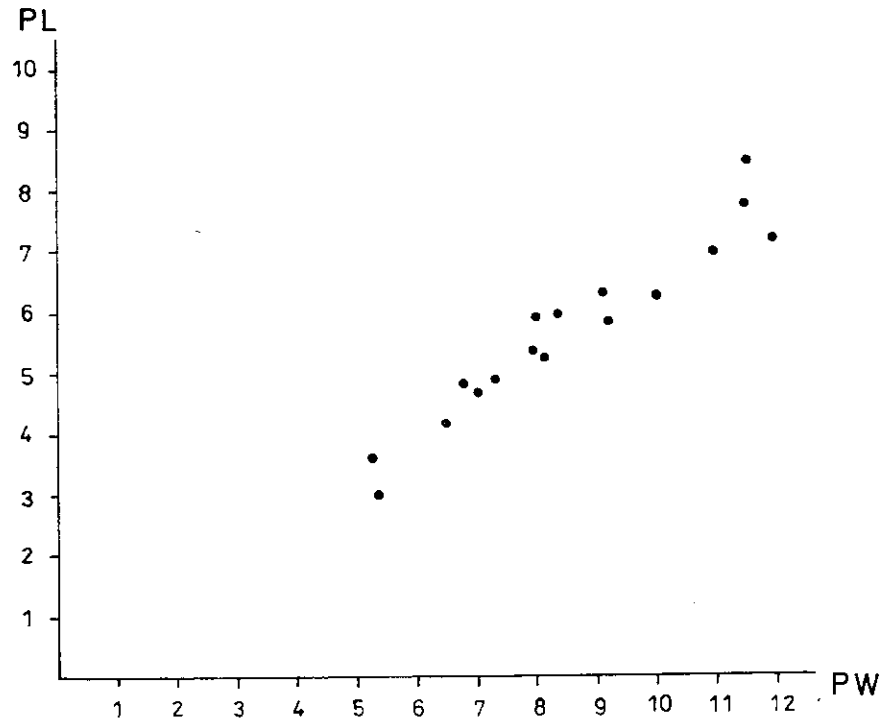
Glabella very long (0.7 to 0.8 of the total sag. CL), outline tongue-like, broadly rounded anteriorly, very slightly constricted between γ, strongly arcuately convex tr. and sag. (in lateral view ant. slope gradual, post. slope steep towards the occipital furrow). GL/GW ratio almost equal (1.2—1.3 up to 1.0). Glabellar furrows not impressed on carapace surface and marked as darker lines without sculpture: S1 arcuate, adax. termination distant from occipital furrow, abax. end very close to dorsal furrow. S2 gently arcuate, not connected with dorsal furrow, widened adax. S3 marked as a rather tr. short arc distant from S2 and dorsal furrow. Internal mould: abax. part of S1 gently widened and deepened close to dorsal furrow. Lateral lobes not differentiated by change of convexity. Occipital furrow deep, abax. bifurcated and clearly delimiting markedly convex occipital lobes of suboval outline. Occipital ring strongly convex tr., distinctly lower than glabella in lateral view. Small median tubercle shifted towards post. margin.

Fixigena very narrow, ant. part slopes steeply anterolat., palpebral lobe tr. narrow, slightly convex abax. Post. part of fixigena narrow up to post. end of occipital lobes, then abruptly widened laterally. Facial suture: section $\beta-\gamma$ slightly diverging from exsag. line (angle 5—10°), β broadly rounded, γ very wide, abax. distance of β equal to δ, section $\varepsilon-\zeta$ long, parallel with dorsal furrow, from ζ strongly deflected abax.

Librigena: Visual surface kidney-shaped, large, strongly convex abax. Eye socle narrow, sharply separated by a furrow from the genal field. Genal field moderately convex, without keel, LBF deep, V-shaped in cross-section, shallowed in genal angle. LB gently convex with few (5—7) terrace lines near outer margin. PBF sharp and deep, PB markedly widened abax., genal spine short with longitudinal ridge. Doublure rather flat with few terrace lines.

Pygidium small, semicircular in outline, PL/PW ratio about 0.6. Convex axis

of semicircular tr. cross-section, rapidly tapering backwards, terminal piece steeply slopes post. Seven complete rings + articulating halfring and clearly differentiated small terminal piece. Rings with rounded crests, RF deep, narrower than rings. Well marked subtriangular apodemal impressions form a longitudinal row on lat. side of axis clearly delimiting lateral axial lobes in all ribs except the first and the last. Pleural region moderately convex, abax. parts steeply slope to BF. Four gently convex ribs + a slight indication of the fifth rib or flat triangular area situated post.



7. *Gerastos* (*Longiproetus*) *moravicus*, dimensions of measurable pygidia (explanations as in fig. 5)

PF deep in first two ribs, shallower in post. ones, gently deepened abax., reaching dorsal furrows. IPF narrow and shallow, slightly more incised adax. Ant. and post. bands of ribs of equal sag. width in three anterior ribs, bands in post. ribs less distinct. BF wide and shallow, shallowed in postaxial region. No postaxial ridge, between post. termination of axis and PBF is a post. sloping space narrower than terminal piece sag. Moderately convex border of constant width, distinctly differentiated from pleural region. Pygidial doublure convex ventrally.

Sculpture: Large tubercles with pointed tops concentrated in post. part of glabella, diminishing and lowering anteriorly; ant. part of glabella smooth. Fixigena smooth

except a row of granules bordering the abax. margin of palpebral lobe. Occipital ring with distant coarse granules in median part. A row of small granules on eye socle, genal field with distant conical granules diminishing and dying out towards BF. Pygidium: Axial rings with coarse tubercles of unequal size, large tubercles tend to form longitudinal rows in apical part of axis, terminal piece granulated, ribs with unequal smaller granules on both bands. Border finely and densely granulated, few waved terrace lines at outer margin.

Dimensions: The lectotype – cranidium S1848 has CL = 8.5 mm, GL = 6.3 mm, GW = 4.9 mm. CL of measured cranidia ranges between 4–11.4 mm. Dimensions of pygidia are shown in fig. 7.

Remarks: The prolonged tongue-like glabella, moderately convex AB and lack of genal keel point to *G.* (*Longiproetus*) as emended by ŠNAJDR (1980)*. The type species, *G.* (*L.*) *tenuimargo* RICHTER et RICHTER, 1918 from the Eifelian of the Eifel Hills, differs in having flat AB and LB, smaller occipital lobes, very low eye socle and longer and narrower genal spine. Pygidium shows a less expressed BF, not distinctly differentiated lat. axial nodes, more adax. and abax. incised IPF and smaller granulae on axis.

KIELAN (1954) reported *G.* (*L.*) *moravicus* from the Middle Devonian Skaly Formation of the Holy Cross Mts., Poland. Although some minor differences exist (e.g. in curvature of RF on pygidium), the specimens described and figured by KIELAN (1954) are evidently conspecific with those from Čelechovice.

G. (*L.*) *chamaeleo* RICHTER & RICHTER, 1918 from the Eifelian of the Eifel Hills seems to be closely allied differing only in flattened inner part of AB, wider ant. parts of fixigenae and slightly indicated genal spines.

Occurrence: Not rare in the Čelechovice Limestone at Čelechovice. Rather rare in the Skaly Formation (Eifelian) in the Holy Cross Mts.

Family *Aulacopleuridae* ANGELIN, 1854

Genus *Cyphaspis* BURMEISTER, 1843

Type species: *Phacops ceratophthalmus* GOLDFUSS, 1843; Middle Devonian, Germany.

Cyphaspis ceratophthalmoides R. RICHTER in REMEŠ, 1913

Pl. VIII, figs. 6–10

1913 *Cyphaspis ceratophthalmoides* RUD. RICHTER; REMEŠ, p. 5, pl. 1.
1914 *Cyphaspis ceratophthalmoides* n. sp.; R. RICHTER, p. 312–314, text-figs. 4a–c.
1929 *Cyphaspis* sp.; REMEŠ, p. 244, pl. 1, fig. 5.

*) During the press, *G.* (*L.*) *moravicus* was referred to the newly established genus *Dohmiella* LÜTKE, 1990 [see LÜTKE, F.: Contributions to a phylogenetical classification of the subfamily Proetinae Salter, 1864 (Trilobita). – Senckenberg. lethaea, 71, *1–83*. Frankfurt. a. M. 1990].

1947 *Nováksaspis ceratophthalmoides* (R. RICHTER); PŘIBYL, p. 6.
1954 *Otarion* (*Otarion*) *ceratophthalmoides* (R. RICHTER); KIELAN, p. 24.
1981 *Otarion* (*Cyphaspis*) *ceratophthalmoides* (RICHTER); PŘIBYL et VANĚK, p. 175.

Holotype: Cephalon of a small specimen (L28865) figured by REMEŠ (1913) on pl. 1, figs. A–C and by RICHTER (1914) on text-figs. 4a–c. Refigured here on pl. VIII, fig. 8.
Type locality: Čelechovice, Moravia.
Type horizon: Čelechovice Limestone, Middle Devonian.
Material: 8 incomplete cephala, 1 pygidium.

Description: Cephalon semicircular in outline, strongly vaulted. Anterior border markedly convex, moderately wide sag., with vertical outer margin. In anterior view, AB forms a parabolic arc, roof-like and rather steeply falling laterally. ABF deep and sharp. Preglabellar field moderately wide sag., convex, gently wider than border, steeply sloping ant.

Glabella ovoid in shape, strongly convex, very steeply sloping ant. and lat., in lateral view gently overhanging the preglabellar field. Glabellar furrows: Only the deeply incised S1 discernible, connected with dorsal and occipital furrows and continuing from a point opposite the palpebral lobe posterodorsally and completely separating the moderately convex and rather small L1 lobe. Occipital furrow deep, transversal, widened abax. Occipital ring damaged in all specimens available (generally narrow and moderately convex sag., presence of median tubercle uncertain).

Dorsal furrows deep, broad on internal mould, gently shallowed in preglabellar region. Fixigena together with librigena conical. Ant. part of fixigena slopes very steeply anterolat., palpebral lobe steeply rising abax. and forming together with the visual surface a subcircular stalked and high eye elevation. Posterior part of fixigena very broad tr. near PB. Facial suture: ant. section $\beta-\gamma$ almost parallel with exsag. line (divergent ant. in flattened specimens), post. section strongly divergent.

Librigena quarter-conical, rather wide tr., very steeply sloping lat., eye socle high, differentiated from the genal field by an abrupt change in slope. LB markedly convex, falling vertically at the outer margin. A pronounced longitudinal ridge at ventrolateral margin where also fine terrace lines appear (FF20,24; orig. REMEŠ, 1929 – L28866). PB distinctly narrower than LB, gently widened abax., PBF very narrow. Genal spine prominent, separated from PB by a furrow, moderately long, markedly diverging from exsag. line. Cephalic doublure very steeply falling abax. up to vertically, forming together with the border a tube-like rim.

Thorax: Only the first strongly damaged segment found in connection with cephalon (FF24); axis narrower tr. than pleurae.

Pygidium (found isolated, tentatively assigned to *C. ceratophthalmoides*): Generally small and short, PL/PW ratio 0.7, fairly convex. Axis tr. broader than lateral lobe, with five complete rings. Articulating halfring narrower than the first ring, first and second rings gently bent ant. and divided by clearly broader and deeper RF than the posterior rings which are flattened on the top; posterior ring very short and passing into post. rounded terminal piece. Dorsal furrows deep and rather

wide, indistinct in postaxial region. Pleural region with four ribs and a slight indication of the fifth one. First two PF extend to the proximity of the outer margin, two posterior PF markedly tr. shorter and shallower; IPF distinct in ant. three ribs – they divide the ribs into smaller and lower anterior and noticeably wider and more convex posterior bands. BF absent, border region indicated merely by dying out of ribs.

Sculpture: Glabella coarsely and densely tuberculated, tubercles mostly conical (on internal moulds elevations with rouded tops), distant on librigena. Smaller granules on cephalic border, terrace lines near ventrolat. margin. Grooves in LBF of the holotype (internal mould). Pygidium tuberculated and granulated: most prominent tubercles on post. three rings form marked longitudinal rows on lat. parts of axis. Rather large tubercles in median parts of post. three rings and in adax. parts of posterior bands of ribs. Distant small granulae of unequal size on rings and ribs become smaller and denser in border region.

Dimensions: The holotype (L28865) shows CL = 2.3 mm, GL = 1.7 mm, cephalon width (without border) 3.1 mm. Another cephalon (orig. REMEŠ 1929, pl. 1, fig. 5 – L28866) exhibits CL = 4.8 mm, calculated cephalon width 6.5 mm. Cephalon FF24: CL = 4.2 mm, ceph. width 7.2 mm (extrapolated). Pygidium L28859 : PL = 2.4 mm, PW = 3.2 mm.

Remarks: The species was introduced for the first time in literature by REMEŠ (1913), who, however, expressively regarded R. RICHTER as the author of the species name and description and referred to RICHTER'S work (1913 in press, edited in 1914). Consequently, R. RICHTER is here introduced as the author.

The holotype (by monotypy) represents an undeformed internal mould with remnants of exoskeleton on the right librigena (pl. VIII, fig. 8). Other cephala are mostly preserved with the exoskeleton but they are deformed in different degrees. The conspecificity of the single isolated pygidium with *C. ceratophthalmoides* is not demonstrable but very probable, as no other representative of *Cyphaspis* or allied genera is known from Čelechovice.

After restitution of *Cyphaspis* by THOMAS and OWENS (1978), *C. ceratophthalmoides* clearly falls within the scope of the genus – particularly due to the strongly convex glabella and very steeply ant. falling preglabellar field. The features of pygidium agree with *Cyphaspis* in short and wide axis, but differ in tr. narrower pleural regions.

The type species, *C. ceratophthalma* (GOLDFUSS, 1843) shows a distinct resemblance in cephalon, differing in still more convex glabella overhanging the ant. border and parabolic in lateral view (in *ceratophthalmoides* semicircular, overhang slight). The anterior border in ant. view is gently arcuate dorsally, in ceratophthalmoides more dorsally upraised and roof-like falling laterally.

Pygidium tentatively referred to *ceratophthalmoides* clearly differs from that of *ceratophthalma*, which is substantially broader, showing a narrower axis with two prominent anterior rings and less distinctly differentiated three posterior ones; pleural region is markedly wider with only three distinct flat anterior ribs separated by narrow PF dying out far from the outer margin, IPF imperceptible. Granulation

in broad abax. part is finer and regular, large tubercles absent (for comparison well preserved specimens of *C. ceratophthalma* from Gees were used, coll. H. Kowalski).

Pygidium referred to *C. ceratophthalmoides* shows a closer resemblance to *C. ellipsocephala* TRENKTEN from the Upper Devonian (Frasnian), which, however, has more rings on axis and rather regular tuberculation.

Occurrence: Rare in the Čelechovice Limestone at Čelechovice.

Family *Scutelluidae* R. et E. RICHTER, 1925

Genus *Scutellum* PUSCH, 1833

Type species: *Scutellum costatum* PUSCH, 1833, Upper Devonian (Frasnian), Poland.

Scutellum flabelliferum (GOLDFUSS, 1839)

Pl. VII, VIII, fig. 11

e.p. 1839 *Bronteus flabellifer* GOLDFUSS; GOLDFUSS, p. 361, pl. 33, fig. 3a, c.
e.p. 1843 *Bronteus flabellifer* GOLDFUSS; BURMEISTER, p. 139.
1843 *Bronteus intermedius* GOLDFUSS; GOLDFUSS, p. 549, pl. 6, fig. 4.
1889 *Bronteus flabellifer* GOLDFUSS; WHIDBORNE, p. 38, pl. 3, fig. 16.
1892 *Bronteus alutaceus* GOLDFUSS; ZIMMERMANN, p. 117—118, pl. 1, figs. 1, 2.
1895 *Bronteus flabellifer* GOLDFUSS; HOLZAPFEL, pl. 13, fig. 10.
1895a *Bronteus intermedius* GOLDFUSS; SMYČKA, p. 7—9, pl. 1, figs. 1a—d.
1895b *Bronteus intermedius* GOLDFUSS; SMYČKA, p. 5, pl. 1, figs. 1a—d.
1895c *Bronteus intermedius* GOLDF.; SMYČKA, p. 137—138, fig. 42, IId.
1925 *Scutellum flabelliferum* (GOLDFUSS); R. RICHTER, p. 242.
1934 *Scutellum flabelliferum* (GOLDFUSS); R. RICHTER, text-figs. 1, 10.
1954 *Scutellum* (*Scutellum*) *flabelliferum* (GOLDFUSS); KIELAN, p. 28—31, pl. 4, figs. 6—9, text-figs. 20—23 (synonymy).
1955 *Bronteus* (*Bronteus*) *flabellifer* GOLDFUSS; MAKSIMOVA, p. 43, pl. 1, figs. 2, 3.
1956 *Scutellum* (*Scutellum*) *flabelliferum* (GOLDFUSS); *Richter* et *Richter*, p. 96, pl. 7, figs. 40—42.
1965 *Scutellum flabelliferum* (GOLDFUSS); LÜTKE, text-fig. 2e.
1966 *Scutellum* (*Scutellum*) *flabelliferum* (GOLDFUSS); SELWOOD, p. 219, pl. 3, figs. 1—3 (synonymy).
1967 *Scutellum flabelliferum* (GOLDFUSS); ERBEN, p. 20, fig. 21.
aff. 1969 *Scutellum* (*Scutellum*) aff. *flabelliferum* (GOLDFUSS); PILLET et LAPPARENT, p. 330, pl. 37, fig. 11.
1979 *Scutellum flabelliferum* (GOLDFUSS); KOWALSKI, p. 7—9, text-fig. 5, 6.
1985 *Scutellum flabelliferum* (GOLDFUSS); KOWALKSI, p. 395—396, text-fig. 34.
1986 *Scutellum* (*Scutellum*) *flabelliferum* (GOLDFUSS); LEVICKIJ, p. 65, pl. 1, fig. 7.
1987 *Scutellum flabelliferum* (GOLDFUSS); KOWALSKI, p. 88, text-figs. 5—7.

Lectotype: Specimen figured by R. et E. RICHTER (1956) on pl. 7, fig. 40a, b (exoskeleton without librigenae).

Type locality: Eifel Hills, probably Auburg near Gerolstein, Germany.

Type horizon: Probably Rommersheimer Formation, Middle Devonian (Eifelian).

Material from Moravia: 19 cranidia, 2 isolated librigenae, 1 rostral plate, 40 pygidia; all preserved in limestone, mostly with exoskeletons.

Description: Cranidium with extremely narrow and gently upraised anterior border bearing 2 to 3 parallel terrace lines visible in dorsal view. ABF very narrow and shallow medially, gently deeper and wider abax.

Glabella subtrapezoidal in outline, rapidly expanding anteriorly, GL/GW ratio about 0.8–0.9, maximum width between anterolat. corners. In the anterior view, glabella forms a broad arc with rounded crest and sides sloping at about 40° laterally. In lateral view, glabella is seen as an asymmetric arch overtopping the fixigenae and steeply rising from ABF up to the top situated at a half distance between ABF and Sp (preoccipital furrow); post. from the top glabella slopes very gently up to the proximity of Sp, then abruptly falls in depressed preoccipital region which gradually passes into the moderately raised occipital ring. In plan view, the ant. outline of glabella forms a low arc touching the ant. border. Glabellar furrows well marked as sculptureless impressions. Sp (preoccipital furrow) transglabellar, deeply impressed, sag. broad and gently curved ant. in abax. parts; in lateral view strongly asymmetrical (ant. slope markedly higher and steeper than the low posterior one). Impression S1 horseshoe-shaped, its both branches connected with dorsal furrow, post. branch deeper than the ant.; isolated small lateral marginal lobe of glabella encircled by S1 is reduced to one small node. S2 developed as slightly concave transversely oriented ovoid impression distant from dorsal furrow, extending adax. closer to sag. line than S3. S3 very distinct, broadening and deepening abax., connected with dorsal furrow; the distance between adax. ends of S3 is equal to about 1/4 tr. width of glabella. Preoccipital glabellar lobe tripartite: slightly convex and tuberculated median part is isolated by rather tr. broad sculptureless preoccipital muscle scars impressions from lat. parts of the lobe reduced to nodes. Occipital furrow narrower and less impressed than Sp, widened laterally, narrower and shallower adax.

Occipital ring moderately convex, slightly narrowed and roof-like sloping laterally, its tr. width markedly exceeds the tr. width of glabella at Sp (equal to one half of the maximum width of glabella). Median occipital node close to post. margin.

Dorsal furrows: at occipital ring arcuately bent abax., between occipital furrow and S1 parallel with sag. line, anteriorly from S1 diverging at approx. 40° from sag. line. Dorsal furrows generally deep, a strong pit-like depression (anterior pit) at abax. ends of S3.

Fixigenae rapidly narrowing ant., anterior part slopes moderately anterolat., being gently concave abax. from the anterolateral corners of glabella and upraised at AB. Palpebral lobe small, flat, semicircular, strongly curved abax. Palpebral furrow slightly impressed and traceable from the palpebral area as anteromedially directed line dying out before reaching the dorsal furrow (MM25636, L28838). Facial suture: ant. section $\beta-\gamma$ sag. long, gradually approaching the dorsal furrow, diverging from γ anterolat. at approx. 15–20° from exsag. line; β widely parabolical, γ and ε rounded, β and δ approx. at the same distance from sag. line.

Librigena (incompletely preserved) subtriangular in outline. Eye prominent, markedly curved abax., visual surface strongly convex lat.; eye socle not preserved.

Genal field sag. longer than wide, sloping moderately to a broad concave LBF. Outer surface damaged, exposed part of lateral doublure broadly concave with long and gently waved terrace lines. Doublure of posterior border gently convex and smooth.

The rostral plate (MM25639) tr. prolonged, lenticular in shape, with truncated lateral edges; general convexity low, ant. margin simply arcuate, surface covered with transversal terrace lines (in median part 20–25 lines visible).

Pygidium: semielliptical in outline, PL/PW ratio about 0.8–0.9. Axis subtriangular, tr. width of its ant. margin is less than one third of PW. Axis tripartite, subdivided by less conspicuous slightly backwards converging longitudinal furrows into three lobes from which the median lobe is more convex and has a broadly rounded crest (in post. view the axis forms a uniform moderately convex arch without incised longitudinal furrows). Longitudinal furrows deepened near the ant. margin, arcuately connected in post. part of axis, causing rounded termination of the median lobe well anterior of the post. edge of the axis (observable merely in well preserved specimens with carapace not damaged, e.g. MM1736, L28834). A deep and rather broad transversal furrow of U-shaped sag. cross-section separates the axis from a very narrow and delicate articulating half-ring narrowed abax.; the furrow is curved ant. in median and abax. parts. Axial furrows shallow, gently deepened ant. and shallowed medially, not interrupted in sag. line.

Pleural region moderately vaulted; the inner region forms an elevated platform which passes lat. very gradually into posterolat. sloping outer region which becomes flat and subhorizontal in the outermost border region. 7 paired lateral ribs and one median rib, all radiating from the axis. All ribs widen abax. reaching the maximum width on the periphery; the width of ribs slightly and gradually decreases towards the median rib. Median rib almost equal in width to adjacent ribs, only in abax. part its width gently exceeds that of the adjacent ribs. All ribs are notably flattened and low in abax. parts; they become more convex adax., namely in the inner platform. The intercostal furrows are rather deep on the inner platform and flat and wider abax.; they die out well before reaching the outer pygidial margin. The width of intercostal furrows is smaller than the width of ribs but it obviously exceeds half the width of ribs in abax. parts. The outer margin of pygidium shows very delicate posterolat. oriented denticles not protruded in spines, demonstrable in best preserved specimens (e.g. MM1736, L28836).

The pygidial doublure attains about one half sag. length of pygidium. It is gently concave, with marked terrace lines. The intercostal furrows are slightly indicated as very shallow depressions completely dying out abax.

Sculpture (except terrace lines): Cranidium distinguished by densely spaced, unequal, mostly conical tubercles with rounded tops. On frontal lobe, the tubercles are somewhat transversely prolonged, diminishing towards ABF and combined with waved ridges parallel with AB; ridges are generally developed in interspaces of tubercles but in some specimens they cross ant. parts of tubercles in the whole

frontomedian part of glabella. Similar short ridges are present on palpebral lobes (e.g. L28838) and in subconcentric arrangement around and on the median node of the occipital ring. Density of tubercles decreases on fixigenae; tubercles are transversely prolonged on median part of the preoccipital lobe, smaller on occipital ring. Pygidium: Rather small tubercles of unequal size and moderate density on axis and ribs. Across the ribs, about 3 to 4 tubercles in abax., 2–3 in adax. parts, density gently decreases in border region. Short and fine oblique ridges close to outer margin of the pygidium (comp. LÜTKE 1965, text-fig. 4a, ERBEN 1967, text-fig. 2L).

Dimensions: The largest cranidium shows CL = 19.2 mm, maximum width of glabella 19.6 mm; CL of the smallest cranidium (L28910) is about 9 mm. The largest pygidium (W 1901.II.3) has PL = 34.4 mm, PW = 39.3 mm; the smallest complete pygidium L28834 has PL = 12.2 mm, PW = 14.7 mm (only dimensions of specimens from Čelechovice reported).

Variability and pathological features: The material is not sufficient for adequate study of individual variability. The specimens available show minor differences in density and size of tubercles and in development of short transversal ridges on glabella, and in density of tuberculation and width of intercostal furrows on pygidia. The pygidium L28834 exhibits clear pathologic features, namely fused sixth and seventh ribs in best part of their course. Similar abnormalities are common in scutelluids (comp. e.g. R. et E. RICHTER 1934, ŠNAJDR 1960).

Remarks: The concept of *S. flabelliferum* became clear after the revision of the type material by R. et E. RICHTER (1956). As a result, the pygidia from Čelechovice occupy, relative to the width of intercostal furrows, an intermediate position between the lectotype of *S. flabelliferum* selected by R. et E. RICHTER (1956, pl. 7, fig. 40a) and the lectotype of *Bronteus intermedius* GOLDFUSS (R. et E. RICHTER 1956, pl. 7, fig. 42) suggesting thus both taxa being conspecific. Specimens figured by KOWALSKI (1979, 1987) from the Middle Devonian of the Eifel Hills show similar differences in the width of intercostal furrows as those figured by the RICHTERS (1956).

Specimens of *S. flabelliferum* described and figured by KIELAN (1954) from the Middle Devonian of Grzegorzowice in the Holy Cross Mts. (Poland), those reported by MAKSIMOVA (1955) from the Česlavka Formation of the South Ural Mts., and those described by SELWOOD (1966) from the Chercombe Bridge Quarry of Devonshire are evidently conspecific. Pygidium figured by LEVICKIJ (1986) from the Middle Devonian of Transkaukasia (Danzig) belongs to a form with narrower intercostal furrows.

The incomplete pygidium designated by PILLET and LAPPARENT (1969) as *S.* (*S.*) aff. *flabelliferum* (GOLDF.) from Bokan Sud, Afghanistan may also be conspecific but it is not sufficient for conclusive identification of species. Pygidium from the Frasnian of Boullonais (France) designated by MORZADEC (1988) as *Scutellum* (*S.*) aff. *flabelliferum* belongs evidently to a new species of the *S. flabelliferum-costatum* group.

Occurrence: *S. flabelliferum* is a widely distributed species known from Europe

(South England, Ardenno-Rhenish area with the Eifel Hills type area, Holy Cross Mts., Góry Sowie Mts., Čelechovice in Moravia), the South Ural Mts., Transkaukasia and possibly Afghanistan. Its occurrences fall within a broader stratigraphic interval starting with the Eifelian and reaching the early Givetian.

Genus *Ancyropyge* CLARKE, 1891

Type species: *Acidaspis romingeri* HALL et CLARKE, 1888; Middle Devonian, Michigan.

Ancyropyge sola sp. n.

Pl. VIII, figs. 1—5

Holotype: incomplete cranidium (L28860a, b) with counterpart, figured here on pl. VIII, figs. 1—5.
Type locality: Čelechovice, Moravia.
Type horizon: Čelechovice Limestone, Middle Devonian.
Material: The holotype.

Description: Anterior border of cranidium very narrow, lath-like, transversal, slightly bent post. and widened abax. ABF extremely narrow and shallow medially, widened abax.

Glabella (except the occipital spine) subtrapezoidal in outline, fused with occipital ring and only slightly widened anteriorly, sag. markedly longer than wide, maximum width in anterior third. In the anterior view, glabella forms a broadly parabolic arc with roof-like sloping sides, posterior sides of glabella become vertical. In the lateral view, the outline of glabella steeply arcuately rises from ABF towards the median node which forms a small but distinct elevation; this is followed post. by a shallow depression and a gentle rise up to the base of a stout occipital spine; behind the spine the outline falls vertically to the post. margin of cranidium. Glabellar impressions: S1 less distinct, close to dorsal furrow, almost not impressed and completely placed on the vertical side of glabella. S2 represented as unsharp posterolat. widened depression connecteed with the dorsal furrow. S3 short, directed transversely, gently deepened and narrowed abax. Lateral lobe L2 moderately convex, differentiated by vaulting from the adjacent parts of glabella, markedly lower than the frontomedian area. A prominent median tubercle is situated between L2 lobes. Occipital ring completely fused with glabella medially and produced into a stout occipital spine of circular cross-section at the base (course of this spine not exposed). Occipital furrow incised exclusively in proximity of the dorsal furrow as a short posteromedially directed line, completely disappearing near the occipital spine. Doublure of occipital ring represented as a slightly convex smooth band (observed before preparation of the post. part of glabella — pl. VIII, fig. 1).

Fixigenae markedly convex and narrow. Anterior part rapidly falls anterolat., palpebral area very steeply falls towards the dorsal furrow. Post. part of fixigenae not observable.

Sculpture: Distant subglobular to subconical larger tubercles and less common smaller tubercles in interspaces; all tubercles dying out in the proximity of dorsal furrows; very distant tubercles on fixigenae. Tubercles are combined with asymmetrical transverse ridges on frontal lobe; ridges arranged subconcentrically to the ant. side of the median tubercle. Interspaces of tubercles and ridges covered with very fine and dense granulation.

Dimensions: The holotype shows GL (without occipital spine) 6.9 mm, GW = = 5.1 mm.

Remarks: The principal characteristic features, namely the glabellar outline, lateral impressions, occipital area fused with glabella, stout occipital spine and rapidly abax. rising fixigenae agree with *Ancyropyge* as discussed by ORMISTON (1967). The presence of median glabellar tubercle, very shallow S2 impressions, steep ant. slope of glabella and the characteristic sculpture may be regarded as specific diagnostic features.

Among known species, *A. manitobensis* (WHITEAVES, 1892) shows a rather close similarity particularly if specimens referred to this species by ORMISTON (1967, p. 46–47, pl. III, figs. 6–8) from the Bathurst Island of the Canadian Arctic area are compared (here only the narrower occipital spine near its base and less marked S2 differ in the only known specimen of *A. sola*). The original material of *A. manitobensis* as described and figured by WHITEAVES (1892) shows less marked median tubercle on glabella and more distinct S2 and S3 furrows.

It should be stressed that *A. manitobensis* (WHITEAVES) and *A. sola* sp. n. might be coeval, as the former is reported from the upper part of the Winnipegosis Formation with early Stringocephalus correlated with the Eifelian/Givetian boundary interval (NORRIS et al. 1982, JOHNSON et al. 1985).

Occurrence: Very rare in the Čelechovice Limestone, Růžičkův lom at Čelechovice.

Ancyropyge sp.

Pl. VIII, figs. 12, 13

Material: one isolated hypostome and two fragments (W 1901.II.28).

Description: Hypostome with almost equal sag. length and transv. width. Anterior margin gently convex anteriorly. Median body subcircular in outline, very strongly convex ventrally, semiglobular in lateral view (lateral sides fall vertically near the border furrow, anterior and posterior slopes very steep). Median furrow absent. Maculae not preserved, but the place of broken left macula indicated as small subcircular area situated on the very steep posterolat. slope of the median body close to the border furrow. Posterior lobe not differentiated. Border furrow shallow, unsharp anteriorly. Anterior wing subtriangular and small, steeply directed dorsolaterally (partly exposed on the left side). Lateral border narrow, broadened

behind ant. wings; posterior border narrow and slightly convex (preserved only in posterolateral part). Sculpture: The median body preserved as internal mould shows unsharp traces of subconcentrically arranged ridges branched and gently anastomosing medially. Few ridges on anterior wing and lateral border.

Remarks: The configuration agrees with hypostome of *A. arcticus* ORMISTON as described and figured by ORMISTON (1967). Minor differences are shown in still more convex median body, steeper falling laterally and posteriorly.

In close proximity of the hypostome, two fragmentary preserved remains most likely belonging to *Ancyropyge* are found: a loosely tuberculated fragment of glabella, and a gently bent and keeled spine which may be interpreted as genal (possibly librigenal) spine. Although both fragments are incomplete, their presence points to *Ancyropyge*, to which — according to analogy with ORMISTON'S (1967) material, also the hypostome belongs. The preservation of all three remains is not sufficient for determination in species.

Occurrence: Čelechovice (exact place unknown), evidently the Čelechovice Limestone (old collection of F. Smyčka).

K tisku doporučil F. Řehoř

Přeložil autor

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Explanation of plates

All specimens coated with ammonium chloride, photographs unretouched. Most specimens

with preserved exoskeleton, exceptions explicitly stated. Sites of deposition noted by symbols prefixed to inventory numbers (explained on p. 124 of the text).

Pl. I

Schizoproetus celechovicensis (SMYČKA), Čelechovice Limestone, Čelechovice
1, 2 — cranidium L28906, dorsal (*1*) and lateral (*2*) views, × 5.5; *3* — cranidium W P.cz.2, orig. RICHTER (1912, pl. 20, fig. 11), × 5.4; *4* — cranidium W 1901.II.15, × 4.5; *5* — cranidium of a smaller specimen MM Ge25642, × 6.4; *6* — cranidium, partly exfoliated S1840, orig. SMYČKA (1895a, b, pl. 1, fig. 3a), × 4.4; *7* — librigena S1843, orig. SMYČKA (not figured), × 4.7; *8* — W 1901. II.17, × 5; *9* — almost complete exoskeleton L28850, orig. SMYČKA (1904, pl. 1, figs. 1, 2), × 3; *10* — the same, lateral view; *11* — cranidium, partly exfoliated S1841, orig. SMYČKA (1895a, b, not figured), × 5; *12* — librigena S1842, orig. SMYČKA (1895a, b, pl. 1, fig. 3b), figured by R. RICHTER (1912, pl. 20, figs. 12a, b), × 5; *13* — pygidium S1844, lectotype, orig. SMYČKA (1895a, b, pl. 1, fig. 3c), refigured by R. RICHTER (1912, pl. 20, figs. 14a, b, c), × 4; *14* — the same, lateral view

Pl. II

Schizoproetus celechovicensis (SMYČKA), Čelechovice Limestone, Čelechovice (figs. *1—8*), Lažánky-Zrcadla (Moravian Karst, figs. *9—12*)
1 — pygidium L28853, × 4; *2* — the same, lateral view; *3* — pygidium, partly exfoliated, L28851, orig. R. RICHTER (1912, pl. 20, fig. 16), × 4.2; *4* — pygidium of a smaller specimen L28904, orig. R. RICHTER (1912, pl. 20, fig. 13), × 6; *5* — pygidium L28852, × 4; *6* — the same, lateral view; *7* — pygidium MM23196 with pathological eighth axial ring, × 3.7; *8* — pygidium L28905, × 3.6; *9* — pygidium of a smaller specimen ICh2556, orig. CHLUPÁČ (1964, pl. 2, fig. 1), × 6; *10* — incomplete cranidium ICh2564, partly exfoliated on the right side, orig. CHLUPÁČ (1964, pl. 1, figs. 1, 2), × 6; *11* — the same, lateral view; *12* — librigena ICh2534, orig. CHLUPÁČ (1964, pl. 1, fig. 6), × 6

Pl. III

Dechenella rittbergensis ZIMMERMANN, Čelechovice Limestone, Čelechovice
1 — cranidium MM23190, × 3.8; *2* — cranidium, priv. coll., × 4; *3* — MM23176; × 4.7; *4* — cranidium L28842 exfoliated in posterior part, × 4.3; *5* — cranidium MM23229, partly exfoliated, × 4.3; *6* — librigena L28848, × 4; *7* — anterior part of cranidium MM1734, × 3.2; *8* — enrolled specimen L28864, × 2.2; *9* — the same, lateral view; *10* — cranidium L28862, right dorsolateral view, × 4.2; *11* — posterior part of thorax and pygidium MM23271, lateral view, × 4.2; *12* — the same, dorsal view

Pl. IV

Dechenella rittbergensis ZIMMERMANN, Čelechovice Limestone, Čelechovice
1 — cranidium with the right librigena, W 1901.II.9, lectotype, orig. R. RICHTER (1912, pl. 20, figs. 2a, b), × 2.5; *2* — the same, dorsolateral view; *3* — cranidium W 1901.V.3., slightly deformed, orig. R. RICHTER (1912, pl. 20, figs. 1a, b), × 2.5; *4* — cephalon L28849, dorsal view, × 3.8; *5* — the same, dorsolateral view from the left, *6* — the same, dorsolateral view from the right; *7* — cranidium with the left librigena MM1734, × 3; *8* — cranidium L28862, × 4

Pl. V

Dechenella rittbergensis ZIMMERMANN, Čelechovice Limestone, Čelechovice
1 — pygidium of a smaller specimen MM25641, × 7.5; *2* — pygidium MM23223, internal mould, × 3.8; *3* — pygidium of a small specimen S1839, orig. SMYČKA (1895a, b, not figured), × 6; *4* — incomplete pygidium MM23177, × 3; *5* — pygidium 128845, × 2.2; *6* — pygidium L28852,

× 3.2; *7* — pygidium, priv. coll., × 4; *8* — pygidium L28863, gently deformed, × 3.3; *9* — pathologic pygidium with partly exfoliated axis MM23216, × 3.2; *10* — pygidium L28845, lateral view, × 3.2; *11* — pygidium with partly exfoliated axis, L28861, dorsolateral view, × 4; *12* — moderately deformed pygidium L28843, × 4

Pl. VI

Gerastos (*Longiproetus*) *moravicus* (SMYČKA), Čelechovice Limestone, Čelechovice
1—3 cranidium — lectotype S1848, orig. SMYČKA (1895a, b, pl. 1, fig. 4a), × 4.5; *1* — lateral view, *2* — dorsal view, *3* — anterior view; *4* — incomplete cranidium L28846, × 3.5; *5* — cranidium with the right librigena, W 1901.II.27, × 3.3; *6* — cranidium L28907, × 3.4; *7* — the same, lateral view; *8* — librigena MM25631, × 5.5; *9* — incomplete cranidium L28908, × 4; *10* — cranidium L28858, × 4; *11* — the same, lateral view; *12* — partly exfoliated cranidium MM25635, × 4.2; *13* — incomplete librigena MM23197, × 9; *14* — incomplete pygidium MM25630, × 4.2; *15* — pygidium L28844, × 3.6

Pl. VII

Scutellum flabelliferum (GOLDFUSS), Čelechovice Limestone, Čelechovice
1 — cranidium L28839, × 2.2; *2* — the same, lateral view; *3* — cranidium L28838, × 2.2; *4* — incomplete and partly exfoliated librigena MM25637, doublure perceptible; × 3.5; *5* — cranidium L28840, × 2.2; *6* — pygidium of a smaller specimen L28834, × 2.2; *7* — incomplete pygidium L28837, × 1.5; *8* — incomplete pygidium L28835, surface gently weathered, × 2; *9* — incomplete pygidium MM25638, × 2.4; *10* — incomplete pygidium MM1736, × 1.4; *11* — incomplete pygidium L28836, × 2

Pl. VIII

1—5 Ancyropyge sola sp. n., Čelechovice Limestone, Čelechovice
1 — cranidium L28860a — holotype, before preparation, × 3.8; *2* — the same, dorsal view after preparation, × 3.6; *3* — the same, dorsolateral view from the left; *4* — the same, anterior view, × 6; *5* — negative counterpart L28860b, × 5.8
6—10 Cyphaspis ceratophthalmoides RICHTER, Čelechovice Limestone, Čelechovice
6 — pygidium L28859 before preparation, × 8.5; *7* — incomplete cephalon L28866, original REMEŠ (1929, pl. 1, fig. 5), × 6; *8* — cephalon L28865 partly exfoliated, holotype figured by REMEŠ (1913, pl. 1) and by R. RICHTER (1914, text-figs. 4a—c), × 8; *9* — pygidium L28859 after preparation, × 7; *10* — librigena, L28909, partly exfoliated, × 8
11 — *Scutellum flabelliferum* (GOLDFUSS), Čelechovice Limestone, Čelechovice, rostral plate MM25639, × 3.5
12—13 — *Ancyropyge* sp., Čelechovice Limestone, Čelechovice, hypostome W 1901.II.28, lateral view (*12*), ventral view (*13*), × 3.8

Authors of photographs: Photolaboratory of ČGÚ (V. Skala — best part, B. Matoulková pl. I, fig. *10*, pl. II, figs. *9—12*, pl. V, figs. *8*, *10—12*, pl. VII, figs. *1—3*, *5—8*, pl. VIII, fig. *1*), dr. V. Turek (pl. I, figs. *3*, *4*, *8*, pl. IV, figs. *1—3*, pl. VI, fig. *5*, pl. VIII, figs. *10*, *12—13*)

Trilobiti středního devonu od Čelechovic na Moravě

(*Résumé anglického textu*)

Ivo Chlupáč

Předloženo 26. března 1990

Trilobitová fauna z čelechovických vápenců (svrchní eifel nebo raný givet) od Čelechovic na střední Moravě obsahuje druhy *Schizoproetus celechovicensis* (Smyčka, 1895) – typický druh rodu, *Dechenella rittbergensis* Zimmermann, 1892, *Gerastos* (*Longiproetus*) *moravicus* (Smyčka, 1895), *Cyphaspis ceratophthalmoides* Richter, 1914, *Scutellum flabelliferum* (Goldfuss, 1839) a *Ancyropyge sola* sp. n. – prvý výskyt rodu ve středním devonu mimo Severní Ameriku. Popsaní trilobiti mají blízké vztahy k druhům z jiných světových oblastí.

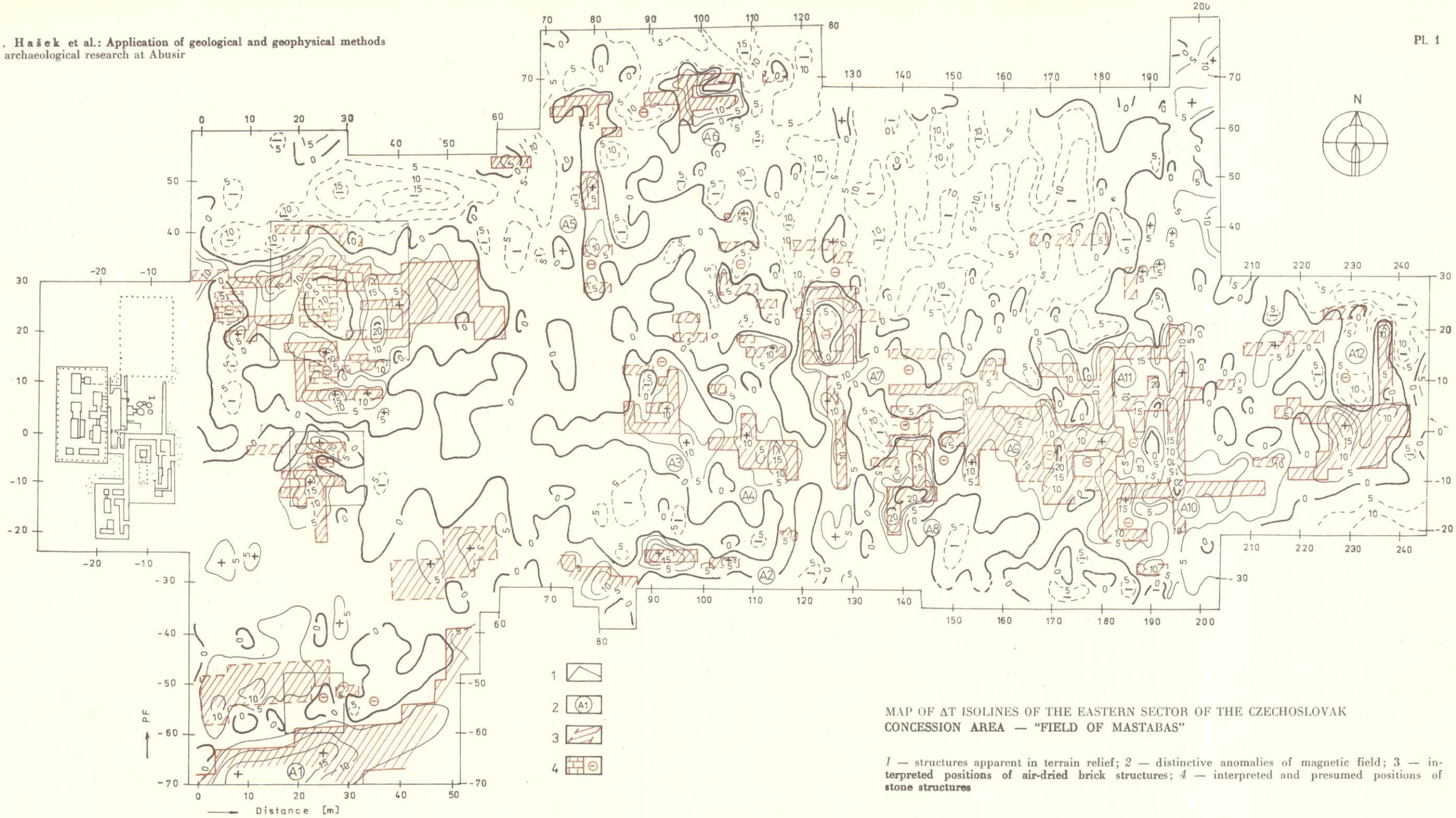
Trilobiti obývali mělkovodní prostředí nečisté karbonátové sedimentace s lokálními korálovými a stromatoporovými biostromami, jehož příkladem jsou na Moravě právě čelechovické vápence, které však mají mnoho analogií v jiných evropských, asijských i severoamerických oblastech. Proetidi čeledi *Dechenellidae* provázení skutelluidy (zvláště ze skupiny *Scutellum flabelliferum-costatum*) jsou zde charakterističtými složkami trilobitových společenstev. Méně stálou složkou jsou phakopidi, kteří však mohou i zcela chybět (příkladem jsou právě čelechovické vápence u Čelechovic).

Ze stratigrafického hlediska patří čelechovické vápence s popsanou trilobitovou faunou širšímu hraničnímu intervalu stupňů eifel-givet. Trilobitová fauna zatím nedovoluje rozlišit oba stupně v hraničním intervalu, což platí i o většině fauny průvodní (rozhodující nálezy konodontů zatím chybějí).

Трилобиты среднего девона из окрестностей с. Челеховице в Моравии

Фауна трилобитов из челеховицких известняков (верхнеэйфельского или раннеживетского возраста) в окрестностях с. Челеховице в средней Моравии содержит виды *Schizoproetus celechovicensis* (Smyčka, 1895) — типичный вид данного рода, *Dechenella rittbergensis* Zimmermann, 1892, *Gerastos* (*Longiproetus*) *moravicus* (Smyčka, 1895), *Cyphaspis ceratophthalmoides* Richter, 1914, *Scutellum flabelliferum* (Goldfuss, 1839) и *Ancyropyge sola* sp. n. — первую находку данного рода в среднем девоне вне Северной Америки. Описанные трилобиты имеют близкие отношения к видам из других областей мира.

Трилобиты обитали в мелководной среде нечистой карбонатной седиментации с локальными коралловыми и строматопоровыми биостромами, примером которой в Моравии служат именно челеховицкие известняки, имеющие многие аналогии в других областях Европы, Азии и Северной Америки. Проетидные трилобиты семейств *Dechenellidae*, сопровождаемые скутеллуидами (особенно из группы *Scutellum flabelliferum — costatum*), являют-

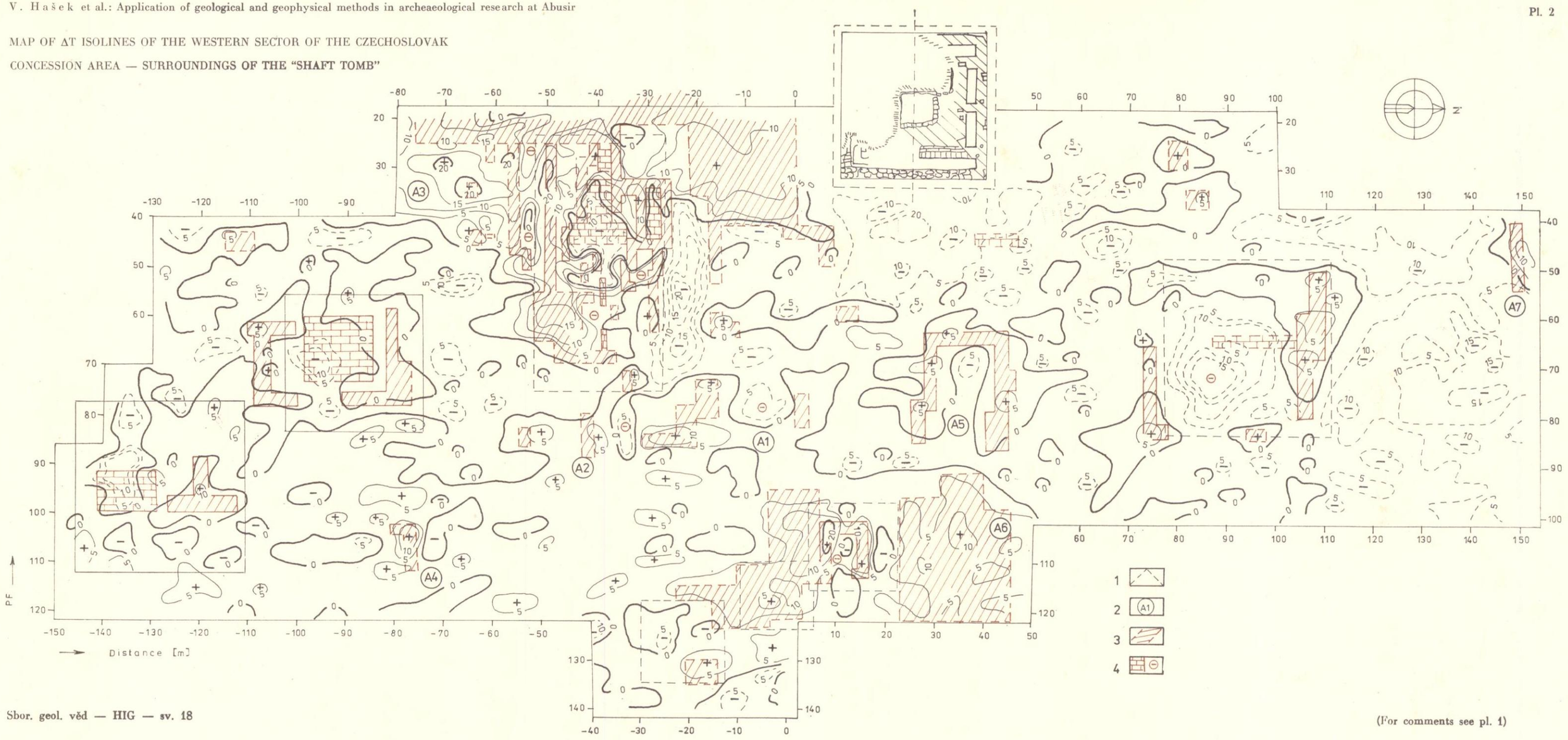


MAP OF ΔT ISOLINES OF THE EASTERN SECTOR OF THE CZECHOSLOVAK CONCESSION AREA — "FIELD OF MASTABAS"

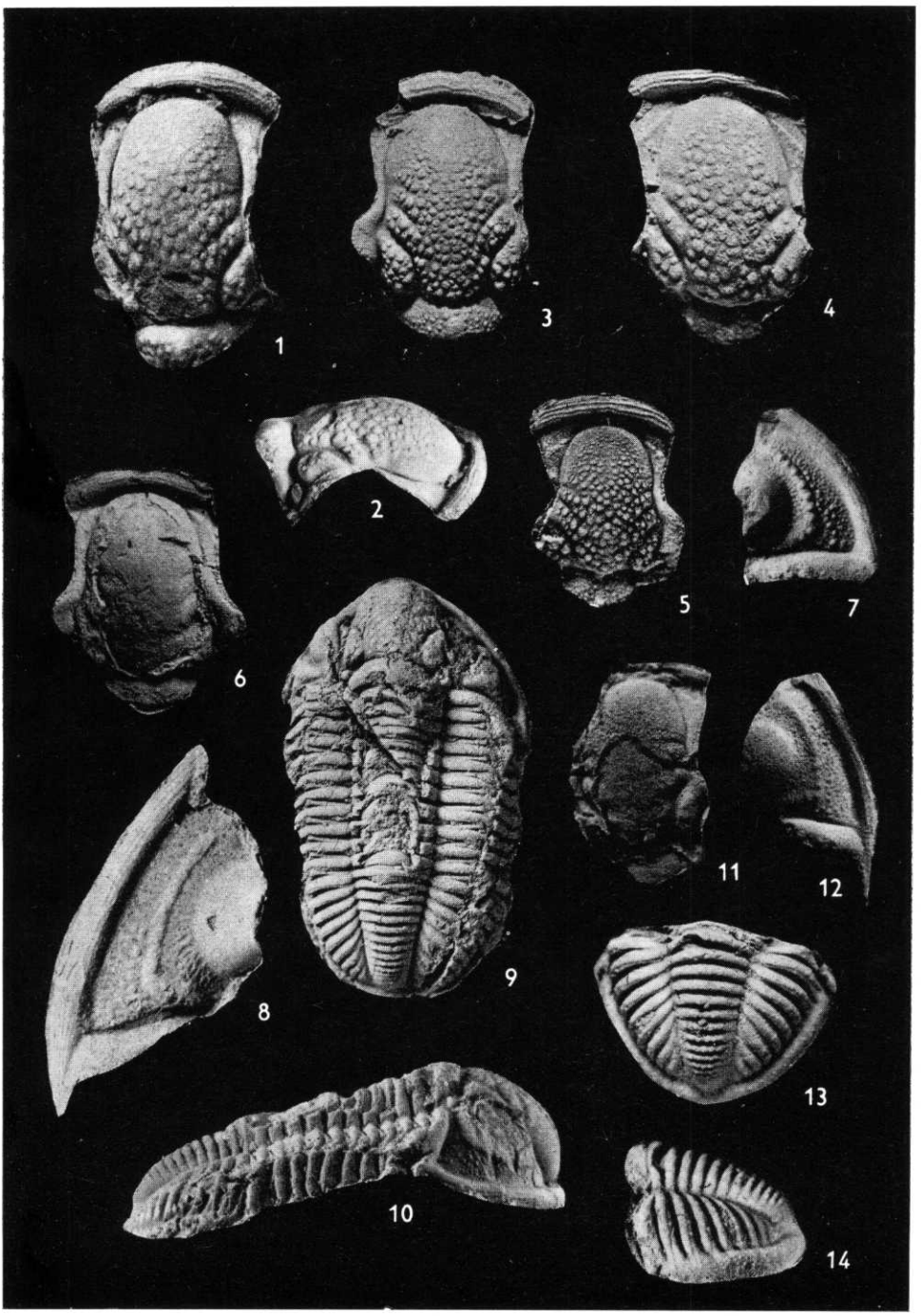
1 — structures apparent in terrain relief; *2* — distinctive anomalies of magnetic field; *3* — interpreted positions of air-dried brick structures; *4* — interpreted and presumed positions of stone structures

MAP OF ΔT ISOLINES OF THE WESTERN SECTOR OF THE CZECHOSLOVAK

CONCESSION AREA — SURROUNDINGS OF THE "SHAFT TOMB"



(For comments see pl. 1)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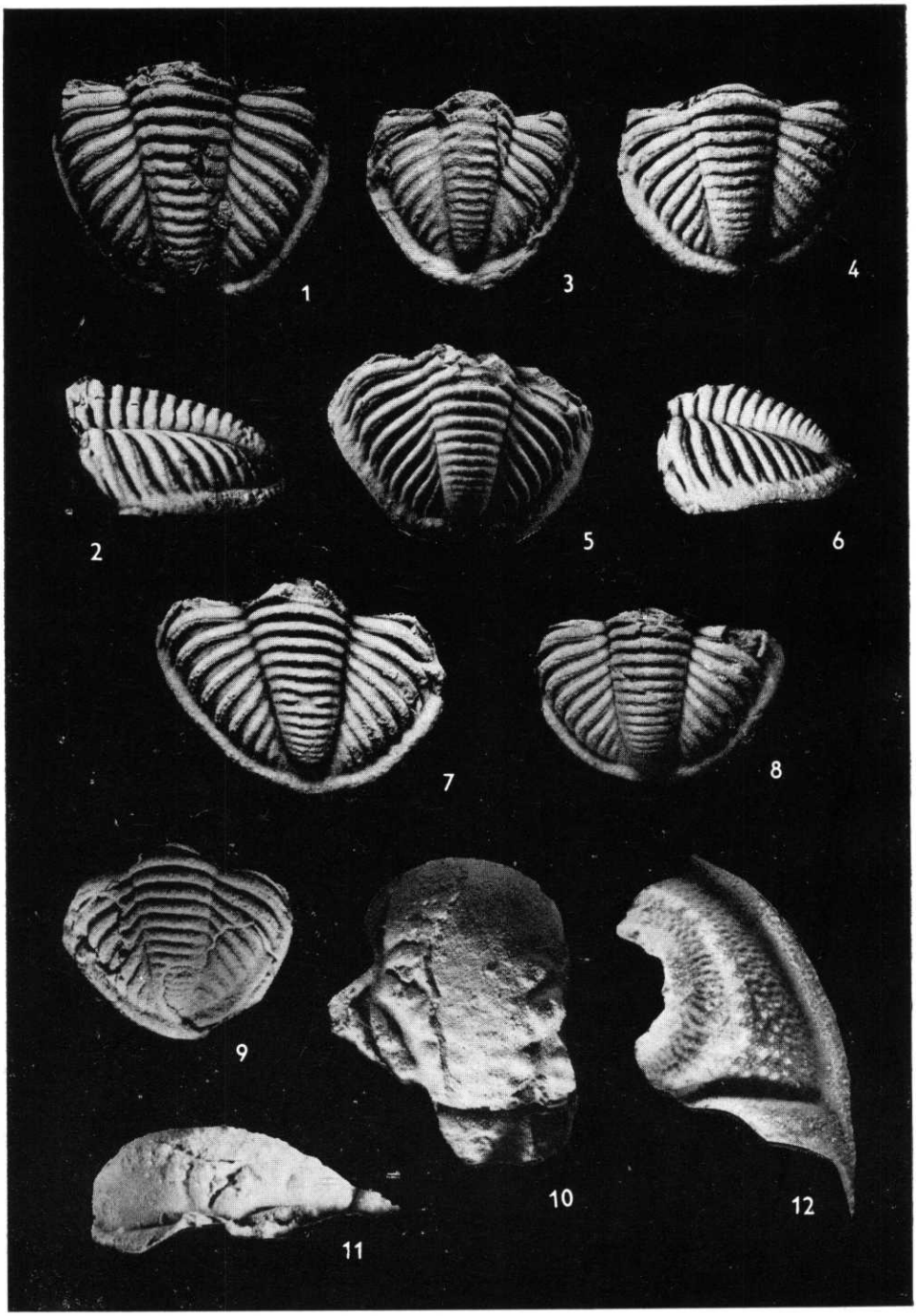
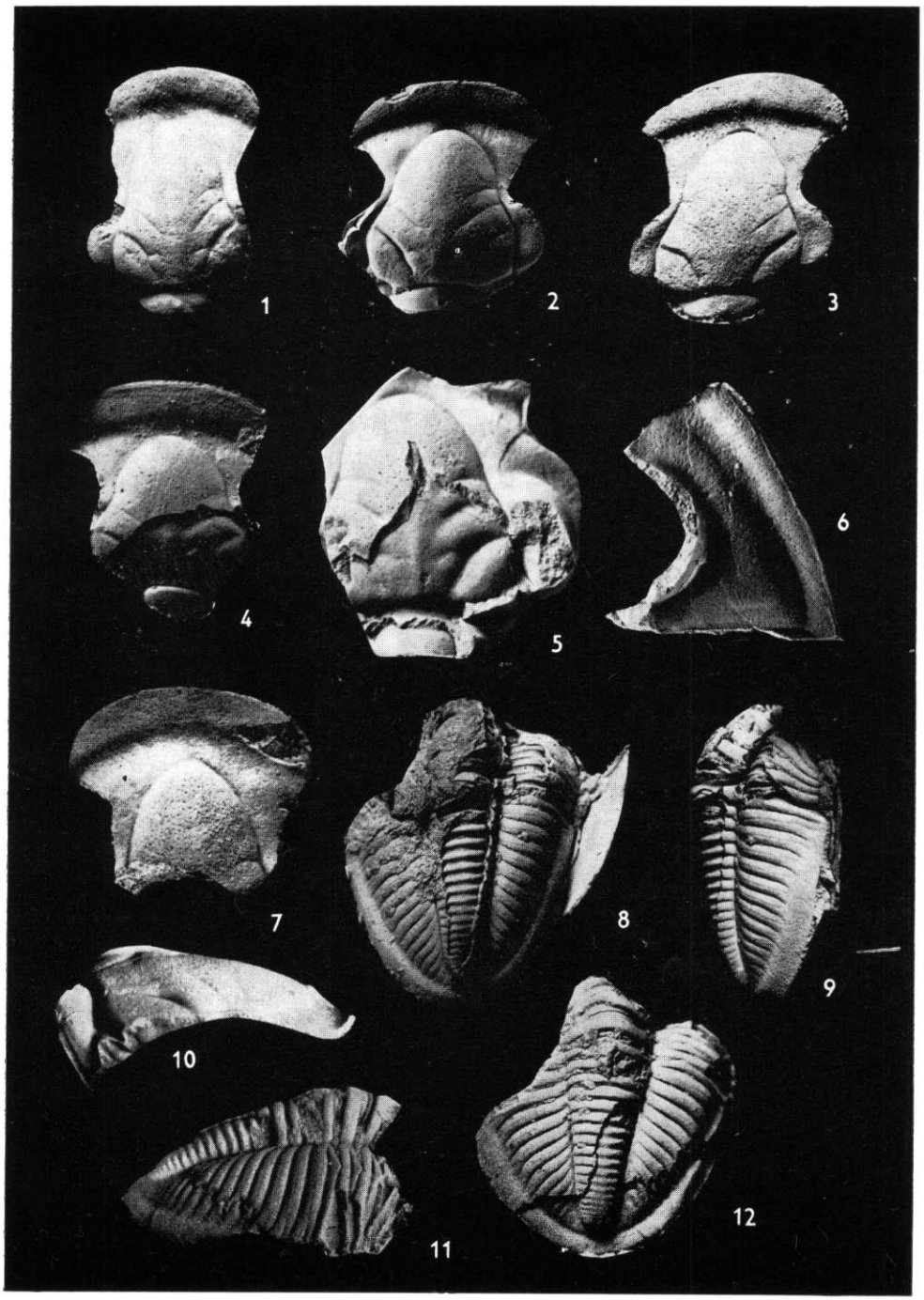
Pl. II

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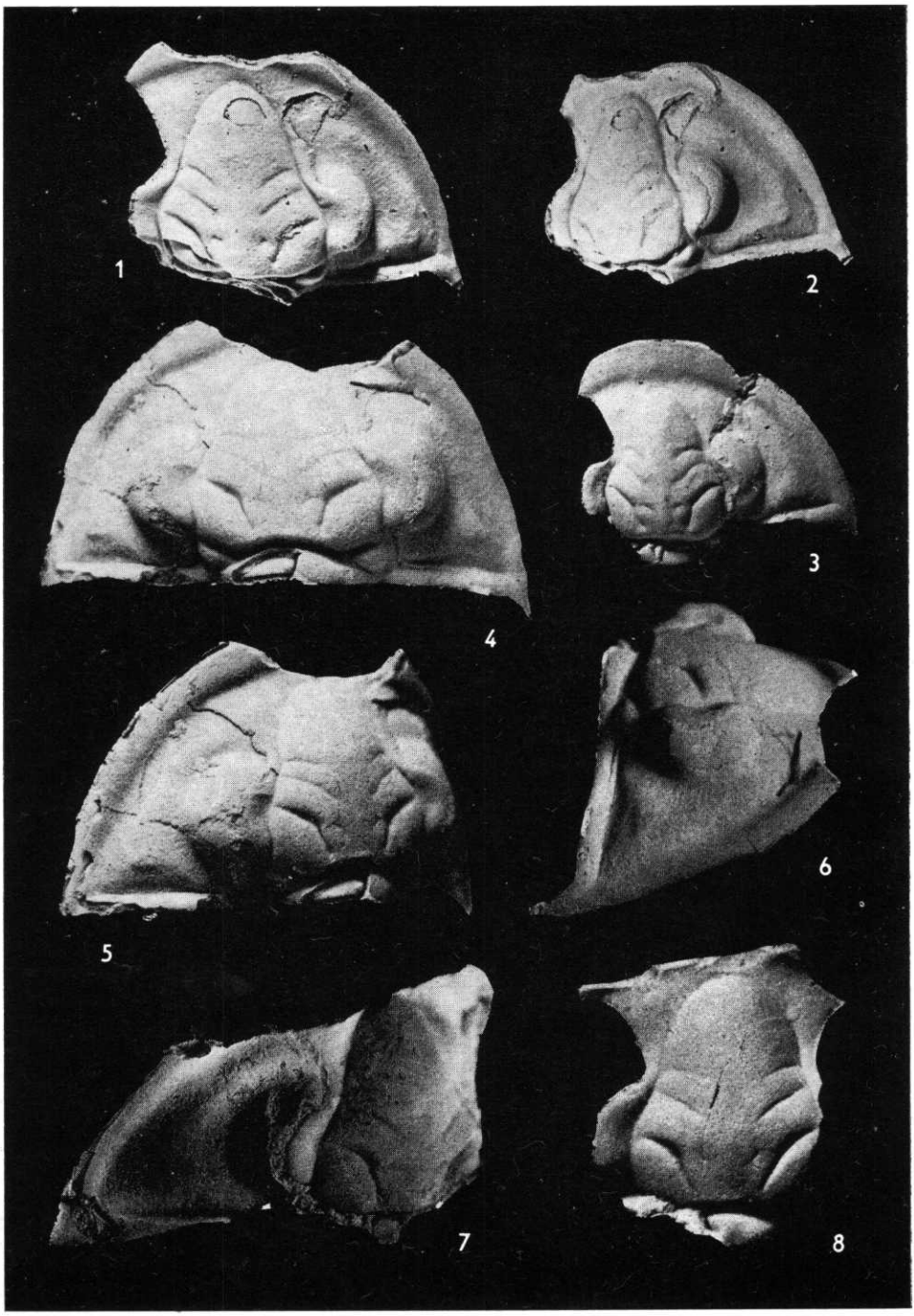
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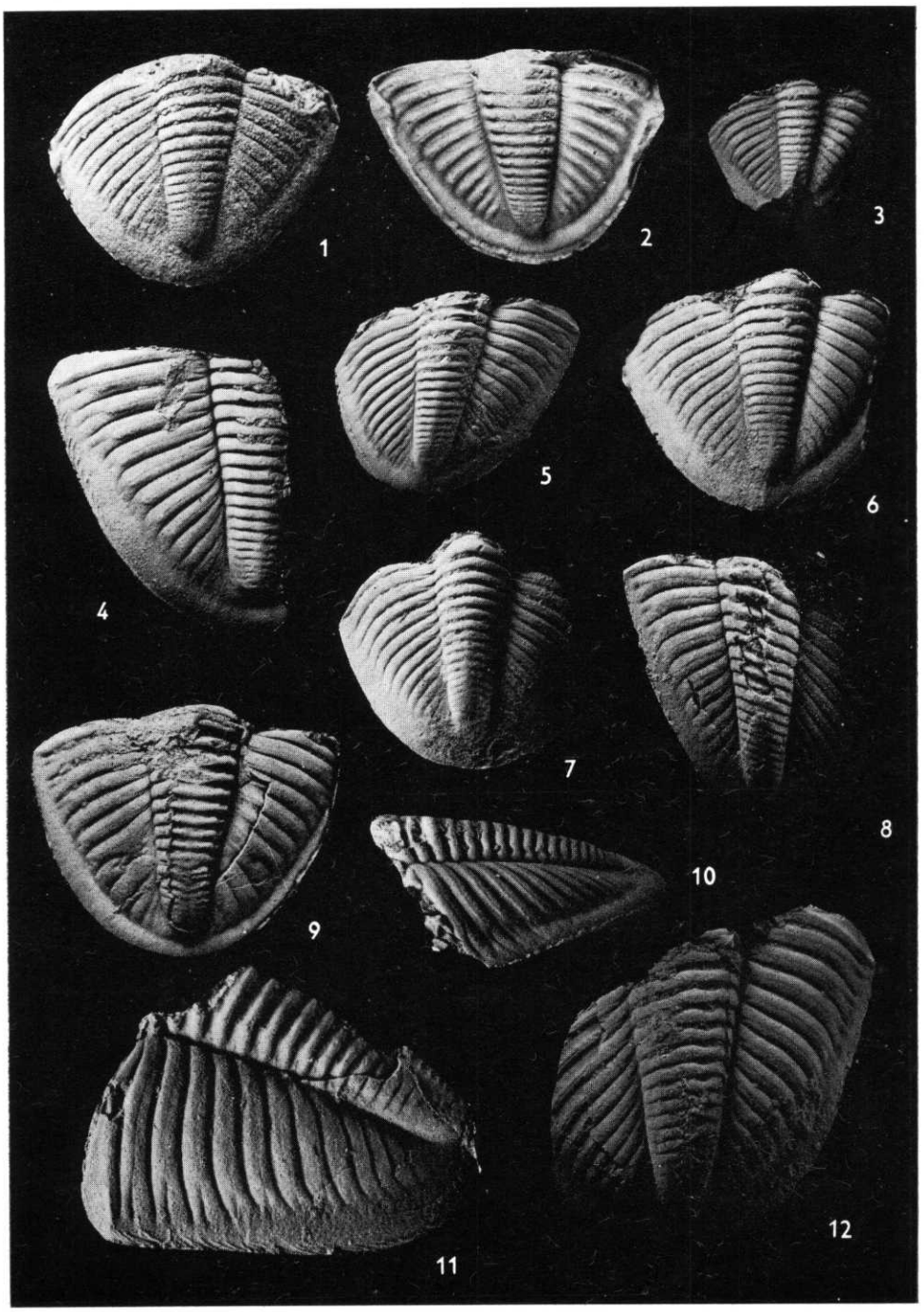
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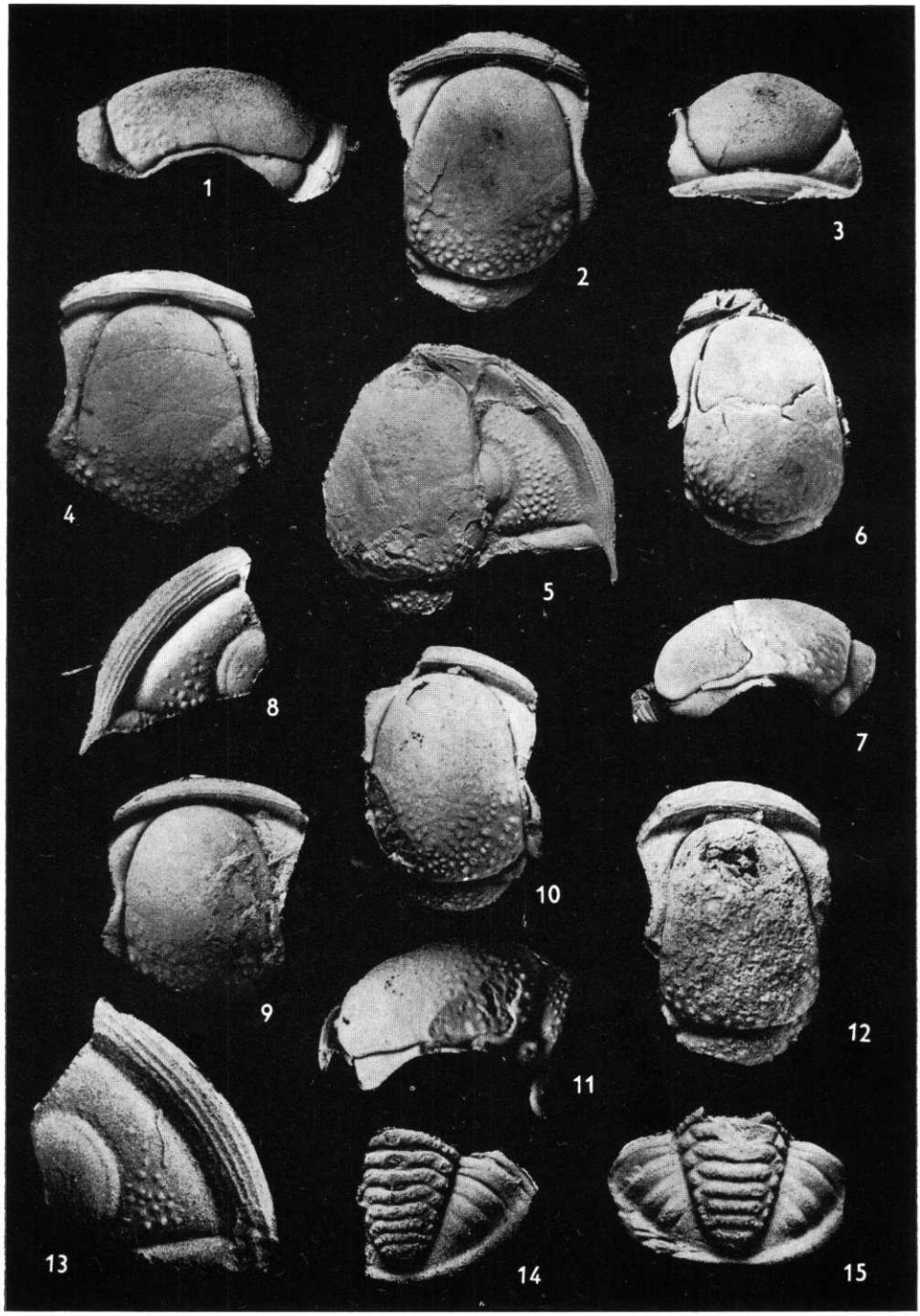
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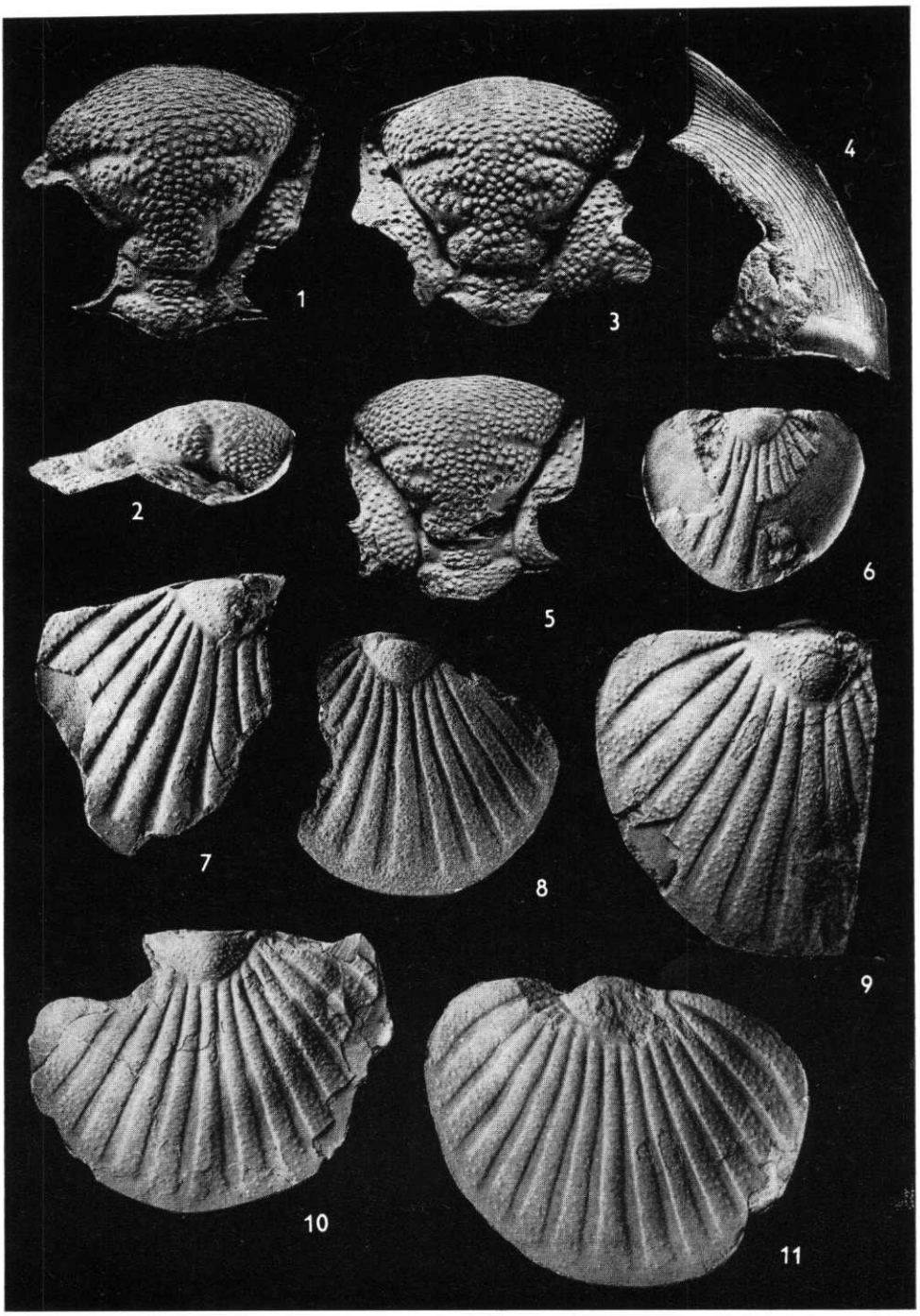
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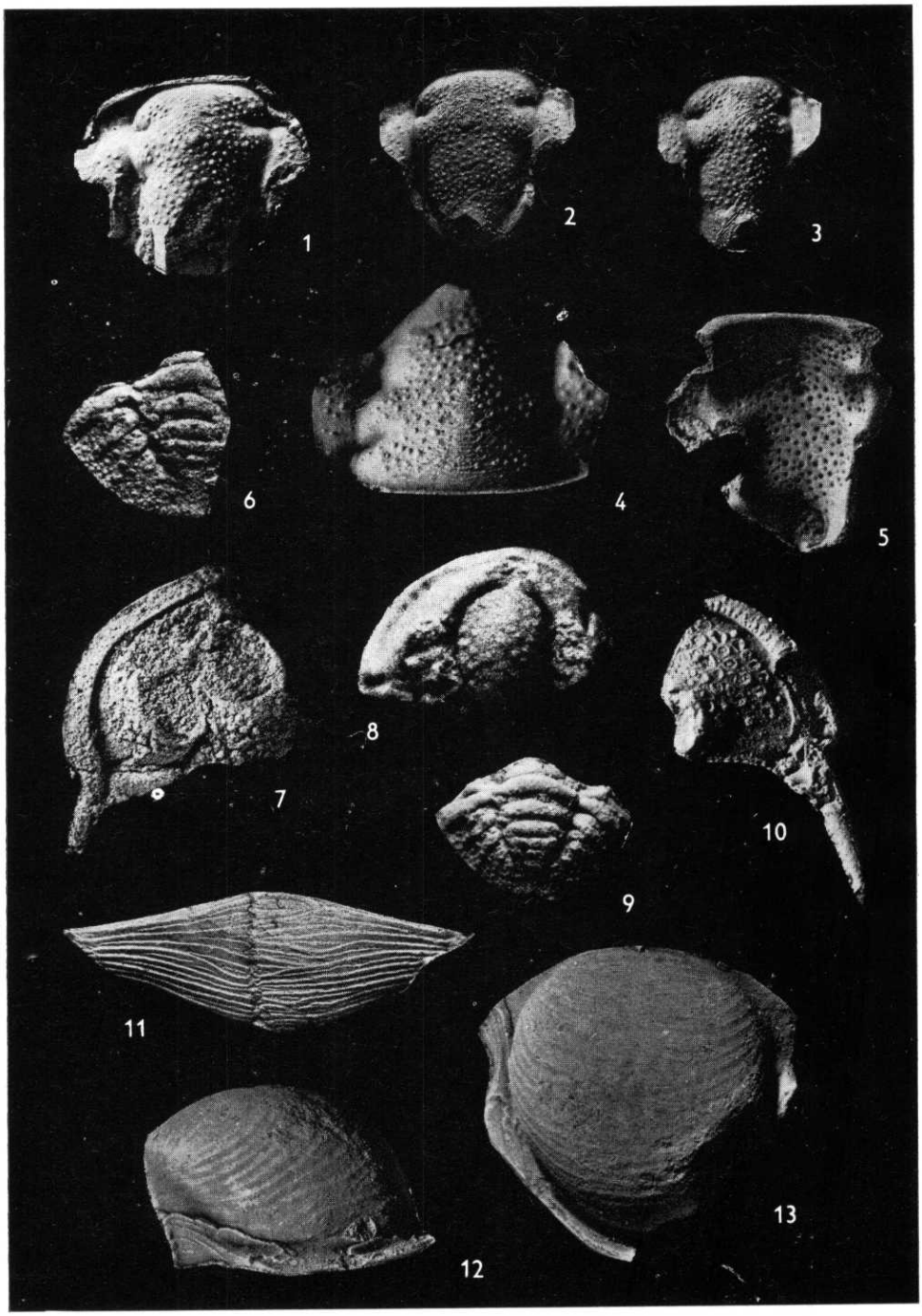
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ся здесь особенно характеристическим компонентом сообщества трилобитов. Менее неизменный компонент представляют собой факопидные трилобиты, которые могут иногда совсем отсутствовать (примером могут служить именно челеховицкие известняки около с. Челеховице).

Относительно стратиграфии челеховицкие известняки, содержащие вышеприведенную фауну трилобитов, относятся к более широкому граничному промежутку между эйфельским и живетским ярусами. По фауне трилобитов пока нельзя различить оба яруса в граничном промежутке, что также относится к большей части сопровождающих остатков животных (пока нет решающих находок конодонтов).

Přeložil A. Kříž