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New Lower Devonian (Lochkovian—Zlíchovian) rhynchonellid brachiopods in the Prague Basin

Noví rhynchonellidní brachiopodi ze spodního devonu (lochkov-zlíchov) pražské pánve

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Abstract: The paper describes the Lower Devonian (Lochkovian—Zlíchovian) rhynchonellid brachiopods from the Prague Basin (Barrandian area, Bohemia); 18 new species and 9 new genera have been erected among the rhynchonellids of the families *Rhynchotrematidae, Katuniidae, Wellerellidae, Trigonirhynchiidae, Septalariidae, Glossinotoechiidae, Hebetoechiidae,* and *Uncinulidae*; further, new data have been added to several species already described by BARRANDE (1847, 1879) and HAVLÍČEK (1961). The *Glossinotoechiidae* are regarded as a new family. Stratigraphical and geographical distributions are recapitulated in all the rhynchonellid species. Group of "*Monticola*" *prokopensis* is excluded from the *Rhynchonellacea* and transferred to the *Athyrisinacea.*

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Introduction

The present paper is devoted to new rhynchonellid brachiopods coming from the Lower Devonian limestones of the Prague Basin (Barrandian area, Bohemia). The following text concerns the rhynchonellid families *Rhynchotrematidae, Katuniidae, Wellerellidae, Trigonirhynchiidae, Septalariidae, Glossinotoechiidae, Hebetoechiidae,* and *Uncinulidae* of Lochkovian through Zlíchovian ages. No uppermost Lower

Table 1

Survey of rhynchonellids in the Lower Devonian of Bohemia

Species	Lochkovian	Pragian	Zlíchovian	Dalejan
Latonotoechia latona (BARR.)		K, D		
Yukiangides vesta (BARR.)	R			
Machaeratoechia marsyas sp. n.			Zk	
sp. n.		K		
Zlichorhynchus hiatus HAVL.		K	Zk	
Sicorhyncha praesella sp. n.	Ko			
sella sp. n.		V		
tenuirostris HAVL.		K		
trinacria HAVL.			Zk	
Cherubicornea amalthea (BARR.)		K		
cherubina sp. n.			Zk	
Corvinopugnax bimbax HAVL.		V, S		
corvinus (BARR.)				Su
Isopoma alecto (BARR.)				Su
Aikarhyncha praecox (BARR.)		K		
Carolirhynchia carolina sp. n.		D	Z	
Rackirhynchia lacerata (BARR.)		K, L, D		
Tetratomia pandora sp. n.		K, D		
elegans HAVL.			Zk	
coalescens HAVL.				Su
Linguopugnoides carens (BARR.)	Ko			
supracarens HAVL.			Zu	
Stenorhynchia ida sp. n.		V, S		
hetaera sp. n.		K		
nympha (BARR.)	Ru	K	Zk	
fryne sp. n.		K		
pseudolivonica (BARR.)		K		
Iberirhynchia sp.		K		
nargis (HAVL.)				Su
Nasonirhynchia naso sp. n.		K		
Astua astuta (BARR.)	R, Ko			
Astutorhyncha saxana sp. n.		V, S, K		
proserpina (BARR.)				Su
Phoenicitoechia phoenix (BARR.)		K		
phoenicula sp. n.		K		
Kotysex simulans (BARR.)		V, S		
furcicosta HAVL.		K		
Praegnantenia praegnans (BARR.)		K		
Onugorhynchia matercula (BARR.)		K		
onuga sp. n.			Zk	
Septalaria palumbina (BARR.)				Su
Amissopecten velox (BARR.)				Su
obsolescens (BARR.)				Su

Table 1 (*continued*)

Species	Lochkovian	Pragian	Zlíchovian	Dalejan
Pseudocamarophoria leidholdi (H.)			Zk	
Monadotoechia monas (BARR.)				Su
prunella sp. n.		S		
paulimonas sp. n.		D		
Eoglossinotoechia cacuminata HAVL.	Ru	V, S		
doris sp. n.	R	D		
surgens (BARR.)		K		
mystica HAVL.	R, Ko			
sylphidea (BARR.)		K		
marocanensis DROT			Zu	
princeps (BARR.)		K		
gibba (BARR.)		K		
Glossinotoechia henrici (BARR.)		K		
Chlupacitoechia chlupaci (HAVL.)			Zk	
Markitoechia marki (HAVL.)			Zk	
omissa HAVL.				Su
clavula HAVL.				Su
Hebetoechia hebe (BARR.)	R, Ko			
ornatrix HAVL.	Ko			
nitidula (BARR.)		K		
Lanceomyonia borealiformis (SI.)	R			
confinis (BARR.)	R, Ko			
Plethorhyncha altera (BARR.)	Ko			
diana (BARR).	Ko			
Eucharitina eucharis (BARR.)		K		
oehlerti (BAYLE)		K		
Voskopitoechia orbona sp. n.		V, K	Zk	
Uncinulus pila (SCHNUR)			Zk, Zu	
altifrons HAVL.		K		
Taimyrrhynx knjaspensis (CHOD.)		K		
rufus HAVL.				Su

D — Dvorce-Prokop Limestone, K — Koněprusy Limestone, Ko — Kotýs Limestone, L — Loděnice Limestone, R — Radotín Limestone, Ru — uppermost layer of the Radotín Limestone, S — Slivenec Limestone, Su — Suchomasty Limestone, V — Vinařice Limestone, Z — Zlíchov Limestone, Zk — Lower Zlíchovian, Chapel Coral Horizon, Zu — Upper Zlíchovian, pink Chýnice Limestone.

Devonian (Dalejan) rhynchonellids have been dealt with, because they were part of a revision of all articulate brachiopods of the Suchomasty (Dalejan) and Acanthopyge (Eifelian) Limestones (HAVLÍČEK - KUKAL 1990). Also the *Pugnacidae, Phoenici-*

toechiidae, and *Rozmanariidae* have not been included in this paper because they were revised separately by HAVLÍČEK in 1990.

An attention is also paid to the group of "*Monticola*" *prokopensis* which was formerly believed to be a rhynchonellid stock with a reversed position of the sulcus and fold (HAVLÍČEK 1956). The recent investigation, however, has shown that these impunctate brachiopods of rhynchonellid appearance bear laterally directed spiralia; for this reason, they are transferred here to the *Athyrisinacea*.

The extensive Lower Devonian brachiopod collection has yielded 18 new species and 9 new genera of rhynchonellids (plus 2 genera of the *Athyrisinacea*). The *Glossinotoechiidae* are regarded here as a new family containing mainly the geniculate shells bearing marginal spines, and thus paralleling the hebetoechiid and uncinulid stocks. The present author has tried to assign the rhynchonellid genera to separate evolutionary lines that he considered as family ranks. This attempt may serve for a better understanding of the phylogenic tree which consists of a suite of closely related, often parallel lineages of externally and internally similar taxa. It is worth to note that some "typical" Famennian stocks had their forerunners in the Bohemian Lower Devonian sequences (e.g. *Carolirhynchia* was an ancestor of the Famennian *Brunnirhynchia*; *Rackirhynchia* was a probable ancestor of all the *Rozmanariidae*).

The Lower Devonian rhynchonellids, dealt with by HAVLÍČEK in 1961, have not been redescribed in this paper except for the cases when the closely related species required further information (e.g. the species of *Sicorhyncha* and *Stenorhynchia*). Further, all type species of the new genera have been redescribed. The stratigraphical position and geographical distribution have been recapitulated in all the rhynchonellids (even in those which were not revised herein).

The present study is based on a new material, collected by I. Chlupáč, M. Šnajdr, J. Vaněk, and the present author from the Lower Devonian limestones during last three decades. All the material is being prepared for deposition in the District Museum at Rokycany. Further, the author had the opportunity to examine the Barrande's collection (including types) deposited in the National Museum in Prague.

Abbreviations used: bv – brachial valve; pv – pedicle valve; sh – shell; su – sulcus; L – length; T – thickness; W – width.

Letter L preceding the catalogue number indicates collections of the National Museum, Prague; letters VH preceding the catalogue number – collection of the present author.

Rhynchonellacea GRAY, 1848

Rhynchotrematidae SCHUCHERT, 1913

Orthorhynchulinae COOPER, 1956

Remarks: The Lower Devonian sequences contain several closely related orthorhynchulid genera distinguished from each other by minor variations in ornamentation (ribs simple or bifurcating; rounded or angular; symmetrical or strongly asymmetric-

al), position of pedicle foramen (permesothyrid or hypothyrid), character of deltidial plates (conjunct or disjunct), character of anterior commissure (rectimarginate, gently to strongly uniplicate; tongue trapezoidal or subtriangular), size of dental plates, and characters of the hinge plates (free or underlain by a thick pad of callosity; inner edges may or may not be supported by crural plates). Further, the muscle fields are either hardly impressed or surrounded by ridges; exceptionally, the posterior margins of the dorsal muscle field are bounded by anterior extensions of the crural plates (in *Zlichorhynchus*).

The following Devonian genera are assigned to the *Orthorhynchulinae*;

Australirhynchia SAVAGE, 1968; Mandagery Park Fm., New South Wales;

Machaeraria COOPER, 1955; Lochkovian–Emsian; North America, Central Asia, Australia;

Callipleura COOPER, 1942; Middle Devonian (Hamilton); North America;

Latonotoechia HAVLÍČEK, 1960; Pragian; Bohemia, Ural Mts., Gornyi Altai;

Yukiangides g.n.; Lochkovian–Emsian; China, Bohemia, Central Asia, Ural Mts., Gornyi Altai;

Sicorhyncha HAVLÍČEK, 1961; Lochkovian–Zlíchovian; France, Bohemia, Carnic Alps;

Zlichorhynchus HAVLÍČEK, 1963; Pragian–Zlíchovian; Bohemia;

Cherubicornea g.n.; Pragian–Zlíchovian; Bohemia, France;

Thliborhynchia LENZ, 1967; Lochkovian–Pragian; Canada;

Franklinella LENZ, 1973; Lochkovian; Canada;

Zeravshanotoechia RŽONSNICKAJA, 1977; Pragian–Zlíchovian; Central Asia, Ural Mts.;

Asiarhynchia SU, 1980; Zlíchovian; Northeast China;

Machaeratoechia g.n.; Pragian–Zlíchovian; Bohemia.

Latonotoechia HAVLÍČEK, 1960

Type species: *Terebratula Latona* BARRANDE, 1847

Diagnosis (emended): Shell medium to large, subequally biconvex to dorsi-biconvex, usually wider than long, less commonly elongate; ventral beak short, moderately incurved; palintrope small, orthocline to apsacline, bordered by angular beak edges; pedicle foramen large, elliptical, hypothyrid, laterally restricted by massive, disjunct deltidial plates. Ventral sulcus shallow to deep, rounded-angular to angular, originating at about a third of the valve length, exceptionally obscure, often asymmetrical with one side much more abrupt than the other one; tongue triangular, usually somewhat distorted. Dorsal fold rounded-angular to angular, low to highly raised, usually not sharply separated from flanks.

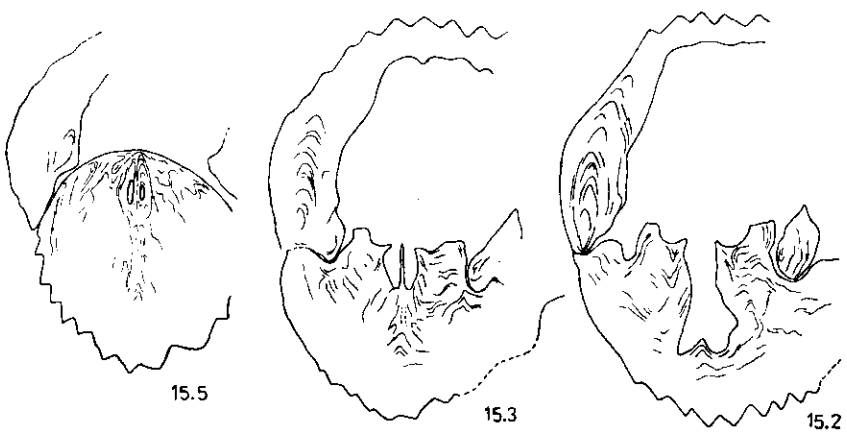
Ribs high, sharply angular, separated by deep, angular grooves, numbering 17–23, never increasing in number by bifurcation or implantation; some ribs on

fold and sulcus may disappear in anterior direction; sulcus bears 4–7 ribs which in late adult specimens are typically asymmetrical with inner sides much higher than their outer sides; on the other hand, the ribs on the fold have very high outer sides, whereas their sides facing the mid-line are low. Asymmetry of shell is apparent from the fact that one side of the sulcus often bears a greater number of ribs than the other side (e.g. 4 ribs on the left side versus 1 rib on the right side). Growth lines densely crowded.

Both valves thick-walled umbonally; dental plates fused with lateral walls of valve, umbonal cavities reduced to almost zero. Ventral muscle field elongate-oval, bordered by low ridges extending to about two fifths of the valve length; myophragm low.

Hinge plates disjunct, slightly concave in transverse profile, moderately sloping to mid-line; hinge plates and subsocket plates rest on thick pads of secondary shell material; notothyrial cavity narrow and deep, posteriorly bearing a blade-like cardinal process which in late adult specimens is hidden beneath a thick layer of callosity. Dorsal muscle field elongate-oval, surrounded by ridges and bisected by a broad myophragm.

Comparison: The closely related genus *Machaeraria* (based on *Rhynchonella formosa* HALL; redescribed by COOPER 1955) differs from *Latonotoechia* in the following ways: 1) Its sulcus is symmetrical with a flat bottom and low, steep sides, whereas the sulcus of *Latonotoechia* is usually asymmetrical, rounded-angular to angular. 2) Tongue of *Machaeraria* is trapezoidal, that of *Latonotoechia* subtriangular to triangular. 3) Ribs of *Machaeraria* are symmetrical, those of *Latonotoechia* asymmetrical on fold and sulcus. 4) Dental plates are thin, short, and moderately diverging in *Machaeraria* but obscure in *Latonotoechia*. 5) Cardinal process is well-developed throughout ontogeny in *Machaeraria* but obscured by secondary shell deposits in late adult specimens of *Latonotoechia*. 6) Hinge plates and subsocket plates are free in *Machaeraria* but underlain by thick pads of callosity in *Latonotoechia*.



1. *Latonotoechia latona* (BARR.). Transverse sections, 6 ×

7) Inner sides of hinge plates are supported by crural plates in *Machaeraria* (see COOPER 1955, pl. 13, figs. 27, 29), whereas the crural plates are absent in *Latonotoechia*.

Latonotoechia latona (BARRANDE, 1847)

Pl. I, figs. 4—7

1961 *Latonotoechia latona* (BARRANDE, 1847); HAVLÍČEK, p. 25, pl. 2, figs. 3—6; text-fig. 1.

Holotype: Shell figured by BARRANDE in 1847, pl. 18, fig. 12; refigured by BARRANDE in 1879 (pl. 25, fig. 13); L 25373.

Type horizon and locality: Koněprusy Limestone, Koněprusy.

Exterior, interior, and ontogeny: See HAVLÍČEK 1961.

Occurrence: Bohemia; Koněprusy Limestone, Koněprusy (Zlatý kůň and Na Voskopě hills, common); Dvorce-Prokop Limestone, Braník (only old collections, rare);
Ural Mts.; Lower Devonian (Pragian) (CHODALEVIČ 1951);
Gornyi Altai; Pragian, Jakušin Formation (GRACIANOVA 1970);
Salair Mts.; Pragian, Malyj Bačat Beds (ALEKSEEVA - GRACIANOVA - ELKIN - KULKOV 1970).

Yukiangides g.n.

Type species: *Camarotoechia parasappho* WANG, 1956

Diagnosis: Shell transversely elliptical in outline, subequally biconvex, with a weak ventral sulcus and dorsal fold; beak gently incurved to almost straight, elliptical pedicle foramen hypothyrid, bordered by conjunct deltidial plates. Ribs numerous, rounded to rounded-angular, mostly simple, exceptionally bifurcating.

Dental plates short, narrow umbonal cavities partly to considerably filled with callosity; ventral muscle field indistinct. Hinge plates massive, disjunct, resting on bottom of a thick-walled brachial valve; cardinal process blade-like, high, confined to the posterior part of the notothyrial cavity. Crural appophyses massive, short, curved ventrally. Dorsal muscle field indistinct.

Comparison: *Yukiangides* involves several Lower Devonian species which were often assigned to *Latonotoechia* in previous papers. *Yukiangides* shares with *Latonotoechia* almost the same brachial valve interior but differs from the latter in having weak, symmetrical ventral sulcus and dorsal fold, low arcuate to trapezoidal tongue, symmetrical, rounded to rounded-angular ribs, conjuct deltidial plates, and well-developed dental plates; further, both the ventral and dorsal muscle fields are hardly impressed in *Yukiangides* but circumscribed by ridges in *Latonotoechia*. Unlike the new genus, *Latonotoechia* has a deep sulcus and highly raised fold, both usually asymmetrical, high, often distorted subtriangular tongue, sharply angular asymmetrical ribs, disjunct deltidial plates, and strongly reduced to almost missing dental plates.

Yukiangides differs from *Machaeraria* (based on *Rhynchonella formosa* HALL, 1857) mainly in having massive hinge plates located on the thick-walled posterior part of the brachial valve, whereas the hinge plates of *Machaeraria* are free, supported only by short, nearly vertical crural plates (see COOPER 1955, pl. 13, figs. 27, 29); moreover, the deltidial plates are incipient and disjunct in *Machaeraria* but conjunct in *Yukiangides*.

Species assigned:

Camarotoechia parasappho WANG, 1956; Yukiang Formation, Lower Devonian, Central Guangxi, Southern China;

Machaeraria (?) *atrypoidea* NIKIFOROVA, 1960; Jakušin Formation, Lower Devonian; Gornyi Altai, Ural Mts., Central Asia;

Machaeraria kurjensis GRACIANOVA, 1967; Jakušin Formation, Lower Devonian; Gornyi Altai;

Rhynchonella vesta BARRANDE, 1879; Lochkov Formation, Lower Devonian, Bohemia.

Yukiangides vesta (BARRANDE, 1879)

Pl. I, figs. 1, 2, 3, 9

1961 *Latonotoechia vesta* (BARRANDE, 1879); HAVLÍČEK, p. 27, pl. 6, figs. 1, 2; text-figs. 2, 3.

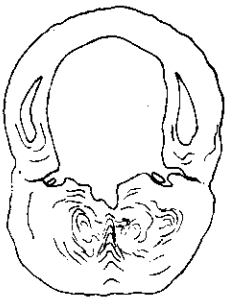
Lectotype (SD HAVLÍČEK 1961): Shell figured by BARRANDE in 1879 on pl. 34 as fig. 3; refigured by HAVLÍČEK in 1961 on pl. 6 as fig. 2; L 28621.

Type horizon and locality: Lochkov Formation, Lochkov.

Exterior: See HAVLÍČEK 1961. Dimensions of a young shell: shW: 7.0 mm; pvL: 7.1 mm; shT: 3.3 mm; lateral profile lenticular. Dimensions of adult specimens: shW: 9.0–15.0 mm; shT/W: 50.8–75.7 %; pvL/W: 85.7–99.0 %. Ventral beak short, moderately incurved; pedicle opening hypothyrid, elliptical, bordered laterally by deltidial plates. Sulcus shallow, discernible near anterior margin of pedicle valve, in low shells gradually passing into modertely convex flanks; in late adults (over 60 % as high as the maximum width), the sulcus is moderately deep with low sides and slightly concave bottom; tongue low, arcuate. Fold indistinct in lenticular shells but formed as a low elevation in late adult specimens. Ribs rounded, equal in size, never bifurcating, 6–8 in the sulcus and 6–8 on each flank.

Interior: Dental plates very short, umbonal cavities mostly filled with secondary shell material. Ventral muscle field indistinct except for the weakly impressed adjustor scars. Hinge plates resting on a thick pad of callosity that obscures the posterior part of the median ridge (see text-fig. 2). Cardinal process linear, located in the posterior part of the notothyrial cavity. Low median ridge extends over two fifths of the brachial-valve length.

Occurrence: Lochkov Formation, Radotín Limestone; area between Lochkov and Kosoř (mostly old collections) and Podolí (abandoned quarry near the former cement factory; collected by P. Štorch).



2. *Yukiangides vesta* (BARR.). Transverse section, × 8

Machaeratoechia g.n.

Type species: *Machaeratoechia marsyas* sp. n.

Diagnosis: Shell medium to large, externally recalling that of *Latonotoechia* but neither asymmetrical nor distorted, dorsi-biconvex in adults; subtriangular to subpentagonal in outline; ventral beak nearly straight, apsacline to orthocline, robust; large pedicle foramen hypothyrid to submesothyrid, bounded by conjunct deltidial plates; sulcus shallow with a flat bottom; fold low, anterior commissure gently arcuate. Ribs numerous, never bifurcating, high, with very steep sides; crests of ribs rounded posteriorly but rounded-angular anteriorly.

Dental plates absent, cardinal teeth located on lateral walls of pedicle valve; ventral muscle field deeply inserted. Hinge plates disjunct, inclined towards mid-line, supported by short, curved crural plates. Cardinal process weak, linear.

Comparison: *Machaeratoechia* differs from *Latonotoechia* in having symmetrical ribs even in the sulcus and fold, arcuate anterior commissure, and clearly developed crural plates supporting the inner edges of the hinge plates. By contrast, the shell of *Latonotoechia* is usually asymmetrical with a prominent, subtriangular to triangular tongue not uncommonly distorted. Further, the ribs of *Latonotoechia* are asymmetrical with inner sides much higher than the outer sides in the sulcus, but with low inner sides and very high outer ones on the fold. Moreover, *Latonotoechia* lacks the crural plates.

Another closely similar genus is *Machaeraria* which is distinguished by thin, moderately diverging dental plates and minute, disjunct deltidial plates. By contrast, *Machaeratoechia* lacks dental plates and has conjunct, rather massive deltidial plates.

Species assigned:
Machaeratoechia marsyas sp.n.; Zlíchov Limestone, Bohemia;
Machaeratoechia sp.n.; Koněprusy Limestone, Bohemia.

Machaeratoechia marsyas sp.n.

Pl. II, figs. 5—8

1956 *Camarotoechia latona* (BARRANDE, 1847); HAVLÍČEK, p. 570, pl. 2, fig. 21.

Holotype: Brachial valve figured on pl. II as fig. 8; VH 6028a.
Type horizon and locality: Zlíchov Limestone (lower part); Hlubočepy (U kapličky quarry).
Material: 5 shells, 1 pedicle valve, 1 brachial valve, and several fragments.

Exterior: Shell subtriangular in outline, subequally biconvex in young specimens becoming dorsi-biconvex in late adults, widest anterior to its mid-length; 14.0–27.5 mm wide in specimens available, as long as the maximum width or slightly wider than long. Pedicle valve moderately convex in sagittal profile with a nearly straight and robust beak; palintrope small, apsacline to orthocline; large hypothyrid pedicle foramen bounded by small, conjunct deltidial plates. Sulcus shallow with low, moderately sloping sides and nearly flat bottom. Anterior commissure gently arcuate and serrate. Brachial valve more convex umbonally than anteriorly; fold low, gently convex in cross section.

Ribs rounded-angular anteriorly, never bifurcating, by contrast to those of *Latonotoechia latona* symmetrical in cross sections, separated by deep subangular grooves, counting 21–26 (5–7 in the sulcus). Growth imbrications sporadic.

Interior: See diagnosis of the genus.

Comparison: *Machaeraria paraformosa* LENZ (Lochkovian, Yukon, Canada; LENZ 1977, PERRY 1984) is a closely similar species, but it differs from *M. marsyas* in having short and moderately diverging dental plates; further, the new ribs in *M. paraformosa* arise, although infrequently, by bifurcation and intercalation, whereas the number of ribs remains constant during ontogeny in *M. marsyas*.

Occurrence: Zlíchov Limestone, lower part; Hlubočepy (U kapličky quarry) and Klukovice (locality Nad koupalištěm).

Machaeratoechia sp. n.

Pl. I, fig. 8; pl. II, fig. 3

Remarks: *M.* sp.n. is distinguished by a roundedly pentagonal outline and very low fold; unfortunately, our collection contains only two free brachial valves.

Occurrence: Koněprusy Limestone, Koněprusy (Císařský quarry).

Zlichorhynchus HAVLÍČEK, 1963

Type species: *Zlichorhynchus hiatus* HAVLÍČEK, 1963.

Zlichorhynchus hiatus HAVLÍČEK, 1963

Pl. II, figs. 1, 2, 4; pl. III, figs. 1–5

1963 *Zlichorhynchus hiatus* n. sp.; HAVLÍČEK, p. 403, pl. 1, figs. 1–5.

Holotype: Shell figured by HAVLÍČEK in 1963, pl. 1, figs. 1, 2; VH 3678a.

Type horizon and locality: Zlíchov Limestone (lower part); Hlubočepy (U kapličky quarry).

Exterior and interior: See HAVLÍČEK 1963. Ontogeny: Young shells 2.7 to 6.0 mm wide are subrectangular, nearly parallel-sided, with a wide, nearly straight posterior margin and a large, open foramen. Adult shells (7.5–14.0 mm wide) are subtriangular in outline, 53.5–57.7 % as high as wide, elongate (pvL/W: 105.7 to 107.8 %), widest at about two thirds of their length, with a short, apsacline beak, large mesothyrid pedicle foramen, and minute deltidial plates which may touch each other in late adult specimens; fold and sulcus absent in any stage of ontogeny, anterior commissure rectimarginate to slightly curved dorsally. Ribs narrow and high, with rounded crests, 17–22 in number, never bifurcating.

Dental plates short, umbonal cavities very narrow. Hinge plates disjunct, triangular, horizontally disposed, gently concave both in transverse and longitudinal profiles, not underlain by secondary shell material; outer edges of hinge plates connected with inner wall of brachial valve by means of deeply concave subsocket plates; inner edges of the plates supported by high, straight, broadly divergent crural plates that bound the muscle field laterally. Cardinal process low, thin ridge located in a deep groove between the hinge plates.

Remarks: The Pragian specimens (Koněprusy Limestone) are not distinguishable from those of the Zlíchov Limestone. The features of the earlier (Pragian) population are as follows: shW of adult specimens: 9.7–11.8 mm; pvL/W: 108.1–112.7 %; shT/W: 57.5–65.4 %; number of ribs: 16–23; outline and convexity of the shell, and the ontogeny are also essentially the same in both the populations.

Occurrence: Koněprusy Limestone, Koněprusy (Zlatý kůň and Na Voskopě hills; rare). Zlíchov Limestone (lower part), Hlubočepy (U kapličky quarry) and Klukovice (locality Nad koupalištěm).

Sicorhyncha HAVLÍČEK, 1961

Type species: *Stegerhynchus trinacrius* HAVLÍČEK, 1956.

Sicorhyncha praesella sp.n.

Pl. XVI, figs. 7, 8

Holotype: Shell figured on pl. XVI as fig. 7; VH 6003a.
Type horizon and locality: Kotýs Limestone, Svatý Jan pod Skalou (Solway quarry).
Material: Two shells and several incomplete valves.

Exterior: Shell 18.0–18.5 mm wide, and 69.5–73.7 % as high as the maximum width, transversely elliptical in outline; widest part at about mid-length. Ventral beak short, incurved, delthyrium not examined. Ventral sulcus shallow, with a flat bottom. Fold clearly elevated above convex flanks, its top flat to gently convex. In side view, brachial valve strongly convex to semicircular, highest at about its

mid-length. Ribs finer on fold and sulcus than on flanks; bottom of sulcus occupied by 7–8 ribs (some originating by bifurcation), each flank bears 8–9 ribs. One parietal rib may be present at one or both sides of the sulcus.

Interior: Not examined.

Comparison: *S. sella* (lower Pragian) differs from *S. praesella* in having much deeper sulcus, more prominent fold, subpentagonal outline of shell, and less numerous ribs on fold and sulcus (usually 5).

Occurrence: Type locality only.

Sicorhyncha sella sp. n.

Pl. IV, figs. 4–7

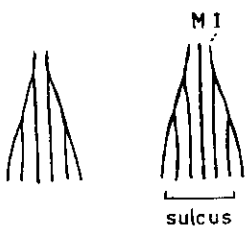
Holotype: Shell figured on pl. IV as fig. 7; VH 6004d.

Type horizon and locality: Vinařice Limestone, Koněprusy (rock near the cement factory Čertovy schody).

Material: 28 shells.

Exterior: Shell dorsi-biconvex, subpentagonal to subtriangular in outline, usually 9.0–16.0 mm wide (the largest shell: 16.9 mm wide), and 50.0–72.4 % as high as wide; widest part at or anterior to mid-length; sides of shell rounded; postero-lateral parts steeply inclined toward valve commissure but never forming flat, vertical walls. Pedicle valve evenly convex in sagittal profile, 75.5–88.7 % as long as wide; sulcus originates at about the posterior quarter of the valve to become rather deep anteriorly, 50–65 % as broad as the maximum width of the shell; it is bordered by highly elevated flanks and extends into a prominent tongue directed antero-dorsally; margin of the tongue rounded. Bottom of sulcus nearly flat; postero-lateral margins of pedicle valve rather long, gently curved towards mid-line; apical angle 82–98°; ventral beak gently curved, pedicle foramen not seen in any specimen (ill-preserved); deltidial plates fused into a single, gently concave piece. Brachial valve bears a highly raised fold with steep sides.

Ribs angular, separated by angular grooves; sulcus bears an unbranched mid-rib (M) and two pairs of secondaries (Ia^-; Ib^-) arising on inner sides of the sulcus-bounding costae. Top of the fold occupied by a pair of submedian ribs, each bifurcating near the beak; further, the outer pair of secondaries bifurcates again in the posterior quarter to third, whereas the inner secondaries remain undivided.



3. *Sicorhyncha sella* sp. n. Rib system on fold (on the left) and sulcus (on the right)

Parietal ribs either absent or one rib may be located at one or both sides of the sulcus. Lateral ribs never bifurcating, 6–8 in number.

Interior: Not investigated.

Comparison: *S. sella* clearly differs from *S. tenuirostris* (Koněprusy Limestone) in having a deeper sulcus and a high fold with steep sides and gently convex top, whereas the fold of *S. tenuirostris* is hardly elevated and always bears a shallow depression on its top.

By overall shape of shell, *Franklinella pedderi* LENZ (Lochkovian, Arctic Canada; LENZ 1973; PERRY 1984) is closely similar to the Bohemian species except for having more numerous ribs (8–15 on fold and sulcus, 10–15 on each flank). An important feature of *Franklinella* is the hypothyrid to submesothyrid pedicle foramen, whereas that of *Sicorhyncha* is permesothyrid; in *Sicorhyncha sella,* unfortunately, the position of the pedicle foramen has not been established.

Occurrence: Type locality only.

Sicorhyncha tenuirostris HAVLÍČEK, 1961

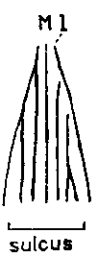
Pl. V, figs. 1–8

1961 *Sicorhyncha trinacria tenuirostris* n. subsp.; HAVLÍČEK, p. 30, pl. 1, figs. 3, 4.

Holotype: Shell figured by HAVLÍČEK in 1961, pl. 1, fig. 4; VH 191.
Type horizon and locality: Koněprusy Limestone, Koněprusy.

Exterior and interior: See HAVLÍČEK 1961.

Ontogeny: Post-protegular stage nearly quadrate, less than 2 mm wide, with rather broad and nearly straight posterior margin, with a large, open, mesothyrid foramen occupying more than a third of the maximum width of the shell. Early growth stages 3.0–4.5 mm wide are gently ventri-biconvex, elongate, wedge-shaped in outline, about 127 % as long as wide, with deltidial plates fused into a triangular plate below the permesothyrid pedicle foramen. During further growth, the length/ /width ratio decreases from about 105 % in shells about 4.9 mm wide to about 100 % in specimens 5.5–6.0 mm in width. Young specimens 6.0–9.0 mm wide are lenticular in lateral profile, equally biconvex, subtriangular in outline, 87–100 % as long as wide; during further ontogeny, shells moderately expand laterally and acquire a nearly



4. *Sicorhyncha tenuirostris* HAVL. Rib system insulcus

pentagonal outline; their lateral profile is dorsi-biconvex due to a strongly swollen beak; shW of adult specimens: 14–16 mm; pvL/W: 83.1–91.0 %; shT/W: 57.5 to 71.3 %; suW/shW: 51.4–59.5 %. A few late adult specimens are up to 18.7 mm wide and even more transverse with pvL/W about 75 %.

Remarks: Significant feature of *S. tenuirostris* is the form of its fold; sides of the fold are hardly elevated above the flanks, top of the fold is slightly to moderately concave in transverse section. Another peculiar feature is a rather large, flat, triangular plate covering the delthyrium; suture between the fused deltidial plates is indistinct. Pedicle foramen is permesothyrid, both in young and adult specimens sealed by the callus that leaves a circular scar (attachment scar?) on the top of the beak.

Ribbing: Sulcus occupied by 5 angular ribs, other number of ribs is exceptional (4, 6, 7). Of them, the primary costae M and I originate on the beak, the secondaries arise either by implantation or bifurcation of the primary costa I, or the new ribs may arise as inner branches of the mother ribs I. Each flank bears 10–15 ribs, some of them arising by implantation and bifurcation in various distances from the posterior margin.

Occurrence: Bohemia, Koněprusy Limestone, area between Koněprusy and Měňany (Zlatý kůň, Na Voskopě, and Plešivec hills; frequent). ?France, Massif Armoricain, Emsian (BRICE 1980).

Sicorhyncha trinacria (HAVLÍČEK, 1956)

Pl. III, figs. 6–11

1961 *Sicorhyncha trinacria trinacria* (HAVLÍČEK, 1956); HAVLÍČEK, p. 31, pl. 1, figs. 1, 2, 7–14.

Holotype: Shell figured by HAVLÍČEK in 1956, pl. 1, figs. 4 and 5; refigured by HAVLÍČEK in 1961, pl. 1, fig. 13; VH 63.

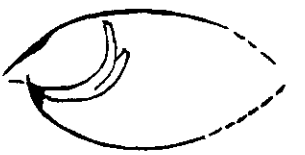
Type horizon and locality: Zlíchov Limestone (lower part), Hlubočepy (U kapličky quarry).

Exterior and interior: See HAVLÍČEK 1961.

Ontogeny: The post-protegular stage is nearly rectangular with a gently curved posterior margin somewhat narrower than the arcuate anterior margin; the youngest available specimen is 3.9 mm wide.

Young growth stages 4.0–6.0 mm wide are ventri-biconvex, elongate (104–120 % as long as wide), with a shallow sulcus but without a fold; a significant feature is a rather broad, moderately curved posterior margin, apsacline ventral palintrope, large permesothyrid pedicle foramen and a flat, triangular plate covering the whole delthyrium. During further ontogeny, the shell acquires a subtriangular outline that changes into a heart-shaped outline in fully grown specimens; for this reason, the postero-lateral margins of shell are nearly straight and gently divergent in young specimens, whereas in late adult growth stages they are curved considerably towards mid-line. Also the lateral profile gradually changes from the ventri-biconvex to clearly dorsi-biconvex profile in adult specimens.

Fully grown specimens are 12.5–15.1 mm wide and 47.6–53.0 % as high as their maximum width (extreme: 64.0 %); pvL/W: 77.5–85.9 %; suW/shW: 51.0 to 57.1 %. Shell of late adult specimens heart-shaped, widest at about 2/3 of its length, with long postero-lateral sides curved towards mid-line; sulcus and fold as in *S. tenuirostris*. Beak rather narrow, nearly straight, posteriorly directed, apically pierced by a large, circular foramen never sealed by a callosity, located above a triangular nearly flat plate covering the delthyrium; palintrophe narrow, apsacline.



5. *Sicorhyncha trinacria* (HAVL.). Crus in lateral view (according to shell VH 5963a), × 5.

Ribbing as in *S. tenuirostris* but somewhat coarser. Bottom of sulcus occupied by 4–6 sharply angular ribs, increasing either by implantation or by branching of the mother costae I. Each flank bears 8–9 ribs. One parietal rib may be present at one or both sides of the sulcus.

Interior: Dental plates fused with the postero-lateral walls of the valve except for their anterior parts which bound the very small umbonal cavities; ventral muscle field obscure. Hinge plates small, triangular, steeply sloping towards mid-line, posteriorly resting on the valve floor; anterior parts of hinge plates free; sockets deep, anteriorly underlain by concave subsocket plates. Cardinal process a thin blade located in a deep pit between the posterior parts of the hinge plates. Crural apophyses short, curved ventrally to almost touch the opposite valve, laterally flattened, terminating with an upper, larger "horn", and a smaller, lower "horn". Muscle field indistinct, median ridge absent or low.

Comparison: Adult specimens of *S. trinacria* are similar to those of *S. tenuirostris*; they differ from the latter species in having much better developed heart-shaped outline of their shell, somewhat coarser ribbing, and less swollen dorsal beak; for this reason, the shT/W ranges from 47.6 to 53.0 in *S. trinacria*, and from 57.5 to 71.3 in *S. tenuirostris*. A significant difference lies in nature of the pedicle opening; that of *S. tenuirostris* is sealed by the secondary shell material, whereas that of *S. trinacria* is open throughout ontogeny. Further differences concern the ontogeny: the subquadrate post-protegular stage reaches up to 3.9 mm in size in *S. trinacria*, that of *S. tenuirostris* is less than 2 mm wide. The elongate shells of early growth stages are confined to specimens less than 5 mm wide in *S. tenuirostris*, whereas the shells of *S. trinacria* retain their elongate form until reaching 6.5–7.0 mm in width.

Occurrence: Bohemia, Zlíchov Limestone (lower part); Hlubočepy (U kapličky quarry, frequent); and Hřib hill near Srbsko (rare).

Cherubicornea g. n.

Type species: *Terebratula amalthea* BARRANDE, 1847.

Diagnosis: Shell equally biconvex to dorsi-biconvex with a narrow, apsacline ventral beak pierced by a circular permesothyrid foramen; deltidial plates fused into one flat to gently convex triangular piece; postero-lateral sides of shell moderately to strongly curved towards mid-line; anterior part of shell extends laterally into acute, alate projections in a similar way as in *Thliborhynchia.* Fold and sulcus well-developed in the Pragian species tending to obscurity in the Zlíchovian; anterior commissure uniplicate, rarely nearly rectimarginate. Ribs high, angular, increasing in number by implantation and bifurcation both in sulcus and fold, as well as on flanks. Growth lines densely crowded.

Dental plates short, mostly fused with inner walls of pedicle valve except for their anterior parts which are free to bound the very narrow umbonal cavities. Ventral and dorsal muscle fields faintly impressed. Hinge plates small, disjunct, steeply sloping to the valve floor, underlain by pads of secondary accumulations; blade-like cardinal process located in a deep pit between the hinge plates.

Comparison: *Sicorhyncha* and *Cherubicornea* form a small group of orthorhynchulid brachiopods probably derived from the ancestral genus *Machaeraria.* Both the Bohemian genera differ from *Machaeraria* in having a permesothyrid foramen and sharply angular ribs, whereas the cosmopolitan *Machaeraria* has a submesothyrid to hypothyrid foramen, disjunct minute deltidial plates, and rounded costae.

Thliborhynchia recalls *Cherubicornea* in having a similar shape of shell with prominent alate extensions and angular ribs. *Thliborhynchia,* however, took over the hypothyrid pedicle foramen and disjunct deltidial plates from its forerunner *Machaeraria.* On the other hand, both *Sicorhyncha* and *Cherubicornea* have a permesothyrid foramen and their delthyrium is completely roofed over by a rather large, flat to slightly convex triangular plate originated by coalescence of deltidial plates. Further, *Sicorhyncha* and *Cherubicornea* differ from *Thliborhynchia julli* LENZ (i.e. the type species of *Thliborhyncha*) in a common bifurcation and implantation of ribs, whereas the ribs of the latter genus do not increase in number during ontogeny. *Thliborhynchia kerri kerri* JOHNSON and *T. kerri mackenziensis* PERRY (both Arctic Canada) are triangular in shape with acute antero-lateral extensions, but both have a submesothyrid foramen, open delthyrium at least in young specimens, and fine, rounded, wire-like costellae (JOHNSON 1975; PERRY 1984).

Cherubicornea is surely derived from *Sicorhyncha* sharing with the latter the same type of ribbing, pedicle opening, and inner morphology. The main difference consists in shape of shell; by contrast to *Sicorhyncha, Cherubicornea* has alate extensions in anterior part of its shell. This peculiar feature is regarded here as a "new device" serving to better stabilize the shell on the substrate; in this respect, its function is comparable to spines and trails in atrypacean brachiopods; for this reason, it may be

used for erecting a new genus. The alate *Cherubicornea* forms a short-living stock which is coeval with the non-alate *Sicorhyncha* stock during the Pragian and Zlíchovian.

A tendency to develop alate shells has also been found in *Zeravshanotoeachia* (Pragian – Zlíchovian; Ural Mts., Central Asia; RŽONSNICKAJA 1977); this genus, however, differs from *Cherubicornea* in having a raised, anteriorly undercut notothyrial platform that bears a blade-like cardinal process; by contrast to inner morphology of other orthorhynchulid genera, the notothyrial cavity of *Zeravshanotoechia* is roofed over by a transverse plate that is attached to the edge of the cardinal process (RŽONSNICKAJA 1977, text-fig. 12).

Species assigned:
Terebratula amalthea BARRANDE, 1847; Pragian; Bohemia, France;
Cherubicornea cherubina sp. n.; Zlíchovian, Bohemia.

Cherubicornea amalthea (BARRANDE, 1847)

Pl. IV, figs. 1–3

1961 *Sicorhyncha amalthea* (BARRANDE, 1847); HAVLÍČEK, p. 32, pl. 1, figs. 5, 6.

Holotype: Shell figured by BARRANDE in 1847, pl. 19, fig. 6; refigured by BARRANDE in 1879, pl. 29, fig. 4; L 25401.

Type horizon and locality: Koněprusy Limestone, Koněprusy.

Exterior and interior: See HAVLÍČEK 1961.

Ontogeny: Young shells (about 7 mm wide) subtriangular, slightly elongate or slightly expanded laterally, 98.0–105.6 % as long as wide, usually equally biconvex, low, with pedicle valve clearly longer than the brachial valve. Widest part about in three quarters of the valve length; postero-lateral margins very long, gently curved towards mid-line, subtending right to acute angles with the arcuate anterior margin. Fold low, convex, sulcus very shallow.

During further ontogeny, the shell expands in width due to developing acute, in late adult growth stages up to rod-like extensions; shW of adult specimens: 17.5 to 20.0 mm; pvL/W: 67.0–76.5 % (extreme: 62.3 % in a shell with long lateral extensions). Sulcus of adult specimens moderately deep with steep sides and a flat to slightly convex bottom; fold moderately high with rather steep sides and gently convex crest. Postero-lateral sides of shell long, either steep and convex or formed as vertical to slightly introverted walls bounded by angular beak edges in both valves. Ventral beak short, slightly incurved, pierced by a circular permesothyrid foramen; palintrope small, apsacline, delthyrium covered by a triangular plate that touches the dorsal beak penetrating into the body cavity.

Ribbing: Sulcus occupied by 5 to 8 sharply angular ribs; median rib never bifurcates in any stage of ontogeny; number of costae increases by implantation or by bifurcation of the sulcus-bounding ribs I, in many specimens succeeded by bifurcation

of the outer branches whereas the inner branches of the mother costae I do not undergo further division. Fold occupied by 6–8 ribs, all originating by successive bifurcation of the submedian pair I. Lateral ribs usually 7 in number (plus 3–5 very fine costellae on the postero-lateral walls). Parietal ribs absent.

Occurrence: Koněprusy Limestone, Koněprusy (Zlatý kůň and Na Voskopě hills; rather frequent). France, bassin d'Ancenis; Emsian (LE MAÎTRE 1934).

Cherubicornea cherubina sp. n.

Pl. V, figs. 9–11

Holotype: Shell figured on pl. V as fig. 11; VH 5977a.
Type horizon and locality: Zlíchov Limestone (lower part); Hlubočepy (U kapličky quarry).
Material: 8 shells, 4 pedicle valves and 2 brachial valves.

Exterior: Shell equally to subequally biconvex, rather low even in mature specimens (39.2–47.8 % as high as maximum width), 14.7–27.0 mm wide; pvL/W: 71.6–81.6 %. Widest part of shell between its mid-length and two thirds, prominent lateral extensions terminate with acute angles. Ventral beak narrow, straight, pierced by large, circular, permesothyrid foramen; delthyrium covered by a low, flat, triangular plate that touches the beak of the opposite valve; palintrope small, apsacline; postero-lateral walls strongly curved towards mid-line, steeply inclined but never bounded by beak edges, thus differing from *C. amalthea*. Pedicle valve moderately convex in lateral profile with a very shallow sulcus gradually passing into gently convex flanks. Fold indistinct, anterior commissure rectimarginate to gently uniplicate and serrate.

Ribs coarse, sharply angular; sulcus bears 5–7 costae, some of them originate by implantation at or anterior to mid-length of valve, not uncommonly the secondary costae are absent in the median sectors altogether. Lateral ribs also angular, sometimes increasing by bifurcation.

Interior: Teeth large, elongate, separated by fossets from valve margin. Dental plates fused with the valve wall except for their anterior parts which are free and separate the large delthyrial cavity from the small umbonal cavities. Ventral muscle field large, faintly impressed, bisected by a myophragm and surrounded by very weak ridges.

Hinge plates small, converging towards valve floor, resting on a low callosity; dental sockets narrow, underlain by a callosity, too. Cardinal process thin, blade-like. Adductor scars faintly impressed, located laterally to a low mid-ridge that extends anteriorly beyond the muscle field.

Comparison: *C. amalthea* is easily distinguishable from the Zlíchovian species in being dorsi-biconvex, having well-developed sulcus and fold, and having a less coarse ribbing; in *C. amalthea* the secondary ribs originate near the beaks, whereas in *C. cherubina* they insert at or anterior to mid-length of the shell.

Occurrence: Zlíchov Limestone (lower part); Hlubočepy (U kapličky quarry) and Klukovice (locality "Nad koupalištěm").

Katuniidae XU & YAO, 1984

Diagnosis: Smooth or anteriorly plicate rhynchonellids with well-developed ventral sulcus and dorsal fold; both valves thick-shelled; ventral muscle field deeply inserted umbonally; dental plates absent; hinge plates strong, disjunct, resting on a thickened posterior part of the valve; dorsal median septum absent.

Comparison: The *Katuniidae* may be derived from the *Pugnacidae*; the latter family, however, usually has moderately diverging dental plates and its hinge plates are not underlain by thick pads of secondary shell material. By contrast to the *Katuniidae*, the pugnacid genera have thin and fairly high crural plates that may touch posteriorly the inner surface of the valve (e.g. in *Pugnax acuminatus* MARTIN and *P. pugnoides* SCHNUR; see SCHMIDT 1965, text-figs. 6, 14).

Carolirhynchia g. n.

Type species: *Carolirhynchia carolina* sp. n.

Diagnosis: Shell nearly cuboidal, anteriorly having a well-developed fold and rather deep sulcus extending into a trapezoidal tongue; ventral beak robust, resting on the beak of the opposite valve; ribs absent or formed as extremely weak undulations on the tongue and anterior part of the fold; flanks smooth.

Both valves thick-shelled; dental plates missing, teeth small; ventral muscle field deeply inserted into the shell umbonally but resting on an elevated platform anteriorly; vascula media located in deep, anteriorly diverging grooves.

Cardinal process absent; hinge plates disjunct, flat, horizontally disposed, underlain by secondary shell material; groove between the hinge plates shallow, with a flat or slightly convex bottom; crural apophyses antero-ventrally directed, terminating with bulbous swellings; median ridge present.

Comparison: *Brunnirhynchia* (Famennian, Moravia; HAVLÍČEK 1979) is a closely related genus that differs from *Carolirhynchia* in having massive hinge plates sloping to the mid-line and separated from each other by a weak median groove. Moreover, *Brunnirhynchia* has a convex bottom of its sulcus often accentuated by a low median plica, whereas *Carolirhynchia* has a flat bottom of its sulcus devoid of any plications. In spite of the fact that *Carolirhynchia* is Lower Devonian in age and *Brunnirhynchia* is an Upper Devonian (Famennian) genus, we may suppose a close relation between them as follows from nearly the same inner and outer morphology of the two.

Katunia (Lower Devonian, Solov'icha Beds, Gornyi Altai; KULKOV 1963) is distinguished by having rounded to rounded-angular ribs in anterior part of its shell; consequently, the anterior commissure is deeply indented in *Katunia* but smooth in *Carolirhynchia*.

Species assigned: Type species only.

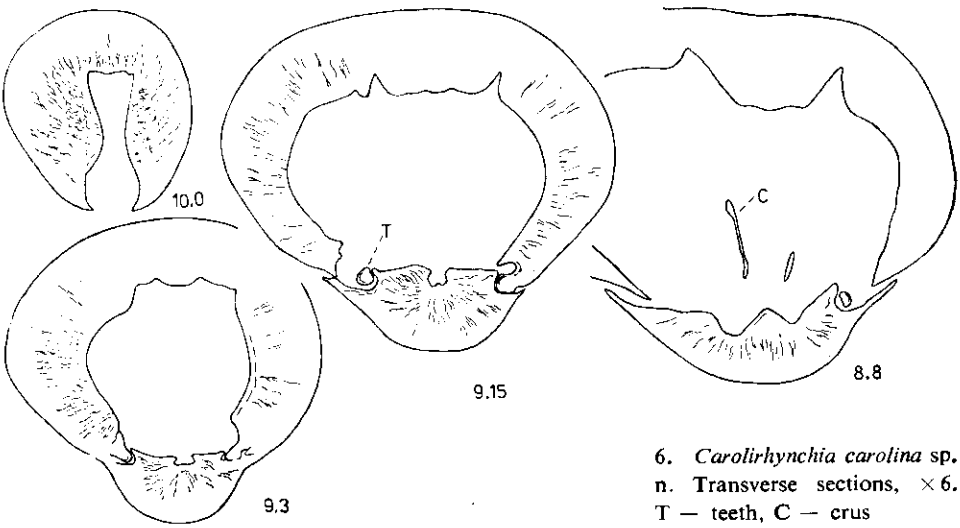
Carolirhynchia carolina sp. n.

Pl. IV, figs. 8, 9

Holotype: Shell figured on pl. IV, as fig. 8; VH 5778.
Type horizon and locality: Zlíchov Limestone, Karlštejn (hillside north-west of the castle).
Material: 18 shells and 2 pedicle valves.

Exterior: Shell nearly smooth, in young specimens lenticular becoming subcuboidal in late adult growth stages, 13.0 – 14.5 mm wide, and 73.1 – 78.5 % as high as the maximum width.

Pedicle valve subpentagonal in outline, widest at about its mid-length, 73.0 – 80.0 % as long as wide, with rather long and straight postero-lateral margins subtending an obtuse angle (105 – 117°). Beak robust, incurved, terminating with a sharp apex directed posteriorly and resting on the dorsal beak. In anterior part of the pedicle



6. *Carolirhynchia carolina* sp. n. Transverse sections, × 6. T — teeth, C — crus

valve, sulcus formed as a deep depression occupying 60.7 – 79.3 % of the maximum width of the shell, laterally bounded by short, rounded ridges; bottom of sulcus nearly flat; tongue trapezoidal with a straight anterior margin.

Brachial valve strongly and evenly convex in lateral profile, 71.0 – 75.1 % as long as wide, with a short beak; fold confined to the anterior half of the valve, moderately to highly elevated, with steeply sloping sides; top of the fold flat.

Both valves smooth; exceptionally, very weak undulations are discernible on the tongue and anterior part of the fold.

Interior: See diagnosis of the genus and text-fig. 6.

Occurrence: Dvorce-Prokop Limestone, Dvorce (Bránická skála; 1 shell); Holyně (locality U kantiny; 1 shell). Zlíchov Limestone, Karlštejn (north-west of the castle; rather frequent); Holyně (locality U kantiny; rare).

Wellerellidae RŽONSNICKAJA, 1956

Tetratomia SCHMIDT, 1941

Type species: *Terebratula tetratoma* SCHNUR, 1851.

Tetratomia pandora sp. n.

Pl. VI, figs. 3–6

Holotype: Shell figured on pl. VI as fig. 5; VH 6038c.
Type horizon and locality: Dvorce-Prokop Limestone, Barrandov.
Material: 12 shells (young and adult specimens).

Exterior: Shell minute, 3.2–4.3 mm wide, tear-drop shaped, widest at about two thirds of pedicle-valve length, exceptionally at mid-length; postero-lateral margins long, nearly straight; pvL/W: 107.7–111.4 % in the Plešivec population (Koněprusy Limestone), 111.4–118.6 % in specimens from the Dvorce-Prokop Limestone; shT/W: 53.6–64.1 % (this value decreases to 34.8 % in early growth stages smaller than 3.3 mm).

Ventral beak orthocline, sharply pointed; pedicle foramen hypothyrid, large with regard to size of the specimen, narrowly triangular in early growth stages, elongate-oval in adults, partly restricted by minute disjunct deltidial plates. Young specimens low (shT/W: 34.8 % or even less), without a sulcus and fold, with a rectimarginate anterior commissure. Adult shells bear a very short sulcus formed as a shallow, evenly concave depression, and a hardly perceptible fold confined to the anterior quarter of the brachial valve; anterior commissure of adult specimens uniplicate – serrate. On brachial valve, a narrow groove extends from the beak to reach the front margin of the fold.

Ribs high, with steep sides and rounded crests, about as broad as interspaces, numbering 11–13 on pedicle valve (3 in the sulcus, 4 on the fold). Sulcus occupied by a mid-rib and a pair or secondary costae which separate from the mother costa about 1 mm from apex. On brachial valve, the inner pair of ribs bifurcates 0.8 to 1.0 mm from the hinge line, other costae remain unbranched throughout ontogeny. Growth lines not observed.

Interior: Not investigated.

Comparison: Shape and size of the shell are the same as in *T. amanshauseri* (DAHMER) (Heisdorf Formation, Upper Emsian, Rhineland; Marettes Formation, Upper Emsian, Massif Armoricain; SCHMIDT 1942, BRICE 1981). The latter species, however, is easily distinguishable from *T. pandora* in the following ways: 1) Its rather deep and narrow sulcus is bounded laterally by steep walls, whereas the sulcus of *T. pandora* is evenly concave in transverse profile. 2) Sulcus is occupied by 1 rib in *T. amanshauseri* but by 3 ribs of equal size in *T. pandora*. 3) The fold of *T. amanshauseri* bears 2 ribs, that of *T. pandora* is occupied by 4 ribs.

Occurrence: Koněprusy Limestone, Plešivec hill near Měňany. Dvorce-Prokop Limestone, Prague territory (Barrandov, Konvářka).

Tetratomia elegans HAVLÍČEK, 1956

Pl. VI, figs. 1, 2

1961 *Tetratomia amanshauseri elegans* HAVLÍČEK, 1956; HAVLÍČEK, p. 43, pl. 3, figs. 15—18.

Holotype: Shell figured by HAVLÍČEK in 1956, pl. 2, figs. 7, 8, 11; refigured by HAVLÍČEK in 1961, pl. 3, figs. 15—17; VH 77.
Type horizon and locality: Zlichov Limestone (lower part); Hlubočepy (U kapličky quarry).
Material: 85 shells, 3 brachial valves.

Exterior and interior: See HAVLÍČEK 1961. Dimensions: shW: 3.2—5.6 mm in mature specimens; shT/W: 57.0—67.0 % (shells less thick are very rare); pvL/W: 94.2—105.0 % (several small shells even more elongate). Ribs subangular, 11—13 on pedicle valve; sulcus occupied by 1 rib, fold bears 2 ribs which appear somewhat later than the other costae.

Comparison: *T. amanshauseri* (DAHMER) (Upper Emsian, Massif Armoricain, Rhineland; redescribed by BRICE 1981) differs from the Bohemian species in having always a strongly elongate shell and bearing 4—5 lateral ribs. By contrast, *T. elegans* is circular in outline (elongate forms are rare, usually confined to small specimens less than 3.8 mm wide) and has 5—6 lateral ribs.

Occurrence: Zlichov Limestone (lower part); Hlubočepy (U kapličky quarry; frequent); Hlubočepy (hillside east of the Švarcenberský quarry; rare); Klukovice (hillside near the former swimming pool; rare).

Trigonirhynchiidae SCHMIDT, 1965

Linguopugnoides HAVLÍČEK, 1960

Type species: *Rhynchonella nympha carens* BARRANDE, 1879.

Diagnosis: See HAVLÍČEK 1961 and DROT 1964.

Linguopugnoides carens (BARRANDE, 1879)

1961 *Linguopugnoides carens* (BARRANDE, 1879); HAVLÍČEK, p. 94, pl. 11, figs. 1, 2; text-fig. 34.

Occurrence: Bohemia: Kotýs Limestone, Svatý Jan pod Skalou (rock south of the village and Solway quarry; rare). Podolia, Lochkovian, Borščov Formation (KOZŁOWSKI 1929; NIKIFOROVA 1954); Central Asia, Lochkovian, Marginalis Beds (NIKIFOROVA 1937).

Linguopugnoides supracarens HAVLÍČEK, 1961

1961 *Linguopugnoides supracarens* n. sp.; HAVLÍČEK, p. 98, pl. 6, fig. 13; text-fig. 35.

Occurrence: Upper Zlichovian, Chýnice Limestone; Srbsko (Císařská rokle).

Stenorhynchia BRICE, 1981

Type species: *Terebratula nympha* BARRANDE, 1847.

Remarks: The Pragian sequence has yielded several species of *Stenorhynchia* which differ from each other in size and minor features of valve exteriors. The general appearance of the "small" species *S. hetaera* is so different from that of the "large" *S. pseudolivonica* to leave no doubt that the two are separate species. Also the "medium-sized" *S. nympha* is easily distinguishable from the "small" *S. hetaera* and the "large" *S. pseudolivonica* and *S. fryne*, if the specimens are not affected by growth anomalies as are the slightly asymmetrical shell, moderately distorted sulcus and tongue, or variations of rib number in the sulcus. Several specimens (less than 0.5 % of specimens investigated) exhibit significant growth anomalies as are the size of the flanks which may be clearly elevated at one side of the shell but very low at the other side. An extreme case was found in a shell of *S. nympha* that has its left flank normally developed whereas its right side is so truncated to be reduced to a high, flat vertical wall with obscure ribbing. This peculiar form of the shell indicates that the animal was squeezed into a fissure that prohibited a normal growth of its shell. The specimens, affected by growth anomalies, are sometimes not determinable on specific level.

Another interesting feature are the variations in brachial valve interior during life of the animal. The early growth stages lacking a well-developed ventral sulcus have a large, open septalium (see text-fig. 8); during further growth, a connective band originates to cover the anterior part of the septalium in mature specimens (see text-fig. 9).

Stenorhynchia ida sp. n.

Pl. VII, figs. 5, 6

Holotype: Shell figured on pl. VII as fig. 6; VH 6016b.
Type horizon and locality: Vinařice Limestone, Koněprusy (Čertovy schody).
Material: 24 shells and several incomplete specimens.

Exterior: Early growth stages (smaller than 6.5 mm) subtriangular in outline with long, nearly straight postero-lateral margins and an arcuate anterior margin, lenticular in lateral profile, with an incipient sulcus. Mature specimens variable in size and shape, 9.8 – 18.3 mm wide, with the following features: pvL/W: 81.7 to 93.1 %; bvL/W: 71.5 – 83.3 %; shT/W: 58.4 – 78.7 %; suW/pvW: 62.5 – 71.2 %; apical angle about 93°. Pedicle valve strongly and evenly convex in sagittal profile; ventral sulcus less broad than in other species of *Stenorhynchia,* moderately deep, extending into a trapezoidal tongue directed antero-dorsally to dorsally; anterior margin of tongue gently arcuate. Bottom of sulcus nearly flat, tongue occupied by 5 angular ribs; one parietal rib may be present either at left or right side of the sulcus. Dorsal beak may or may not bear a shallow groove. Fold moderately to highly

raised at its anterior margin. Lateral ribs 5–6 in number. Postero-lateral sides of shell low, steeply inclined towards commissures, rarely bordered by rounded-angular edges.

Interior: The same as in *S. nympha*.

Comparison: *S. ida* is a probable praecursor of *S. fryne* (Koněprusy Limestone) as indicated by the gently curved anterior margin of its tongue, nearly evenly convex sagittal profile of its pedicle valve, and a common presence of a parietal rib at one side of its sulcus. *S. fryne*, however, is distinguished by a serrate anterior commissure, whereas *S. ida* has a deeply indented anterior commissure; further, the sulcus of *S. fryne* is broader than that of *S. ida*.

Externally, *S. ida* is similar to *S. nympha* (Koněprusy Limestone); it differs from the latter in having a deeper but less broad sulcus (suW/pvW: 62.5–71.2 % in *S. ida*, 69.7–80.6 % in *S. nympha*) and a less curved tongue which is directed antero-dorsally to dorsally in *S. ida* but postero-dorsally in adult specimens of *S. nympha*.

Occurrence: Vinařice Limestone (including brecciated limestone in its lowermost part); Koněprusy (Čertovy schody; rather common); Slivenec Limestone, Tobolka (Tobolský hill; only one shell).

Stenorhynchia hetaera sp. n.

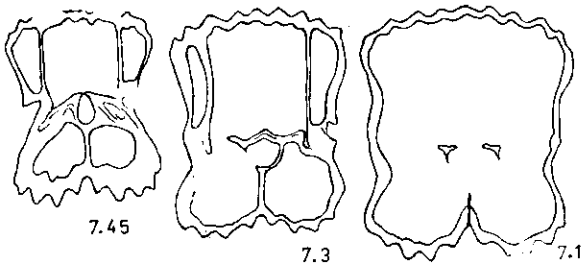
Pl. VII, figs. 1, 3, 4

1961 *Stegerhynchus nympha* (BARRANDE, 1847); HAVLÍČEK (partim), pl. 9, fig. 7.

Holotype: Shell figured on pl. VII as fig. 1; VH 4849e.
Type horizon and locality: Koněprusy Limestone, Koněprusy (Zlatý kůň hill, Houba quarry).
Material: 186 shells.

Exterior: Shell small, lenticular, lacking a sulcus and fold in the earliest growth stages (3.2–4.7 mm wide), but nearly cuboidal in mature specimens with a very high, nearly rectangular tongue; shW of adult specimens: 6.4–11.0 mm, pvL/W: 84.8–96.1 %, exceptionally slightly elongate; bvL/W: 80.4–88.6 %; shT/W: 60.5 to 95.0 %, in gerontic specimens up to 100 %; suW/pvW: 76.0–80.9 %. Pedicle valve pentagonal in outline with straight postero-lateral margins subtending 87–98°; ventral beak short, nearly straight, posteriorly directed; palintrope small (about two fifths of the pvW), bounded by shallow grooves; circular foramen surrounded by triangular plates which may touch each other; postero-lateral walls of pedicle valve low, steeply sloping towards lateral commissures, separated from the rest of the valve by rounded to obscure edges. In sagittal profile, maximum curvature of pedicle valve about at its mid-length; sulcus deep, bounded by narrow, highly elevated flanks. Bottom of sulcus flat, less commonly slightly convex. Tongue high in adults, in sagittal profile so curved to be postero-dorsally directed; anterior margin of tongue straight and indented, exceptionally arcuate.

The groove originating at the dorsal beak reaches either the front of the fold or,



7. *Stenorhynchia hetaera* sp. n. Transverse sections, × 8

more commonly, disappears at about a third of the valve length. Fold flat-topped, highest at its front. Ribs angular, 5 in the sulcus (rarely 4 or 6; about 1 % of the population), and 3–5 (exceptionally 6) on flanks. Anterior commissure deeply indented: each incision continuous with a short, tapering groove on the rib of the opposite valve.

Interior: See text-fig. 7.

Comparison: *S. nympha* differs from *S. hetaera* in its larger size, almost evenly curved pedicle valve in sagittal profile, less deep sulcus, gently arcuate anterior margin of the tongue, and more numerous lateral ribs.

Occurrence: Koněprusy Limestone, Koněprusy (Zlatý kůň and Na Voskopě hills).

Stenorhynchia nympha (BARRANDE, 1847)

Pl. VIII, figs. 1–9

1961 *Stegerhynchus nympha* (BARRANDE, 1847); HAVLÍČEK, p. 85, pl. 9, figs. 8–13; text-fig. 29.
1981 *Stenorhynchia nympha* (BARRANDE, 1847); BRICE, p. 197, pl. 25, figs. 1–5; text-figs. 1A, 1B (herein quotations of earlier papers).

Neotype (SD HAVLÍČEK 1961): Shell figured by BARRANDE in 1879, pl. 153, case VIII; refigured by HAVLÍČEK in 1961, pl. 9, fig. 11; L 25155l.
Type horizon and locality: Koněprusy Limestone, Koněprusy.
Material: about 300 shells.

Exterior and interior: See HAVLÍČEK (1961) and BRICE (1981); shW of mature specimens: 10.6–17.2 mm; pvL/W: 80.1–98.5 %; bvL/W: 76.0–90.6 %; suW/pvW: 69.7–80.6 %; shT/W: 76.0–92.5 %. About 2 % of the Zlatý kůň population are young shells lenticular in lateral and transverse profiles, with very shallow to obscure sulcus and fold. Adult shells are nearly cuboidal, subpentagonal in outline, with moderately deep sulcus and high tongue. Ventral beak gently incurved, posteriorly directed; palintrope about a third as broad as the maximum width of valve, apsacline; delthyrium open. Postero-lateral sides of pedicle valve rather long, straight or slightly curved toward mid-line, subtending 88–110°. Sides of sulcus steep, bottom of sulcus flat; elevated flanks small, highest at their lateral margins. Tongue trapezoidal, in late adult growth stages high, with gently curved anterior margin. Fold flat-

-topped with steep sides; in side view, its anterior part upturned dorsally. Postero--lateral sides of shell usually low, rather steeply sloping towards commissures, bounded by inconspicuous edges, exceptionally nearly vertical up to introverted and delimited with subangular edges.

Ribs angular, coarser than in *S. hetaera*, 5 in the sulcus (about 98 % of the population), and 7–10 on each flank where the outer ones change into costellae. Interesting are the sulcus-bounding ribs which are usually somewhat less high than the other ribs. Specimens with 4 ribs in the sulcus are rare; of specimens investigated, only 2 shells bear 3 ribs in the sulcus. Anterior and lateral commissures deeply indented; each incision continues for a short distance as a narrow, tapering groove on top of the costa of the opposite valve.

Occurrence: Bohemia: Koněprusy Limestone, Koněprusy (Zlatý kůň and Na Voskopě hills; frequent); Lochkov Limestone (uppermost part), Hlubočepy (near the former swimming pool; collected by J. Vaněk).
Carnic Alps, Emsian (Riffkalk) (SCUPIN 1906; GORTANI 1915).
France, Massif Armoricain, Emsian (BRICE 1981).
Morocco (Maroc pré-Saharien); Emsian (DROT 1964; LE MAÎTRE 1944).
Turkey, Pendik Formation (PAECKELMANN 1925).
Gornyi Altai, Emsian, Jakušin Beds (GRACIANOVA 1967); Solov'icha Beds (KUŁKOV 1963).
Salair Mts., Emsian, Malyj Bačat and Verchnij Krekovsk Beds (ALEKSEEVA, GRACIANOVA, ELKIN, KUŁKOV 1970).
Canada, Yukon; latest Lochkovian–early Pragian (Delorme Formation) (PERRY 1984).

Stenorhynchia fryne sp. n.
Pl. X, figs. 1–4

Holotype: Shell figured on pl. X as fig. 3; VH 4860c.
Type horizon and locality: Koněprusy Limestone, Koněprusy (Houba quarry).
Material: 90 shells.

Exterior: Similar to *S. nympha* but larger, with the following features: shW: 16.0–22.5 mm in mature specimens; pvL/W: 74.7–92.8 %; bvL/W: 71.2–84.7 %; suW/pvW: 72.0–87.2 %; shT/W: 74.0–91.0 %. Pedicle valve pentagonal in outline with postero-lateral sides nearly straight, subtending 97–119°; ventral beak more incurved than in *S. nympha*, palintrope about a third as broad as the maximum width of the pedicle valve. Postero-lateral sides of both valves low, separated by inconspicuous rounded edges from the rest of the shell; rarely, these walls are vertical, exceptionally slightly concave, bordered by subangular edges. In sagittal profile, pedicle valve strongly and evenly convex; sulcus moderately deep, its bottom flat or slightly concave; tongue trapezoidal, low to high, dorsally to postero-dorsally

directed, with gently curved anterior margin. By contrast to *S. nympha*, no groove observed on dorsal beak. In transverse profile, top of the fold gently convex.

Sulcus bears 5 (exceptionally 4) angular ribs; lateral ribs, numbering 6–10, decrease in size towards valve margins to acquire a form of costellae. Anterior and lateral commissures indented, the incisions less high than in *S. nympha* except for 2 gerontic shells with an extremely high tongue.

Interior: The same as in *S. nympha*.

Comparison: The closely related *S. nympha* differs from *S. fryne* in being invariably smaller, having a higher tongue in adult specimens, sharper incisions continuous with short grooves on ribs of the opposite valves, usually a smaller shoulder angle, and a smaller pvL/W ratio.

Stenorhynchia pseudolivonica (BARRANDE, 1847)

Pl. IX, figs. 1–4

1961 *Stegerhynchus pseudolivonicus* (BARRANDE, 1847); HAVLÍČEK, p. 88, pl. 10, figs. 4–8; text-figs. 30–33 (herein quotations of earlier papers).

1967 *Stegerhynchus pseudolivonicus* (BARRANDE); GRACIANOVA, p. 68, pl. 6, fig. 6.

1987 *Stenorhynchia pseudolivonica* (BARRANDE, 1847); SAPEĽNIKOV, MIZENS, ŠATROV, p. 92, pl. 16, fig. 6 (herein quotations of earlier papers).

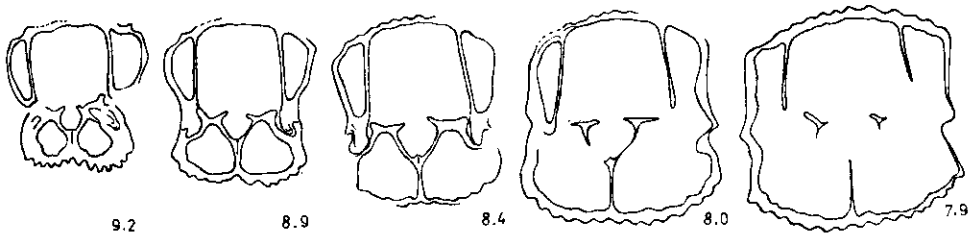
Holotype: Shell figured by BARRANDE in 1847, pl. 20, fig. 7; refigured by BARRANDE in 1879, pl. 29, fig. 15, and by HAVLÍČEK in 1961, pl. 10, fig. 8; L 25145.

Type horizon and locality: Koněprusy Limestone, Koněprusy.

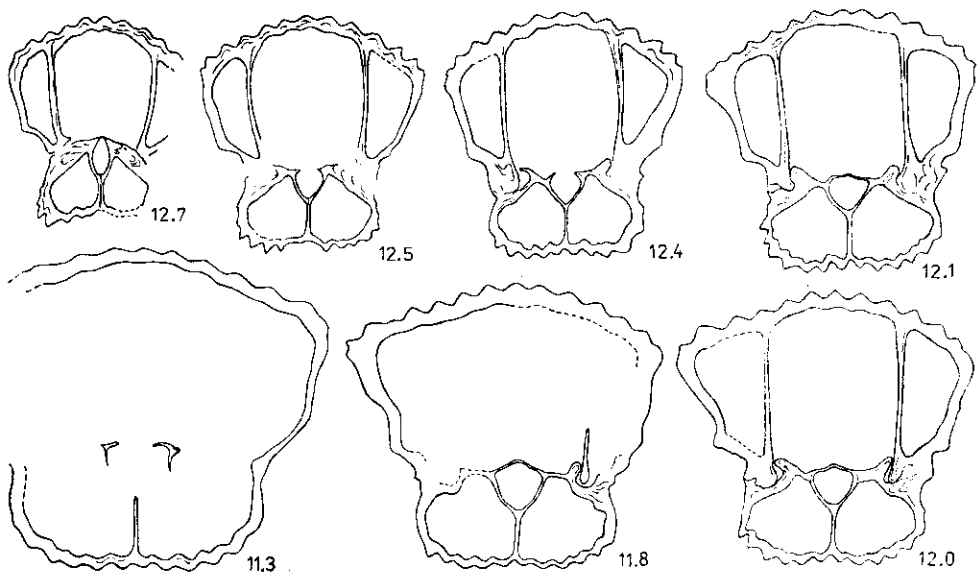
Material: about 150 shells.

Exterior: Young shells, distinguished by small size and extremely shallow sulcus, form about 30 % in the population on the Zlatý kůň hill; early growth stages are lenticular in lateral profile, 10.4–18.0 mm wide, with serrate and gently arcuate anterior commissure; they are less high than two fifths of the maximum width of the shell, subtriangular to subquadrate in outline; apical angle varies from 85° to 117°; postero-lateral sides of pedicle valve straight, rarely slightly curved toward mid-line.

Mature specimens are 16.0–22.5 mm wide, dorsi-biconvex, with pedicle valve almost evenly curved in sagittal profile; brachial valve strongly convex in transverse profile, highest at front margin of the fold; pvL/W: 73.3–86.9 %; bvL/W: 65.0 to 83.0 %; shT/W in late adults: 70.3–87.8 %. Ventral beak small, moderately incurved, posteriorly to postero-dorsally directed; palintrope as in *S. nympha*. Sulcus shallow to deep (depending on age of the specimen), in transverse profile concave becoming subangular in late adult growth stages; consequently, the tongue is low to high, arcuate to subangular, usually directed dorsally (in gerontic shells postero-dorsally). Flanks small, less clearly distinguishable from sulcus than in *S. nympha*, less commonly (about 15 % of the population) the sulcus passes gradually into the flanks. Fold rounded, usually not clearly separable from the flanks, in late adult shells becoming subangular in cross section. Postero-lateral sides of shell usually



8. *Stenorhynchia pseudolivonica* (BARR.). Young shell, transverse sections, × 8



9. *Stenorhynchia pseudolivonica* (BARR.). Late adult specimen, transverse sections, × 6

truncated to develop low, vertical or even introverted walls bounded by subangular edges, less commonly these walls pass gradually into the flanks of both valves, thus resembling the posterior portions of shells of *S. hetaera* and *S. nympha*.

Ribs angular, low in umbonal regions becoming high and sharp on fold and sulcus, ranging in number from 14 to 19; the ribs located in the sulcus are typically asymmetrical with inner sides facing the mid-line always higher than their outer sides.

Interior: See text-figs. 8, 9. Septalium of young shells open, that of adult specimens covered anteriorly with a highly convex to subcarinate connectivum.

Comparison: *S. pseudolivonica* little resembles *S. nympha* because of having concave sulcus, rounded to subangular fold, arcuate to subtriangular tongue, and flanks poorly separable from the sulcus; further, the ribs are typically asymmetrical

in the sulcus of *S. pseudolivonica* but symmetrical in *S. nympha*. Moreover, *S. pseudolivonica* is always larger and its postero-lateral sides are usually truncated.

The most similar species is *S. fryne* which shares with *S. pseudolivonica* the large size of its shell and rather coarse ribbing. Unlike *S. pseudolivonica*, *S. fryne* has a flat or slightly concave sulcus bounded by steep sides which separate it from the highly elevated flanks; further, the anterior margin of its tongue is gently arcuate, that of *S. pseudolivonica* is highly arcuate to subtriangular; further, the ribs located in the sulcus of *S. fryne* exhibit only a slight tendency to asymmetry.

Occurrence: Bohemia: Koněprusy Limestone, Koněprusy (Zlatý kůň and Na Voskopě hills; frequent).
Carnic Alps, Emsian (Riffkalk) (SCUPIN 1906).
Morocco (Maroc pré-saharien), Tindouf Basin; upper Siegenian–upper Emsian (DROT 1964, LE MAÎTRE 1944).
Ural Mts., Salair Mts., Gornyi Altai, Central Asia: Lower Devonian (GRACIANOVA 1967; SAPEĽNIKOV - MIZENS 1981; SAPEĽNIKOV - MIZENS - ŠATROV 1987).
Northwestern and Arctic Canada: early Zlíchovian (JACKSON - LENZ - PEDDER 1978).

Iberirhynchia DROT & WESTBROEK, 1966

Type species: *Iberirhynchia santaluciensis* DROT & WESTBROEK, 1966.

Iberirhynchia sp.
Pl. VII, fig. 2

Remarks: By overall shape of shell and ribbing, the Bohemian specimens are closely similar to *I. santaluciensis* (Santa Lucia Formation, Emsian/Eifelian boundary beds, León Province, Spain); owing to a poor material, it is not possible to compare the Bohemian and Spanish specimens in a greater detail.

Occurrence: Koněprusy Limestone, Koněprusy (Zlatý kůň hill, Houba quarry; 3 shells available).

Nasonirhynchia g. n.

Type species: *Nasonirhynchia naso* sp. n.

Diagnosis: Shell rhynchonelliform, lenticular in young specimens but dorsi-biconvex in late adult growth stages; in posterior view, brachial valve much more convex than the subplanar pedicle valve. Ventral beak short, gently incurved, overhanging the dorsal beak; deltidial plates not examined (due to less favourable preservation?); dorsal beak strongly inflated. Postero-lateral sides of both valves nearly vertical or even introverted, rather high, bounded by subangular edges. Ventral sulcus broad, its bottom flat; flanks very narrow and raised considerably to give an alate appearance to the shell. Tongue high, trapezoidal; fold short, rounded to

rounded-angular, in side view upturned dorsally near its anterior margin; for this reason, the brachial valve acquires its maximum height just at front of its fold.

Ribs hardly perceptible in umbonal regions of both valves where they are developed as very low, rounded ridges broader than interspaces. In the sulcus, the ribs become subangular to angular, triangular in cross sections, with sides containing obtuse angles, whereas the ribs on the fold are very high, sharply angular, with sides subtending acute angles. Lateral ribs weak in pedicle valve, weak to obscure in brachial valve. Ribs never bifurcate; parietal ribs absent or 1 rib may occur at one or both sides of the sulcus. Anterior commissure deeply indented.

Dental plates short, nearly parallel in cross section; umbonal cavities narrow, posteriorly filled with callosity. Cardinal process absent; septalium deep, V-shaped, resting on a low, robust median septum, and roofed over by a gently convex, massive plate for its full length.

Comparison: *Nasonirhynchia* is closely related to the coeval genus *Stenorhynchia*; it differs from the latter in having an extremely weak ribbing in umbonal regions of both valves, and in bearing a robust plate covering the whole septalium cavity, whereas the septalium of *Stenorhynchia* is open posteriorly but closed anteriorly by a thin plate in mature specimens.

Oligoptycherhynchus SARTENAER (based on *Terebratula hexatoma* SCHNUR) and the new genus share the massive plate covering the large septalium, but the former genus is distinguished by strong, angular to subangular ribs over the whole surface of both valves, and by clearly broader umbonal cavities in its pedicle valve.

Species assigned: Type species only.

Nasonirhynchia naso sp. n.

Pl. IX, fig. 6

Holotype: Shell figured on pl. IX as fig. 6; VH 4880a.

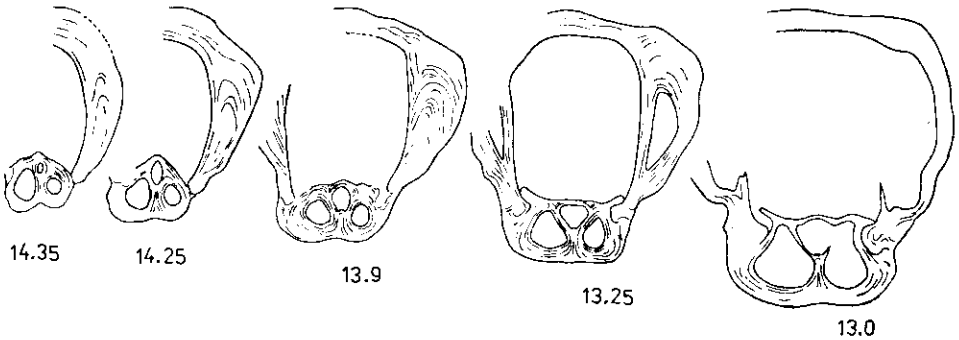
Type horizon and locality: Koněprusy Limestone, Koněprusy (Zlatý kůň hill, Císařský quarry).

Material: 12 shells and several incomplete specimens.

Exterior: shW: 14.8–17.0 mm; shT/W: 93.0–104.0 % in adult specimens; young shells low, lenticular; pvL/W: about 90 %; shoulder angle: 89–102°. Ribs weak to obscure over most of the shell; sulcus occupied by 3 low angular ribs, parietal ribs absent, rarely one parietal rib may be present at one or both sides of the sulcus. Lateral costae weak; ribs on the fold angular, separated by very deep angular grooves.

Interior: See diagnosis of the genus and text-fig. 10.

Occurrence: Koněprusy Limestone, Koněprusy; all specimens available were collected from a single lens of a bioclastic limestone within the reef core of the Pragian reef complex in the Císařský quarry; this species was never found in the richly diversified perireefal communities between Zlatý kůň and Plešivec hills.



10. *Nasonirhyncha naso* sp. n. Transverse sections, × 6

Astua g. n.

Type species: *Rhynchonella astuta* BARRANDE, 1879.

Diagnosis: Shell large, 20–29 mm wide in adults, transversely elliptical in outline, equally biconvex and lenticular in young specimens becoming dorsi-biconvex in late adult growth stages; sulcus deep, with a gently convex bottom and steep sides; fold highly elevated, tongue nearly rectangular, high, dorsally directed. Ventral beak short, incurved, deltidial plates not observed; beak edges absent; posterior margin of shell arcuate.

Radial pattern weak to obscure near beaks but well-developed in anterior part of shell; in sulcus, tongue and fold, the ribs are moderately high, angular, as broad as intercostal furrows, numbering 5–8 in the sulcus, and 12–13 on each flank; parietal ribs absent. Ribs mostly simple throughout ontogeny, exceptionally bifurcating on the tongue; fine concentric rugellae densely crowded.

Dental plates short, thin, diverging anteriorly; in cross section nearly parallel to each other. Median septum high and long (over a third of the brachial valve length); septalium narrow, not filled with secondary shell material, open; cardinal process absent.

Comparison: *Rhynchonella astuta,* the type species of the new genus, was assigned by HAVLÍČEK (1961) to *Astutorhyncha,* based on *Terebratula proserpina* BARRANDE (Suchomasty Limestone, Dalejan). In spite of some similarities in shape of shell, ornamentation, and inner morphology, the new genus is easily distinguishable from *Astutorhyncha* in the following ways: 1) Ribs in sulcus, fold, and tongue of *Astua* are angular and as broad as the intercostal furrows, those of *Astutorhyncha* are rounded and much broader than interspaces, 2) Lateral ribs are much more numerous in *Astua* than in *Astutorhyncha,* 3) Beak edges are obscure in *Astua* but sharply angular in *Astutorhyncha,* 4) Dental plates are thin and 3–4 mm long in *Astua* but obscure in *Astutorhyncha.*

A transitional link between *Astua* and *Astutorhyncha* is the Pragian species *Astutorhyncha saxana* which shares with the former genus the short dental plates; further, its rounded ribs become anteriorly subangular, thus recalling the radial pattern of the Lochkovian genus *Astua*. The assignment of "*saxana*" to *Astutorhyncha* is based mainly on the presence of beak edges, vertical to introverted postero-lateral walls of its shell, small number of lateral ribs, and nature of intercostal furrows which are narrower than the adjacent ribs.

In many respects, *Astua* is closely similar to *Havlicekella* AMSDEN (Turkey Creek Limestone, Early Devonian, Oklahoma; AMSDEN 1985); the latter genus, however, has its septalium filled with callosity and bears a digitate cardinal process; further, the ribs of *Havlicekella* often bifurcate, whereas the bifurcation is an exception in *Astua*.

Astua and *Linguopugnoides* (Lochkovian–Zlíchovian) are closely similar genera as both have taken their origin in the *Stenorhynchia* stock at the beginning of the Lower Devonian. *Linguopugnoides* differs from *Astua* in having a smooth shell except for its tongue, anterior part of the fold, and marginal parts of its flanks; the ribs occupying the anterior part of the fold are very high, sharply angular in *Linguopugnoides*. By contrast, *Astua* bears weak ribs even in posterior part of its shell; its costae, although angular in anterior part of its shell, are rather low. Further, *Astua* has a small septalium never closed by a connectivum, whereas the septalum of *Linguopugnoides* is roofed over anteriorly by a thin, convex plate in late adult growth stages (see text-fig. 48 in KOZŁOWSKI 1929).

Species assigned: Type species only.

Astua astuta (BARRANDE, 1879)

Pl. IX, fig. 7

1961 *Astutorhyncha astuta* (BARRANDE, 1879); HAVLÍČEK, p. 106, pl. 11, figs. 4–7; text-fig. 39.

Lectotype (SD HAVLÍČEK 1961): Shell figured by BARRANDE in 1879, pl. 18, case V, fig. 2; refigured by HAVLÍČEK in 1961, pl. 11, fig. 7; L 28678.

Type horizon and locality: Kotýs Limestone, Svatý Jan pod Skalou.

Exterior and interior: See HAVLÍČEK 1961.

Occurrence: Bohemia: Kotýs Limestone, Svatý Jan pod Skalou (mostly old collections); Měňany (Skalice hill; frequent); Karlštejn (Javorka hill; rare).
Central Asia, Lochkovian, Marginalis Beds (NIKIFOROVA 1937).

Astutorhyncha HAVLÍČEK, 1961

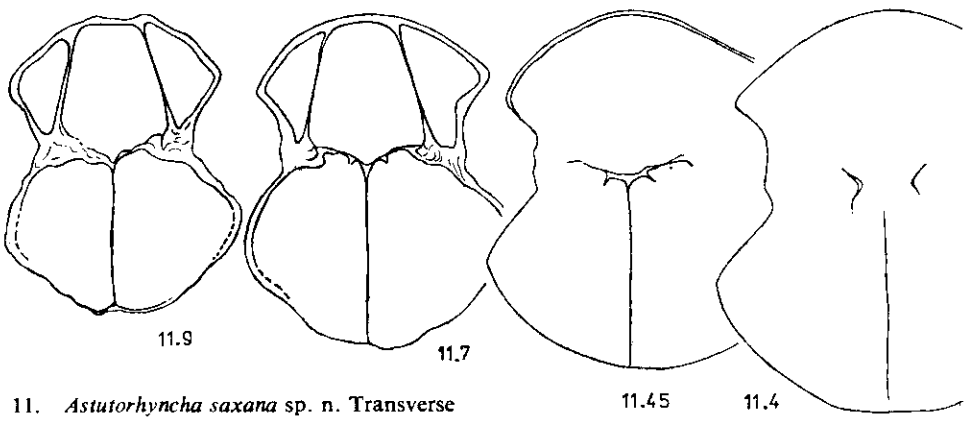
Type species: *Terebratula Proserpina* BARRANDE, 1847

Astutorhyncha saxana sp. n.

Pl. IX, fig. 5; pl. XI, figs. 1, 2

Holotype: Shell figured on pl. IX as fig. 5; VH 4895.
Type horizon and locality: Koněprusy Limestone, Koněprusy (Císařský quarry).
Material: 12 shells and several incomplete specimens.

Exterior: Shell 14.5–26.5 mm wide, lenticular in young specimens but nearly cuboidal in late adults; postero-lateral sides formed as low, vertical or even introverted walls bounded by edges. In sagittal profile, pedicle valve evenly convex, anteriorly extending into a high, trapezoidal tongue directed antero-dorsally to dorsally. Beak nearly straight, defined laterally by sharp edges paralleling the commissures. Sulcus moderately deep, located between highly raised flanks; bottom of sulcus flat, anterior margin of tongue straight and serrate. Fold low, with steep sides. Dimensions of the holotype: shW: 20.0 mm; pvL: 16.6 mm; suW: 14.3 mm; shT: 14.9 mm;



11. *Astutorhyncha saxana* sp. n. Transverse sections, ×7

shoulder angle: 110°. Ribs rounded to rounded-angular, broader than interspaces, in umbonal regions obscure but strong anteriorly. Sulcus occupied by 2–4 ribs of subequal to inequal size, flanks bear 4–5 ribs; parietal ribs absent.

Interior: Dental plates thin, short, moderately diverging anteriorly. Hinge plates form a shallow, V-shaped septalium that becomes slightly concave towards front margin; median septum thin and high.

Comparison: *A. proserpina* (Dalejan) differs from the new species in having very short to obscure dental plates and rounded ribs counting 5–7 in the sulcus.

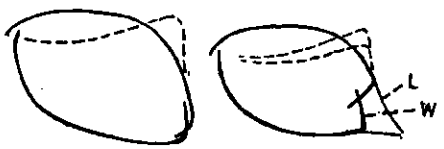
Occurrence: Vinařice Limestone, area between Vinařice and Koněprusy (Oujezdce hill and Čertovy schody; fairly common). Slivenec Limestone, Bubovice (Čeřinka quarry; in association with *Platyscutellum kutorgai*); Radotín (Cikánka quarry; one shell); Koněprusy Limestone, Koněprusy (Zlatý kůň hill, Císařský quarry).

Septalariidae Havlíček 1960

Onugorhynchia g. n.

Type species: *Terebratula matercula* Barrande, 1847.

Diagnosis: Shell small, pentagonal in outline; sulcus and fold well-developed; beak sharp, gently incurved, delthyrium filled up with beak of opposite valve. Both beaks smooth; ribs short, rounded, never branching, broader than subangular interspaces, usually 5–9 in sulcus; parietal ribs absent, lateral ribs 4–5, sometimes indistinct. Thin growth lamellae rarely preserved in anterior part of the shell; in most specimens, they have been broken off during life of the animal after retreat of the mantle. For this reason, most shells are truncated anteriorly and laterally to develop rather high, introverted anterior and lateral walls bearing low (rarely obscure) ribs crossed by fine growth lines (see text-fig. 12). A peculiar feature is a sudden



12. *Septalaria* (on the left) and *Onugorhynchia* (on the right). Longitudinal sections. L — growth lamella (usually broken away during life of the animal); W — anterior introverted wall; edge of each valve bears short spines penetrating into the body cavity

change of surficial ribs into angular grooves just at edges bounding the steep walls, whereas the narrow interspaces are substituted by low ribs on the anterior and lateral walls. This radial pattern is quite different from that of the uncinulid and glossinotoechiid genera the ribs of which do not change into grooves on the paries geniculatus. Anterior commissure smooth to gently undulate; marginal spines short, flat, triangular (owing to recrystalization ill-preserved).

Dental plates short, gently diverging anteriorly, resting nearly perpendicularly on the valve floor. High median septum supports the horizontally disposed hinge plates, cardinal process small.

Comparison: *Onugorhynchia* differs from *Septalaria* LEIDHOLD in developing truncated shells with rather high, introverted walls separated by angular edges from the rest of the shell surface; moreover, the ribs in the new genus change suddenly into grooves, and vice versa, the intercostal grooves into radial ribs after crossing the edges bounding the paries genigulatus. By contrast, *Septalaria* lacks both the paries geniculatus and the substitution of ribs by grooves in marginal parts of the shell. Instead of it, *Septalaria* has step-like growth imbrications (Anwachs-Stufen according to H. SCHMIDT, 1941, 1975), which are densely crowded close to the undulate to finely serrate anterior commissure.

Species assigned:
Terebratula matercula BARRANDE, 1847; Pragian, Bohemia;
Onugorhynchia onuga sp. n.; Zlichovian, Bohemia.

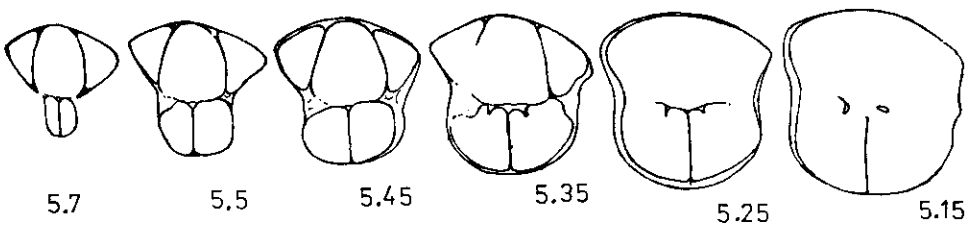
Onugorhynchia matercula (BARRANDE, 1847)

Pl. XI, figs. 3, 4

1961 *Septalaria matercula* (BARRANDE, 1847); HAVLÍČEK, p. 183, pl. 27, figs. 9–11.

Lectotype (SD HAVLÍČEK 1961): Shell figured by BARRANDE in 1847, pl. 20, fig. 4; refigured by BARRANDE in 1879, pl. 34, fig. 10; and by HAVLÍČEK in 1961, pl. 27, fig. 11; L 28677.
Type horizon and locality: Koněprusy Limestone, Koněprusy.
Material: about 250 shells.

Exterior: See BARRANDE (1847) and HAVLÍČEK (1961).
Interior: See text-fig. 13.



13. *Onugorhynchia matercula* (BARR.). Transverse sections, × 10

Occurrence: Bohemia: Koněprusy Limestone, area between Měňany and Koněprusy (Plešivec hill, frequent; Zlatý kůň hill: very rare). Supposed occurrence in the Gornyi Altai (Jakušin Formation) (GRACIANOVA 1967) needs further investigation.

Onugorhynchia onuga sp. n.
Pl. XI, figs. 5, 6

Holotype: Shell figured on pl. XI as fig. 6; VH 6030a.
Type horizon and locality: Zlíchov Limestone (lower part), Hlubočepy (U kapličky quarry).
Material: 9 shells.

Exterior: Shell 9.2–13.0 mm wide and 52–78 % as high as maximum width, pentagonal in outline; widest part at or slightly anterior to mid-length. Pedicle valve about as long as wide (pvL/W: 95.7–103.2 %), in sagittal profile more curved anteriorly than umbonally; ventral beak small, nearly straight, orthocline; pedicle foramen circular, mesothyrid; deltidial plates small, conjunct, suture clearly discernible. Sulcus appears at about mid-length and extends into a low to high (depending on age and size of the specimen), nearly rectangular tongue with a straight anterior margin. Bottom of sulcus flat to slightly convex, sides of sulcus low and steep. Fold short, with a flat to gently convex top; suW/pvW: 56.6–69.0 %.

Umbonal regions smooth; sulcus bears 5 (in one shell 6) low, rounded ribs slightly broader than interspaces; parietal ribs absent; each flank bears 5–6 very short ribs. Anterior and lateral walls introverted, defined by angular edges; each costa, after crossing the transverse edge, changes into a shallow groove on the introverted wall, and vice versa, each intercostal groove is substituted by a low rib that extends to the commissure. Short marginal spines as in *O. matercula*.

Interior: Not investigated.

Comparison: *O. matercula* (based on the Plešivec-hill population) differs from the new species in being somewhat smaller (7.7–10.2 mm wide) and more transversal with pvL/W ranging from 83.1 to 91.5 % (in an exceptional shell: 96.4 %). Further, *O. matercula* has a shallower sulcus bounded by less steep sides, and its ribs are clearly finer than those of *O. onuga*; the Plešivec-hill population has 6–9 ribs in the sulcus, whereas *O. onuga* bears 5 (only in one shell 6) ribs in the sulcus. The range of the shT/W and suW/pvW is almost the same in both the species.

Occurrence: Type locality only.

Pseudocamarophoria WEDEKIND, 1925

Type species: *Terebratula microrhyncha* ROEMER, 1844.

Remarks: According to BIERNAT (1966), *Amissopecten* HAVLÍČEK may be a junior synonym of *Pseudocamarophoria* WEDEKIND; this suggestion is not correct as *Amissopecten* lacks dental plates, has a broad sulcus taking most of the pedicle-valve width, and has very low ribs separated by angular intergrooves. On the other hand, *Pseudocamarophoria* has short dental plates, its sulcus is not extremely broad, and its rounded ribs are of variable size and number, not uncommonly obscure; its interspaces are as broad as the adjacent ribs.

Pseudocamarophoria leidholdi (HAVLÍČEK, 1956)

Pl. XII, figs. 5–7

1961 *Amissopecten leidholdi* (HAVLÍČEK, 1956); HAVLÍČEK, p. 188, pl. 26, figs. 5–8.

Holotype: Shell figured by HAVLÍČEK in 1956, pl. 1, figs. 12, 13, 16; VH 75.
Type horizon and locality: Zlichov Limestone (lower part), Hlubočepy (U kapličky quarry).
Material: 18 shells and several valves.

Exterior and interior: See HAVLÍČEK 1956 and 1961.

Dimensions: shW: 6.5–9.6 mm; pvL/W: 89.5–101.1 %; shT/W: 55.0–67.5 % in mature specimens; early growth stages very low, lenticular in lateral profile; suW/pvW: 69–74 %. Posterior portion of shell smooth; low rounded undulations, confined to anterior part of the shell, are of subequal size, about as broad as the rounded interspaces, ranging from 2 to 5 on the tongue; parietal ribs absent; lateral ribs, if at all discernible, are usually 2 in number. Undulations occupy tongue and anterior part of the fold, less commonly are missing altogether. Of intercostal furrows, the best developed is the median one which originates in front of the ventral beak.

Occurrence: Type locality only.

Monadotoechia HAVLÍČEK, 1960

Type species: *Terebratula monas* BARRANDE, 1847.

Monadotoechia prunella sp. n.

Pl. XII, figs. 1, 2

Type horizon and locality: Slivenec Limestone, Srbsko (Kodská rokle).
Holotype: Shell figured on pl. XII as fig. 1; VH 6032d.
Material: 16 shells.

Exterior: Shell slightly wider than long or elongate, in early growth stages lenticular (less high than three fifths of the maximum width) but nearly cuboidal in adults, 5.8–7.2 mm wide, and 65.7–74.0 % as high as maximum width in late adult growth stages. Pedicle valve subpentagonal in outline, 97.3–108.6 % as long as wide, widest at or anterior to mid-length, with a short, incurved beak postero-dorsally directed; deltidial plates not observed. Ventral sulcus confined to anterior part of valve, taking 61.2–72.6 % of the shell width, shallow, with low steep sides and a flat bottom; tongue rectangular, with a denticulate anterior margin. Dorsal fold low, flat-topped. Posterior portion of shell smooth; ribs confined to sulcus, tongue, fold, and anterior parts of the flanks where they are formed as low rounded ridges broader than angular interspaces. Sulcus occupied by 3 ribs, fold bears 4 very short ribs; parietal ribs absent, lateral costae very short, 3–4 in number.

Interior: Dental plates thin, short; hinge plates supported by a thin median septum.

Comparison: *M. prunella* differs from *M. monas* (Suchomasty Limestone) in being moderately larger but less high and less elongate (dimensions of *M. monas*: shW: 4.3–5.7 mm; pvL/W: 102–114 %; shT/W: 86–94 %); further, the ribs of *M. monas* are often unequal in size and originate in posterior part of the shell, those of *M. prunella* are very short, confined only to anterior part of the shell.

M. volaica (GORTANI) (Lower Devonian, Carnic Alps; GORTANI 1915) is closer to *M. monas* than to *M. prunella* as it is strongly elongate, nearly circular in cross section, and its ribs begin between the beaks and mid-length of valves.

Occurrence: Type locality only.

Monadotoechia paulimonas sp. n.

Pl. XII, figs. 3, 4

Holotype: Shell figured on pl. XII as fig. 4; VH 6033a.
Type horizon and locality: Dvorce-Prokop Limestone, Hlubočepy (Švarcenberský quarry).
Material: 8 shells (all partly damaged).

Exterior: Shell closely similar to that of *M. monas* (Suchomasty Limestone) with the following features: shW: 4.3–5.4 mm; pvL/W: 100.0–102.3 %; shT/W: 66.0–78.0 %; suW/pvW: 60.5–62.7 %. Ventral beak small, incurved, not defined by beak edges; ventral sulcus shallow, with a flat bottom; fold short, low, flat-topped. Ribs short, confined to anterior part of the shell, well-developed on fold and subrectangular tongue. Sulcus occupied by 3 rounded ribs which are as broad as, or

slightly broader than the intercostal furrows; fold bears 4 ribs, each flank has 1–2 ribs; anterior commissure indented.

Interior: Not examined.

Comparison: *M. monas* (Suchomasty Limestone) differs from the new species in being more elongate (its pvL/W: 102–114 %) and much higher (its shT/W: 86–94 %); size of the two species is about the same.

Our collection contains only one considerably elongate shell (108 % as long as wide; Řeporyje Limestone, Klukovice) which differs from the Švarcenberský-quarry population not only in its L/W ratio, but also in having only 2 weak ribs in the sulcus; its specific determination remains uncertain.

M. prunella (Slivenec Limestone) differs from *M. paulimonas* in being somewhat larger and in having much shorter and weaker ribs in its sulcus and fold.

Occurrence: Type locality only.

Glossinotoechiidae fam. n.

Diagnosis: Acuminate rhynchonellids, elongate-oval to heart-shaped in outline, with postero-lateral sides long, gently convex to curved towards mid-line. Hinge margin short, strongly curved; ventral beak orthocline, directed posteriorly to postero--dorsally; beak edges present, conjunct deltidial plates below mesothyrid pedicle foramen. Ventral sulcus and dorsal fold weak to obscure, anterior commissure uniplicate and denticulate.

The earliest glossinotoechiid genus *Hostimex* never truncated, lenticular in lateral profile throughout ontogeny, whereas all the Devonian genera develop paries geniculatus and marginal spines in adult growth stages. Ribs low, rounded, unbranched or exceptionally bifurcating, usually extending from both beaks, flattened and bisected by secondary grooves on paries geniculatus.

Dental plates short, closely adjacent to lateral walls of valve; median septum supports a V-shaped septalium which is roofed over anteriorly by a connectivum; septalium cavitiy either free of secondary deposits during ontogeny, or the secondary shell material accumulates on upper sides of hinge plates and partly to completely fills out the septalium cavity to form a variably shaped, usually striated cardinal process.

Remarks: A common feature of the *Uncinulidae, Hebetoechiidae,* and *Glossinotoechiidae* is a tendency to develop geniculate shells and marginal spines in adult growth stages. In spite of this resemblance, the *Glossinotoechiidae* are regarded as a separate family that forms a well-knit group of closely similar rhynchonellids ranging from the Wenlock to the Middle Devonian, thus paralleling the lineages of the *Hebetoechiidae* and *Uncinulidae*. The latter two families differ from the *Glossinotoechiidae* in having sphaeroidal to cuboidal shells with slightly curved posterior margins and short, incurved ventral beaks; moreover, the *Hebetoechiidae* are distinguished by the absence of a connectivum and presence of a coarse ribbing.

The earliest glossinotoechiid genus, *Hostimex* (upper Wenlock, Ludlow), has inner morphology and radial pattern nearly the same as those of *Eoglossinotoechia,* but it retains a lenticular lateral profile in all growth stages. On the other hand, all later (i.e. Lower and Middle Devonian) genera develop geniculate shells (= concha alta) in adult growth stages; they have lenticular shells (= concha plana) only in early growth stages. A peculiar feature is a double geniculation in the pedicle valve of *Glossinotoechia*; its concha-plana stage terminates in developing a highly elevated marginal rim (i.e. ventral geniculation); this stage is succeeded by a sudden change in growth direction resulting in a dorsal geniculation that is typical of the concha-alta stage of mature specimens. *Chlupacitoechia* is reminiscent of *Glossinotoechia* in that its pedicle valve underwent a double geniculation during ontogeny but, in contrast to the latter genus, its highly elevated antero-lateral margins (i.e. the ventral geniculation) do not fuse anteriorly into a continuous ventral rim which is the most typical feature of *Glossinotoechia.*

In the Devonian glossinotoechiids, the septalium cavity was gradually reduced by a variably thick layer of callosity during both the ontogeny and evolution of the family (see HAVLÍČEK 1983). In some genera, the secondary shell material obscured both the septalium cavity and the connectivum and built up a radially striated cardinal process. WESTBROEK (1967) regarded *Glossinulus* as a terminal link of the *Eoglossinotoechia-Glossinotoechia* stock; this genus, however, differs from all other glossinotoechiids in lacking a connectivum in anterior part of its septalium.

Another aberant genus is *Markitoechia*; its inner morphology is essentially the same as in other glossinotoechiids but posterior part of its shell is smooth and its moderately curved hinge margin recalls rather an uncinullid than a glossinotoechiid genus. The outline of shell, however, is highly variable; for instance, *Markitoechia marki*, the type species of the genus, is 97–117 % as long as wide with gradual transitions from the extremely elongate to slightly transversal forms. The elongate forms with a strongly curved hinge line are closely similar to shells of *Eoglossinotoechia surgens,* thus supporting the idea that the latter species was an ancestor of *Markitoechia* (HAVLÍČEK 1983). The main distinguishing characters between *Markitoechia* and *Eoglossinotoechia* are the high, rod-like cardinal process and loss of ribbing in the posterior half of the shell in the former genus.

Genera assigned to *Glossinotoechiidae*:

Hostimex HAVLÍČEK, 1982; Wenlock–Ludlow; Bohemia;

Eoglossinotoechia HAVLÍČEK, 1959; Lochkovian–Zlíchovian; North Africa, Europe, Central Asia, Ural Mts., Gornyi Altai;

Glossinotoechia HAVLÍČEK, 1959; Pragian; Bohemia;

Chlupacitoechia g. n.; Pragian, Zlíchovian; Spain, France, Bohemia;

Glossinulus SCHMIDT, 1942; Upper Emsian–Couvinian; Rhineland, Harz, France, Morocco;

Markitoechia HAVLÍČEK, 1959; Zlíchovian–Dalejan; Bohemia; Lower Eifelian, Morocco (DROT 1980).

Eoglossinotoechia HAVLÍČEK, 1959

Type species: *Eoglossinotoechia cacuminata* HAVLÍČEK, 1959.

Diagnosis (emended): See HAVLÍČEK 1983.

Eoglossinotoechia cacuminata HAVLÍČEK, 1959

Pl. XIII, figs. 2–8

1959 *Eoglossinotoechia cacuminata* n. sp.; HAVLÍČEK, p. 81.
1961 *Eoglossinotoechia cacuminata* HAVLÍČEK, 1959; HAVLÍČEK, p. 162, pl. 26, fig. 3; text-fig. 69.
1961 *Glossinotoechia surgens kotýsensis* n. subsp.; HAVLÍČEK, p. 174, pl. 25, figs. 1, 2; text-fig. 77.
1983 *Eoglossinotoechia cikanea* sp. n.; HAVLÍČEK, p. 155, text-fig. 2.

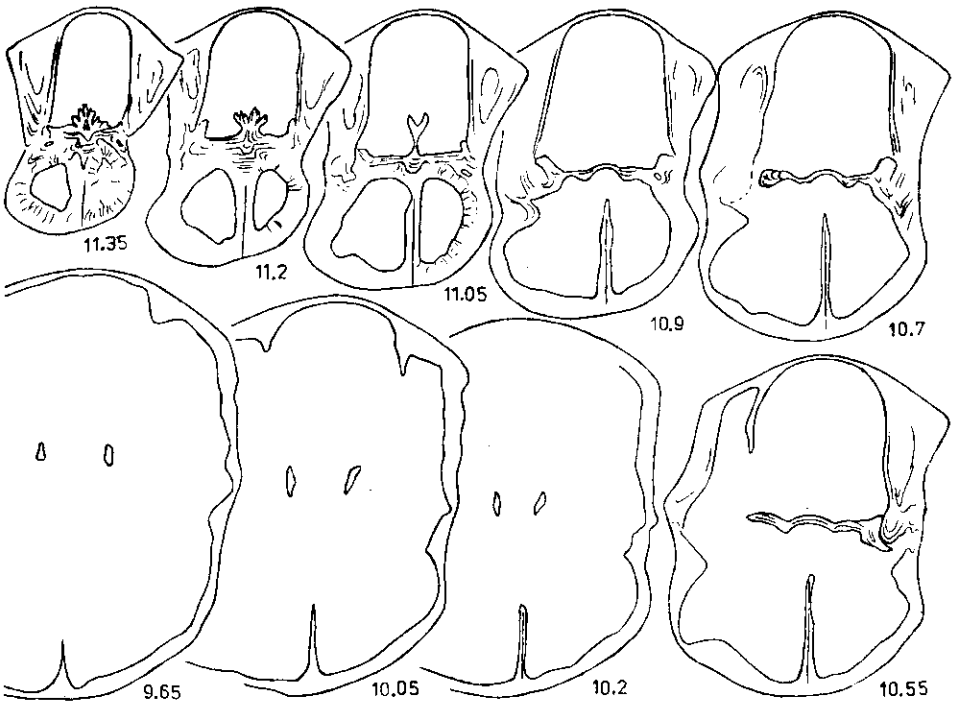
Holotype: Shell figured by BARRANDE in 1879, pl. 120, case II; refigured by HAVLÍČEK in 1961, pl. 26, fig. 3; L 28884.
Type horizon and locality: Slivenec Limestone, Dvorce.
Material: over 100 shells.

Exterior (based on Čertovy schody population): Shell acuminate, variable in size and shape, elongate, widest anterior to mid-length, in mature specimens developing paries geniculatus; shW: usually 7.2–11.0 mm; smaller shells very rare (5.4 to 7.0 mm wide); pvL/W: 103.7–119.5 % in specimens of normal size; extremes: 99.0 % in a shell of heart-shaped outline 10.6 mm wide; the smallest specimens narrower than 7.2 mm are 116.0–131.5 % as long as wide; shT/W: usually 63–76 %, rarely even more (83–93.3 % in small, considerably elongate shells). Pedicle valve gently convex between the beak and sulcus, with postero-lateral margins long, straight to gently curved towards mid-line; beak orthocline, gently incurved, beak edges rounded; apical angle 59–69° (exceptional specimen: 75°). Sulcus very shallow to obscure; if present, it is formed as a weak depression between gently elevated flanks; tongue subrectangular, in transverse profile flat. Brachial valve more curved umbonally than anteriorly with a weak to obscure fold near front margin.

Ribs originate in front of the beaks as hardly discernible ridges that gradually increase in size anteriorly and rarely bifurcate; in anterior part of shell, ribs are rounded, separated from each other by angular grooves, numbering 22–36 (depending on size of the specimen); sulcus occupied by 7–12 ribs (extreme in a single shell: 5 ribs); 1 parietal rib usually present. On paries geniculatus, each rib flattened and bisected by a secondary groove; growth lines in a zig-zag arrangement; anterior commissure serrate to moderately undulate, marginal spines present. On sides of both valves, paries geniculatus bordered by edges; in the median sector of pedicle valve, a transverse, obtuse edge is usually present, less commonly obscure.

Interior: See text-fig. 14.

Remarks: Several shells collected from the Slivenec Limestone are somewhat larger than those of the Vinařice Limestone (up to 14.6 mm wide); other features remain the same as in specimens of the type locality.



14. *Eoglossinotoechia cacuminata* HAVL. Transverse sections, × 8

Occurrence: Vinařice Limestone, area between Koněprusy and Měňany (Čertovy schody; Oujezdce hill; eastern slope of Plešivec hill); frequent; Slivenec Limestone, Srbsko (Kodská rokle; Petzold quarry); Bubovice (Čeřinka quarry); Svatý Jan pod Skalou (Solway quarry); Radotín (Cikánka valley); frequent at all localities; Dvorce (old collections). Uppermost limestone bed of the Lochkov Formation, Hlubočepy (abandoned quarry north of the rock Barrandova skála; frequent, in association with *Stenorhynchia nympha* and *Plectospira*).

Eoglossinotoechia doris sp. n.

Pl. XIII, fig. 1

1961 *Eoglossinotoechia cacuminata* HAVLÍČEK, 1959; HAVLÍČEK (partim), p. 162, pl. 26, figs. 2, 4; text-figs. 71—73.

Holotype: Shell figured on pl. XIII as fig. 1; VH 6077a.

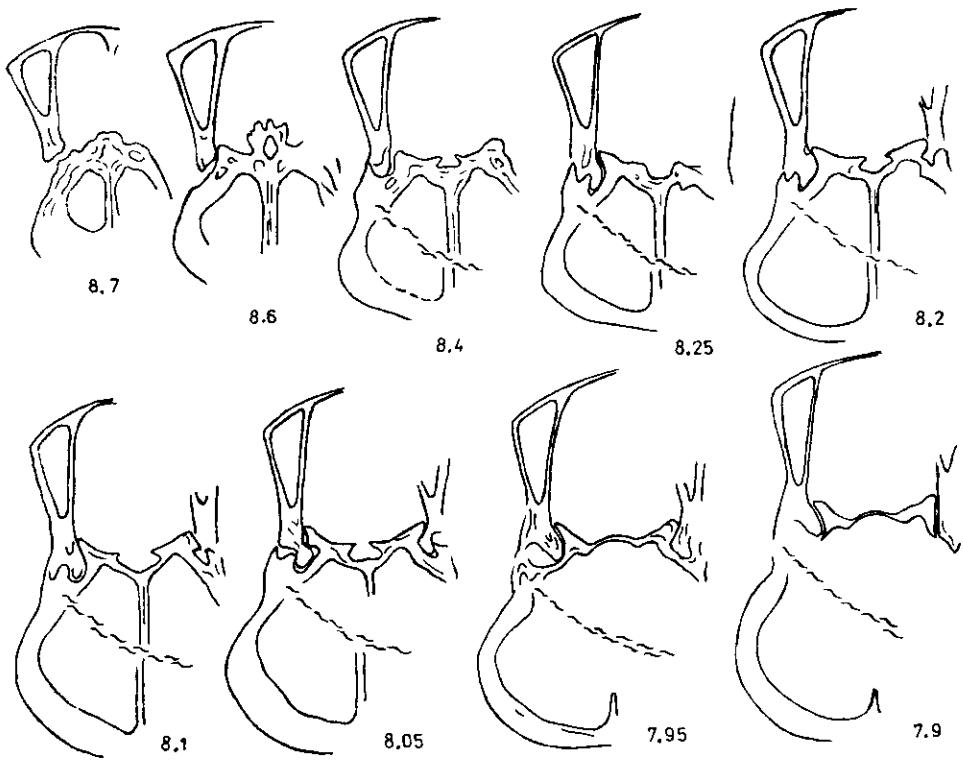
Type horizon and locality: Radotín Limestone, Radotín (Černá rokle).

Material: 40 shells.

Exterior: In general aspect, closely similar to *E. cacuminata* but much less variable in size and shape, with the following features: shW: 8.2—10.6 mm; pvL/W: 101.9 to

112.6 %; shT/W: 66.0–87.3 %; apical angle: 75–80° (a single specimen: 72°); ribs appear in umbonal regions as faint ridges becoming anteriorly moderately high, rounded, separated by angular grooves, rarely bifurcating; number of costae ranges from 27 to 37, sulcus occupied by 9–14 ribs; parietal ribs present (1, rarely 2 ribs at each side of the sulcus). On paries geniculatus, all ribs flattened, bisected by secondary grooves, and bearing growth lines in a zig-zag arrangement.

Interior: See text-fig. 15.



15. *Eoglossinotoechia doris* sp.n. Transverse sections, × 10

Comparison: *E. doris* differs from its descendant *E. cacuminata* in having a greater apical angle and usually being less elongate; further, *E. cacuminata* is usually bent in the sulcus to develop an obtuse edge that separates the gently convex pedicle-valve surface from the paries geniculatus; on the other hand, *E. doris*, although strongly curved in the sulcus, never has an edge between the gently convex median sector and the paries geniculatus. Further, the septalium cavity in *E. cacuminata* is completely filled out by the secondary shell material that reaches to the connectivum, whereas the septalium cavity in *E. doris* is free of callosity except for its posterior part where a highly raised cardinal process is located.

Occurrence: Radotín Limestone, Dvorce (old collections); area between Lochkov and Radotín (mostly Černá rokle and the left bank of the Radotínský brook; rather common); Kotýs Limestone, Svatý Jan pod Skalou (Solway quarry; only 1 shell).

Dvorce-Prokop Limestone (lowermost part), Radotín (Černá rokle; rare).

Remarks: Presence of *Eoglossinotoechia* in the pre-Lochkovian strata has not been proved during recent field investigations; HAVLÍČEK (1961) supposed pre-Lochkovian age in the type specimen of *E. cacuminata*; this suggestion, however, is an evident error because this shell comes from the Slivenec Limestone (Pragian).

Eoglossinotoechia surgens (BARRANDE, 1879)

Pl. XIV, figs. 1–5

1961 *Glossinotoechia surgens surgens* (BARRANDE, 1879); HAVLÍČEK, p. 172, pl. 25, figs. 3–6; text-fig. 76.

Holotype: Shell figured by BARRANDE in 1879, pl. 121, fig. 1; refigured by HAVLÍČEK in 1961, pl. 25, fig. 4; L 28885.

Type horizon and locality: Koněprusy Limestone, Koněprusy.

Material: About 500 shells.

Exterior: Similar to *E. cacuminata* but smaller (5.5–8.4 mm wide; extremes: 4.6 and 8.9 mm) and less elongate (pvL/W usually 100.6–110.0 %; sporadic cordate shells even broader with pvL/W: 96.7–100 %; another extreme are few small and narrow specimens with pvL/W: 110.0–114.5 %, exceptionally up to 122.7 %); shT/W: 75.0–85.0 % (extreme: 95.5 %). Apical angle: 75–89° (in an extremely narrow shell: 71°). Sulcus shallow, confined to anterior quarter of pedicle valve, with low, moderately sloping sides and a flat to slightly convex bottom. Fold very short, gently elevated. Ribs obscure in posterior part of shell but well-developed in sulcus, fold, and flanks as rounded, never bifurcating ridges broader than angular interspaces; number of ribs ranges from 19 to 27, sulcus occupied by 6–10 costae; 1 parietal rib usually present. On paries geniculatus, ribs flattened and medianly grooved as in *E. cacuminata*.

Interior: See HAVLÍČEK 1961.

Comparison: *E. surgens* differs from the lower Pragian *E. cacuminata* in usually having a well-developed shallow sulcus and short fold, smooth umbonal regions, greater apical angle, and less elongate shell; a few considerably elongate shells do occur within the Plešivec-hill population, but they differ from *E. cacuminata* in a much smaller number of ribs in the sulcus (4–6).

E. doris is closely similar to *E. surgens*, but it is moderately larger, its ribs originate in umbonal regions, and its cardinal process does not occupy the whole septalium; on the other hand, the rather strong cardinal process of *E. surgens* fills out completely the septalium cavity and extends anteriorly to the connectivum.

Occurrence: Koněprusy Limestone, Měňany (Plešivec hill; frequent). According to DROT (1964) probably also in the Pragian limestone in Morocco.

Eoglossinotoechia mystica HAVLÍČEK, 1961

1961 *Eoglossinotoechia mystica* n. sp.; HAVLÍČEK, p. 154, pl. 19, figs. 1—5; text-figs. 62—66.

Occurrence: Radotín Limestone, Dvorce (old collections); Karlštejn (Javorka, rare); Lejškov (Monograptus uniformis Zone, rare); Měňany (Skalice hill, lower part of the Monograptus uniformis Zone; frequent); Řeporyje (upper part of the Scyphocrinites Horizon; rare); Kotýs Limestone, area between Svatý Jan pod Skalou, Loděnice and Lužce (rare).

Eoglossinotoechia sylphidea (BARRANDE, 1847)

1961 *Eoglossinotoechia sylphidea* (BARRANDE, 1847); HAVLÍČEK, p. 158, pl. 20, figs. 1—9; text-figs. 67, 68.
1983 *Eoglossinotoechia sylphidea* (BARRANDE); HAVLÍČEK, text-fig. 1.

Occurrence: Koněprusy Limestone, area between Měňany and Koněprusy (Plešivec, Na Voskopě, and Zlatý kůň hills; common).

Eoglossinotoechia marocanensis DROT, 1964

Pl. VI, fig. 9

1964 *Eoglossinotoechia sylphidea* (BARRANDE, 1847) *marocanensis* n. subsp.; DROT, p. 135, pl. 16, figs. 8—10; text-figs. 58—60.

Occurrence: Bohemia: Chýnice Limestone (pink, crinoidal limestone in the upper Zlíchovian); Lištice (Macháček quarry; rather common in association with *Uncinulus pila*).
Morocco: Tindouf Basin, upper Emsian, horizon with *Arduspirifer arduensis* (DROT 1964).

Eoglossinotoechia princeps (BARRANDE, 1847)

1961 *Glossinotoechia princeps* (BARRANDE, 1847); HAVLÍČEK, p. 167, pl. 21, figs. 1—6, 9, 10; text-fig. 74 (herein quotations of earlier papers).

Occurrence: Bohemia: Koněprusy Limestone, area between Měňany and Koněprusy (Plešivec and Na Voskopě hills; frequent).
Carnic Alps: Pragian (Riffkalk) (SCUPIN 1906).
France: Massif Armoricain, Manche, Anjou; lower Emsian (Siegenian) (DROT 1964).
Morocco: Tindouf Basin, lower Emsian (Siegenian) (DROT 1964).

Eoglossinotoechia gibba (BARRANDE, 1879)

1961 *Glossinotoechia gibba* (BARRANDE, 1879); HAVLÍČEK, p. 171, pl. 24, figs. 1- 13; text-figs. A, 75.

Occurrence: Koněprusy Limestone, Koněprusy (Na Voskopě hill, not common; Zlatý kůň hill, very rare).

Glossinotoechia HAVLÍČEK, 1959

Type species: *Terebratula Henrici* BARRANDE, 1847.

Diagnosis (emended): See HAVLÍČEK 1983.

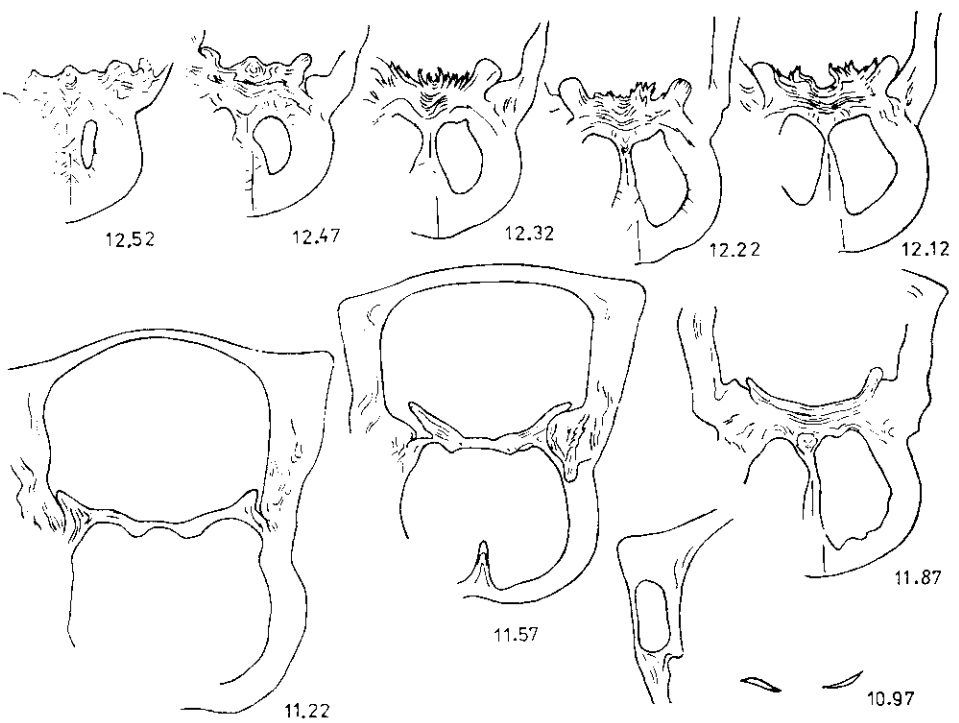
Glossinotoechia henrici (BARRANDE, 1847)

Text-fig. 16

1961 *Glossinotoechia henrici* (BARRANDE, 1847); HAVLÍČEK, p. 175, pl. 21, figs. 7, 8; pl. 23, figs. 1—13; text-figs. 78, 79.

1967 *Glossinulus* (*Glossinotoechia*) *henrici*; WESTBROEK, pl. 11, figs. 7—10.

1983 *Glossinotoechia henrici* (BARRANDE); HAVLÍČEK, text-fig. 3.



16. *Glossinotoechia henrici* (BARR.). Transverse sections, ×7

Occurrence: Koněprusy Limestone, area between Mořany and Koněprusy (Plešivec hill, rare; Na Voskopě and Zlatý kůň hills, frequent).

Markitoechia HAVLÍČEK, 1959

Type species: *Uncinulus marki* HAVLÍČEK, 1956.

Markitoechia marki (HAVLÍČEK, 1956)

Pl. XIII, figs. 9, 10; pl. XIV, figs. 6—8

1961 *Markitoechia marki* (HAVLÍČEK, 1956); HAVLÍČEK, p. 151, pl. 25, figs. 11—15.
1967 *Markitoechia marki*; WESTBROEK, pl. 12, figs. 5—7.

Occurrence: Zlíchov Limestone (lower part), Hlubočepy (U kapličky quarry, common); Srbsko (Hřib hill, only one shell).

Chlupacitoechia g. n.

Type species: *Uncinulus (Glossinulus) chlupáči* HAVLÍČEK, 1956.
Name: In honour of Ivo Chlupáč, palaeontologist and stratigrapher of the Geological Survey, Prague.

Diagnosis: Glossinotoechiid brachiopod internally and externally closely similar to *Glossinotoechia* but lacking a continuous marginal rim in its pedicle valve.

Comparison: *Chlupacitoechia* has taken its origin in the *Eoglossinotoechia* stock which is distinguished by high, geniculate shells (concha alta) in adult growth stages. The growth of the shell in the new genus, however, differs clearly from that of *Eoglossinotoechia* in developing a double geniculation in the pedicle valve. First, the antero-lateral margins were bent abruptly in ventral direction (ventral geniculation); this stage was later succeeded by a sudden change in growth direction that gave rise to a paries geniculatus (dorsal geniculation); both growth stages are separated from each other by sharp edges.

A significant feature of both *Chlupacitoechia* and *Glossinotoechia* is a double geniculation in the pedicle valve; the main difference between the two genera consists in that the ventrally raised antero-lateral sides do not coalesce in the median sector of the pedicle valve to form a continuous submarginal rim in *Chlupacitoechia*, whereas *Glossinotoechia* is distinguished by a sharp-edged, highly raised, continuous marginal rim surrounding the gently convex ventral disc both laterally and anteriorly.

"*Uncinulus*" *chlupaci* was tentatively assigned to *Tridensilis* SU by HAVLÍČEK (1983). The latter genus, coming from the Emsian sequence in China (SU 1976, 1980), differs from *Chlupacitoechia* in having a nearly cuboidal to globose shell, gently curved hinge margin, well-developed shallow sulcus, and in lacking the growth stage of ventral geniculation in its pedicle valve. Internally, *Tridensilis* has a high, distally tripartite cardinal process, whereas that of *Chlupacitoechia* is finely striated on its posterior face. *Tridensilis* is probably a genus of the *Uncinulidae*.

Position of *Chlupacitoechia* within the phylogenic tree of the glossinotoechiids was shown by HAVLÍČEK (1983, text-fig. 7) under an incorrect name *Tridensilis*.

Species assigned to *Chlupacitoechia*:

Uncinulus (*Glossinulus*) *chlupaci* HAVLÍČEK, 1956; Zlíchovian, Bohemia;

Glossinotoechia lata SCHUMANN, 1965; lower Emsian, Spain; upper Emsian, France (Massif Armoricain);

Glossinotoechia intermedia BRICE, 1981; upper Emsian (Marettes Formation); France (Massif Armoricain).

Chlupacitoechia chlupaci (HAVLÍČEK, 1956)

Pl. XIII, figs. 11, 12; pl. XV, figs. 7–9

1961 *Glossinotoechia chlupáči* (HAVLÍČEK, 1956); HAVLÍČEK, p. 179, pl. 2, figs. 1, 2.

Holotype: Shell figured by HAVLÍČEK in 1956, pl. 1, figs. 1, 2; refigured by HAVLÍČEK in 1961, pl. 2, fig. 1; VH 208.

Type horizon and locality: Zlichov Limestone (lower part), Hlubočepy (U kapličky quarry).

Material: 14 shells and many fragments.

Exterior: Dimensions: shW: 14.6–26.5 mm; pvL/W: 86.8–95.5 %; the largest, late adult specimen: 79.5 %; shT/W: 67.1–82.2 %. Shell acuminate, dorsi-biconvex, subpentagonal in young specimens becoming heart-shaped in outline in late adult growth stages, with long postero-lateral margins considerably curved towards midline; anteriorly and laterally truncated; pedicle valve gently convex in sagittal profile but concave in transverse section; antero-lateral sides of pedicle valve moderately to highly raised (depending on age of the specimen) but, in contrast to *Glossinotoechia henrici*, not fused into a continuous rim surrounding the disc of the pedicle valve; the upturned margins (ventral geniculation) separated by conspicuous, sharp edges from the paries geniculatus, whereas the edge in the median sector is obtuse to right-angled. Sulcus absent, tongue low, rectangular, often bearing a shallow median depression. Ventral beak straight, posteriorly directed; pedicle foramen mesothyrid, deltidial plates conjunct with a well-discernible suture. Brachial valve highly convex in transverse profile with an obscure fold; paries geniculatus separated from rest of the brachial valve by obtuse edges. Anterior commissure uniplicate-denticulate; marginal spines present.

Ribs very low with nearly flat crests, somewhat higher and gently rounded near anterior and lateral margins of both valves, always broader than intercostal furrows, never bifurcating, counting 30–36 on each valve; on paries geniculatus, ribs flat-topped, bisected by secondary grooves and bearing growth lines in a zig-zag arrangement.

Interior: Dental plates thin, short. Long median septum supports a rather massive septalial complex originating by fusing of posterior part of the mid-septum and hinge plates; septalium cavity filled out by secondary shell material which in late adult specimens builds up a moderately to highly raised cardinal process; its steeply inclined posterior face finely striated.

Occurrence: Zlíchov Limestone (lower part), Hlubočepy (U kapličky quarry; rather frequent but complete shells are rare because the thin-walled specimens are usually crushed); Klukovice (rare).

Hebetoechiidae HAVLÍČEK, 1960

Remarks: The *Hebetoechiidae* is a separate stock of sphaeroidal to subcuboidal rhynchonellids developing the paries geniculatus and marginal spines in adult growth stages. The Silurian hebetoechiids have deep, cup-like septalium free of secondary shell material and never roofed over by a connectivum (e.g. *Hebetoechia sphaerulea* HAVL., *Lanceomyonia tarda* (BARR.)). During further evolution, the secondary shell deposits accumulate on upper sides of hinge plates and partly to completely fill the septalium cavity (e.g. *Hebetoechia hebe* (BARR.), *Eucharitina eucharis* (BARR)). Since the lower Emsian (Pragian), the septalial complex was gradually reduced; first, the inner and outer hinge plates were horizontally disposed to form a single flat plate without a cup-like depression in its middle; later on, the median septum gradually atrophied; in *Voskopitoechia* g. n., it was still fully developed to support the horizontally disposed hinge plates, whereas in *Kransia* WESTBROEK, although high and having a mediotest, it did not support the hinge plates. Reduction of the median septum terminated in *Beckmannia* MOHANTI that had a low mid-septum lacking a mediotest and was in no contact with the hinge plates (MOHANTI 1972).

Another interesting trend in hebetoechiid evolution concerns the anterior commissure which changed from the uniplicate-denticulate condition to the uniplicate-smooth condition in terminal links of the family (*Kransia* WESTBROEK, *Beckmannia* MOHANTI).

Besides the "main" lineage of small to medium-sized hebetoechiids also some large genera have been assigned to the *Hebetoechiidae* (*Eucharitina* SCHMIDT, *Plethorhyncha* HALL & CLARKE) (HAVLÍČEK 1961).

Hebetoechia HAVLÍČEK, 1960

Type species: *Terebratula Hebe* BARRANDE, 1847.

Hebetoechia hebe (BARRANDE, 1847)

1961 *Hebetoechia hebe* (BARRANDE, 1847); HAVLÍČEK, p. 119, pl. 17, figs. 8—14; text-fig. 44.
1983 *Hebetoechia hebe* (BARRANDE); HAVLÍČEK, text-fig. 5.

Occurrence: Přídolí Limestone (uppermost part); localities: see HAVLÍČEK - - ŠTORCH (1990).

Kotýs Limestone, area between Lištice, Loděnice, and Lužce (Herinky hill; exposure south of Svatý Jan pod Skalou; Solway quarry; Branžovy hill; rather frequent at all localities); Bubovice (near Čeřinka quarry).

Radotín Limestone (lower part); Podolí (abandoned quarry); Karlštejn (Budňanská skála); Suchomasty (Klonk); Řeporyje (upper part of the Scyphocrinites Horizon); rather common at all localities.

Hebetoechia ornatrix HAVLÍČEK, 1961

1961 *Hebetoechia ornatrix* n. sp.; HAVLÍČEK, p. 121, pl. 8, figs. 2, 3; text-fig. 45.

Occurrence: Bohemia: Kotýs Limestone, Svatý Jan pod Skalou (not common). Radotín Limestone, Karlštejn (Budňanská skála; rare).
Morocco: probably Tindouf Basin, lower Gedinnian, Acastella tiro Zone (Drot 1964).

Hebetoechia nitidula (BARRANDE, 1879)

1879 *Rhynchonella nitidula* BARR.; BARRANDE, pl. 113, case I, figs. 1–3.
1961 *Hebetoechia nitidula* (BARRANDE, 1879); HAVLÍČEK, p. 126, pl. 17, figs. 1–3; text-fig. 49.

Remarks: *H. nitidula* involves small, 8.0–10.3 mm wide, rather robust shells with smooth beaks and partly developed paries geniculatus in adult growth stages. Sulcus and fold bear 2–5 rounded ribs; the ribs on tongue and sides of brachial valve are usually flat-topped and bisected by secondary grooves, less commonly rounded and lacking secondary grooves. On the other hand, the paries geniculatus is absent in anterior part of brachial valve and lateral sides of pedicle valve where all ribs are short and rounded; anterior commissure is uniplicate and deeply indented.

The shells with paries geniculatus well-developed in both valves, by HAVLÍČEK (1961) also assigned to *H. nitidula*, are transferred here to *Voskopitoechia orbona* sp. n. which is distinguished by smaller and more variable shell and horizontally disposed hinge plates never producing a cup-like septalium.

Interior: See HAVLÍČEK 1961, text-fig. 49.

Occurrence: Koněprusy Limestone, Měňany (old collections).

Lanceomyonia HAVLÍČEK, 1960

Type species: *Terebratula tarda* BARRANDE, 1847.

Lanceomyonia borealiformis (SIEMIRADZKI, 1906)

1961 *Lanceomyonia borealiformis* (SIEDMIRADZDKI, 1906); HAVLÍČEK, p. 112, pl. 13, figs. 6, 7.

Occurrence: Bohemia: Radotín Limestone (lower part); Měňany (Skalice Hill; frequent, Monograptus uniformis Zone); Karlštejn (Budňanská skála; rare).
Ukraine (Podolia). Lochkovian, Borščov Formation (KOZŁOWSKI 1929, NIKIFOROVA 1954).

Central Asia (Fergana): Lochkovian, Isfara and Pentamerus Beds (NIKIFOROVA 1937).
Morocco (Tindouf Basin): Gedinnian – ?Lower Siegenian (DROT 1964).

Lanceomyonia confinis (BARRANDE, 1879)

1961 *Lanceomyonia confinis* (BARRANDE, 1879); HAVLÍČEK, p. 116, pl. 13, figs. 4, 5; text-fig. 43.

Occurrence: Bohemia: Kotýs Limestone (lower part); Svatý Jan pod Skalou (exposure south of village, rare; Solway quarry, very rare). Radotín Limestone, Lejškov (Monograptus uniformis Zone; rare); Karlík (in association with *Warburgella rugosa,* rare).
West Siberian platform: Lochkovian (KUĽKOV - PEREGOEDOV 1989).

Plethorhyncha HALL & CLARKE, 1894

Type species: *Rhynchonella speciosa* HALL, 1854.

Plethorhyncha diana (BARRANDE, 1879)

1961 *Plethorhyncha diana* (BARRANDE, 1879); HAVLÍČEK, p. 130, pl. 16, figs. 1–5.

Occurrence: Kotýs Limestone, Svatý Jan pod Skalou (old collections).

Plethorhyncha altera (BARRANDE, 1879)

1961 *Plethorhyncha altera* (BARRANDE, 1879); HAVLÍČEK, p. 129, pl. 15, figs. 4–7; text-fig. 50.

Occurrence: Kotýs Limestone, Svatý Jan pod Skalou (Solway quarry, very rare; most of shells comes from old collections).

Eucharitina SCHMIDT, 1955

Type species: *Terebratula Eucharis* BARRANDE, 1847.

Eucharitina eucharis (BARRANDE, 1847)

1961 *Eucharitina eucharis* (BARRANDE, 1847); HAVLÍČEK, p. 132, pl. 18, figs. 1–6; text-figs. 51, 52.

Occurrence: Koněprusy Limestone, Měňany (Plešivec hill; frequent).

Eucharitina oehlerti (BAYLE, 1878)
Pl. XVI, fig. 10

1964 *Eucharittina oehlerti* (BAYLE, 1878); DROT, p. 123, pl. 17, figs. 10—13; text-figs. 53, 54.

Remarks: By their size and general aspect, the Bohemian specimens are not distinguishable from the French and North African shells, described and illustrated by DROT (1964). Inner morphology of the Bohemian specimens has not been investigated.

Occurrence: Bohemia: Koněprusy Limestone, Koněprusy (Zlatý kůň hill, rare; never in association with *E. eucharis!*).

France and Morocco: Siegenian (localities listed by DROT 1964).

Voskopitoechia g. n.

Type species: *Voskopitoechia orbona* sp. n.

Diagnosis: Shell small, equally biconvex, subpentagonal in outline, lenticular in early growth stages (concha plana) but geniculate anteriorly and laterally in adult specimens (concha alta), usually slightly wider than long, less commonly elongate. Ventral beak orthocline, deltidial plates not observed (due to imperfect preservation?). Sulcus shallow, originating anterior to mid-length, extending into a low to high rectangular tongue; fold very short, moderately elevated above flanks, with a gently convex top. Both valves smooth umbonally; ribs formed as low, rounded ridges in sulcus and fold; ribs on paries geniculatus are flattened and bisected by secondary grooves; zig-zag deflections clearly developed; anterior commissure uniplicate and gently undulate to nearly smooth; marginal spines present.

Dental plates thin and short; hinge plates conjunct, fused into one piece never producing a septalium, resting on a thin median septum.

Comparison: Externally, the new genus strongly recalls a small *Hebetoechia*; *Voskopitoechia*, however, differs from *Hebetoechia* in lacking the cup-like septalium; instead of it, *Voskopitoechia* has its hinge plates fused into a flat, horizontally disposed plate, thus indicating a close relation to the upper Emsian—Eifelian genus *Kransia* WESTBROEK. As shown by MOHANTI (1972), the septalial complex in *Kransia* is even more reduced and consists of conjunct hinge plates which are no more in contact with the median septum. On the other hand, the conjunct hinge plates of the Bohemian genus are supported by a rather high, thin median septum. Further, the anterior commissure of *Kransia* is uniplicate and smooth, that of *Voskopitoechia* is uniplicate and gently undulate.

Disposition of hinge plates and location of crural bases in *Voskopitoechia* are strongly reminiscent of those in the septalariid genera. *Voskopitoechia*, however, cannot be assigned to the *Septalariidae* because of having geniculate shells in adult growth stages with typically flattened ribs, and in having secondary grooves and characteristic growth lines in a zig-zag arrangement on the flat-topped ribs. By contrast to the septalariid genera, the median septum of *Voskopitoechia* is never alate in lateral profile. All the morphological features of *Voskopitoechia* support the idea of WESTBROEK (1967) that the type species of the new genus is an inter-

mediate link between *Hebetoechia* and *Kransia*.
Species assigned: Type species only.

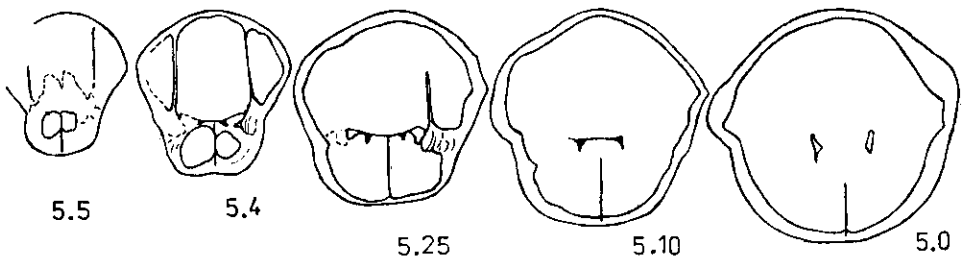
Voskopitoechia orbona sp. n.

Pl. XV, figs. 1–6

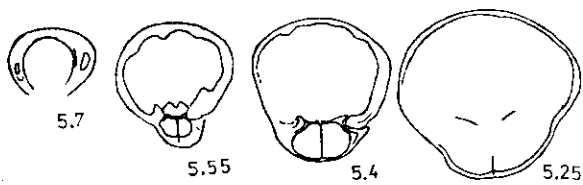
1967 *Hebetoechia nitidula*; WESTBROEK, pl. 11, figs. 11, 12.
1983 *Kransia nitidula* (BARRANDE); HAVLÍČEK, text-fig. 6.

Holotype: Shell figured on pl. XV as fig. 4; VH 6070d.
Type horizon and locality: Koněprusy Limestone, Koněprusy (Na Voskopě Hill, new quarry).
Material: About 400 specimens.

Exterior: See diagnosis of the genus. Dimensions: shW: 4.3–6.6 mm, rarely larger (maximum 9.4 mm wide); few elongate shells are rather narrow (2.7–4.5 mm wide); pvL/W: usually 92.0–97.0 % (small elongate specimens: 102.0–122.8 %); shT/W: 60.0–76.6 % (extreme: 56 %); suW/pvW: 54.6–60.6 %. Sulcus usually bears 3–5 ribs, the largest specimen (9.4 mm wide) has 7 ribs in its sulcus; in small elongate shells, number of ribs decreases to 1–2 in sulcus. Parietal ribs absent, ex-



17. *Voskopitoechia orbona* sp. n. Transverse sections, × 8



18. *Voskopitoechia orbona* sp. n. Transverse sections, × 8

ceptionally 1 parietal costa present; lateral ribs very short, 3–8 at each side of the shell.

Interior: See text-figs. 17, 18.

Remarks: In spite of a wide range in variability, all specimens investigated are assigned to the same species because of existence of many transitional forms between

the elongate and paucicostate shells and the transversal shells with more numerous ribs in sulcus.

Occurrence: Vinařice Limestone, Koněprusy (Čertovy schody; less frequent). Koněprusy Limestone, Měňany (Plešivec hill, frequent); Koněprusy (Na Voskopě and Zlatý kůň hills; less frequent). Zlichov Limestone, Hlubočepy (U kapličky quarry; only one shell).

Uncinulidae RŽONSNICKAJA, 1956

Remarks: The *Uncinulidae* (s.s.) embrace the rhynchonellids pentagonal in outline, in early growth stages lenticular in lateral profile (concha-plana stage) becoming strongly convex, nearly cuboidal to globose in late adult specimens (concha-alta stage) with well-developed paries geniculatus and marginal spines. Ribs on the paries geniculatus flat-topped, bisected by secondary grooves and crossed by fine growth lines in a zig-zag arrangement. Septalium V-shaped, often filled out by secondary shell material that builds a variably shaped, usually striated cardinal process. Connectivum may or may not be present. The *Uncinulidae* form a separate family paralleling the stocks of the *Glossinotoechiidae* and *Hebetoechiidae* and ranging from the Wenlock (*Tadshikia* NIKIFOROVA) to the Frasnian.

Uncinulus BAYLE, 1878

Type species: *Hemithiris sub Wilsoni* D'ORBIGNY, 1850.

Uncinulus pila (SCHNUR, 1851)

Pl. X, figs. 5—8

1961 *Uncinulus maledictus maledistus* (BARRANDE, 1879); HAVLÍČEK, p. 143, pl. 22, figs. 10—17.
1964 *Uncinulus pila* (SCHNUR, 1851); DROT, p. 147, pl. 16, figs. 6, 7, 11—13; text-fig. 64 (herein quotations of earlier papers).
1967 *Uncinulus maledictus maledictus*; WESTBROEK, pl. 12, figs. 1—4.
1981 *Uncinulus pila* (SCHNUR, 1851); BRICE, p. 202, pl. 24, fig. 4; pl. 25; figs. 12—17; text-fig. 4A—B (herein quotations of earlier papers).

Lectotype (SD MAUZ 1935 — see SCHMIDT 1941): Internal mould of pedicle valve figured by SCHNUR in 1853, pl. 26, fig. 1d; refigured by SCHMIDT in 1941, pl. 4, fig. 68; Schnur's collection deposited in the Institut of Geology and Palaeontology, Bonn.
Type horizon and locality: Wiltz Beds, upper Emsian; the Eifel.
Material: 35 shells and about 200 free valves (often incomplete).

Exterior: Shell sphaeric in shape, anteriorly and laterally truncated, 11.6 to 17.1 mm wide, and 75.0—91.5 % as high as its maximum width (extremes: 72.5 and 102.5 %), widest at or slightly anterior to mid-length. Ventral beak short, incurved, foramen apical; beak edges obtuse. Ventral sulcus short, shallow; its bottom gently

concave to flat, exceptionally bearing a weak median elevation; tongue flat or concave in cross section, postero-dorsally directed, with a straight to arcuate anterior margin. Anterior commissure uniplicate-smooth, marginal spines rather long. Brachial valve strongly convex in transverse profile, fold hardly elevated.

Ribs slender, rounded, clearly developed even in umbonal regions of both valves, often bifurcating, numbering 11–15 on the tongue, and 15–22 on each flank; 1–3 parietal ribs may be present. On paries geniculatus, the ribs are flat-topped and bisected by secondary grooves; growth lines not observed.

Interior: See HAVLÍČEK 1961.

Comparison: The size, shape, and ornamentation of the Bohemian specimens are nearly the same as those of the coeval West European species *U. pila*; for this reason, *Uncinulus maledictus* (BARRANDE, 1879) is regarded here as a junior synonym of *U. pila* (SCHNUR, 1851).

Occurrence: Bohemia: Zlíchov Formation, lower part; Hlubočepy (U kapličky quarry; common); same formation, upper part (pink crinoidal Chýnice Limestone); Lištice (Macháček quarry; less common).
Occurrence in the upper Emsian strata of West Germany, France, Belgium, Spain, Morocco, and Algeria: see DROT (1964) and BRICE (1981).

Uncinulus altifrons HAVLÍČEK, 1961

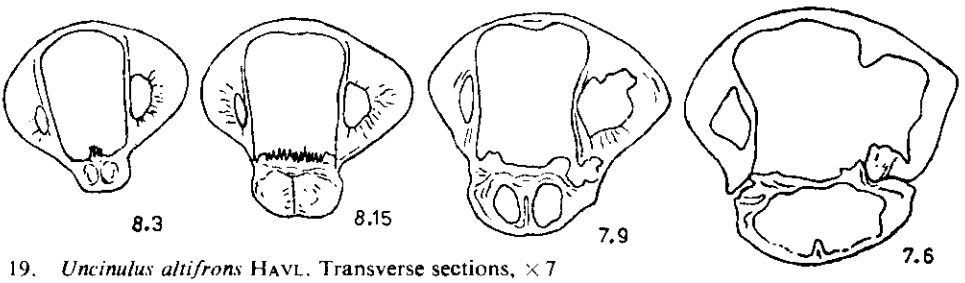
Pl. VI, figs. 7, 8

1961 *Uncinulus maledictus altifrons* n. subsp.; HAVLÍČEK, p. 141, pl. 22, figs. 1, 2; text-fig. 56.

Holotype: Shell figured by BARRANDE in 1879, pl. 25, fig. 6; refigured by HAVLÍČEK in 1961, pl. 22, fig. 2; L 28886.
Type horizon and locality: Koněprusy Limestone, Koněprusy.
Material: About 350 shells.

Exterior and interior: See HAVLÍČEK 1961. Dimensions: shW: 7.2–13.0 mm (the largest specimen: 14.2 mm); pvL/W: 91.0–106.4 % (in a few transversal shells: 86.1–89.5 %); shT/W: 74.5–92.6 %. Bottom of sulcus flat to slightly convex, anterior commissure uniplicate, usually weakly undulated. Ribs fine, in umbonal regions indistinct, anteriorly rounded, rarely bifurcating, broader than interspaces, counting 7–11 on tongue, and 10–16 on each flank; one parietal rib may be present at each side of the sulcus. On paries geniculatus, ribs flat-topped as in *U. pila*.

Comparison: *U. altifrons*, the forerunner of *U. pila*, differs from the latter in being moderately smaller, usually more elongate, and in having less ribs on tongue and flanks; in addition to these little reliable features, *U. altifrons* is distinguished by umbonally indistinct ribs which either remain unbranched during ontogeny, or some of them may bifurcate. By contrast, the ribs of *U. pila* are well-developed even in umbonal regions as fine rounded ridges which often bifurcate.



19. *Uncinulus altifrons* HAVL. Transverse sections, × 7

Occurrence: Koněprusy Limestone, area between Měňany and Koněprusy (Plešivec hill, frequent; Zlatý kůň hill – Císařský quarry, rare).

Taimyrrhynx HAVLÍČEK, 1983

Type species: *Uncinulus irbitensis taimyricus* NIKIFOROVA, 1960.

Diagnosis: See HAVLÍČEK 1983.

Taimyrrhynx knjaspensis (CHODALEVIČ, 1951)

Pl. XVI, fig. 9

1961 *Uncinulus knjaspensis* CHODALEVIČ, 1951; HAVLÍČEK, p. 144, pl. 12, figs. 1, 2; text-figs. 57, 58.

Holotype: Shell figured by CHODALEVIČ in 1951, pl. 12, fig. 3; Chodalevič collection, Sverdlovsk.
Type horizon and locality: Uppermost Lower Devonian to lower Eifelian, Sverdlovsk region, Ural Mts.
Material: 16 shells.

Remarks: During ontogeny, the ribs bifurcate several times; in several specimens they are of about the same size over the whole surface, whereas in others they are grouped into poor bundles in umbonal regions, thus recalling the pattern of the Uralian specimens (e.g. the holotype). As the size, general aspect of shell, and ribbing are nearly the same in the Uralian and Bohemian specimens, they all are regarded as conspecific. Dimensions of the Bohemian population: shW: 22.9–28.0 mm; pvL/W: 78.6–88.5 %; bvL/W: 72.4–88.5 %; shT/W: 65.6–84.7 %; number of ribs on tongue: 12–17.

T. rufus HAVL. (Suchomasty Limestone) differs from *T. knjaspensis* in having smaller shell (17.3 mm wide in the holotype), deeper sulcus with 4–5 parietal ribs at its sides, and a different shape of its tongue; the anterior and lateral margins of tongue are arcuate in *T. rufus*, those of the rectangular tongue in *T. knjaspensis* are straight.

Occurrence: Bohemia: Koněprusy Limestone, Měňany (Plešivec hill, not frequent).
Ural Mts.: See CHODALEVIČ 1951.

Group of *Monticola prokopensis*

Small paucicostate shells with a weak ventral fold and dorsal sulcus were assigned by HAVLÍČEK (1956) to the rhynchonellid genus *Monticola* NALIVKIN (= *Plectorhynchella* COOPER & MUIR WOOD). With regard to the fact that the Bohemian "monticolid" brachiopods have a spirally coiled brachidium, they are excluded here from the *Rhynchonellacea* and transferred to the *Athyrisinacea*.

Athyrisinacea GRABAU, 1931

Metathyrisinidae WANG, RONG & YANG, 1980

Remarks: The *Metathyrisinidae* are fairly common in the Upper Silurian and Lower Devonian of Australia, East and Central Asia, but not yet recorded in Europe. The Bohemian specimens are distinguished by small paucicostate and impunctate shells with disjunct hinge plates not supported by any ridges or pads of secondary shell material; spiralia are directed laterally as in other genera of the *Athyrisinacea*.

Argorhynx g. n.

Type species: *Monticola prokopensis* HAVLÍČEK, 1956.

Diagnosis: Small unisulcate shells of rhynchonellid appearance with smooth umbonal regions but coarsely plicate in anterior parts of both valves. Ventral beak incurved, overhanging the beak of the opposite valve; ventral interarea minute, orthocline to anacline, pedicle foramen partly restricted by deltidial plates. Dorsal sulcus shallow, ventral sulcus absent. Median costa absent in pedicle valve but well-developed in brachial valve; all plications unbranched. Dental plates thin, short, gently diverging anteriorly; muscle field not impressed. Hinge plates small, disjunct, not underlain by any ridges or pads of secondary shell material. Spiralia directed laterally with 3 (maximum 4) whorls.

Comparison: *Argorhynx*, although externally and internally similar to *Sibiritoechia* ALEKSEEVA (Lower Devonian, Salair and Verchojansk ridges; ALEKSEEVA 1966; GRACIANOVA 1970), differs from the latter in lacking a medial costa in its pedicle valve but having a mid-rib in its brachial valve. By contrast, *Sibiritoechia* bears a medial rib in its pedicle valve but has a pair of submedian costae in its brachial valve. (*Sibiritoechia* was erected as a rhynchonellid genus of the *Hypothyridinidae*; its attribution to the *Metathyrisinidae* is not sure because of lack of any information about the spiralia.)

Pygmaella BARANOV (Lower Devonian, north-eastern U.S.S.R.; BARANOV 1977) is another closely similar rhynchonellid genus that has a small, paucicostate and unisulcate shell. *Pygmaella*, however, differs from the Bohemian genus in having inner edges of its hinge plates supported by well-developed crural plates, whereas no crural plates have been observed in *Argorhynx*. The main distinguishing character is the

presence of spirally coiled brachidium in *Argorhynx*; instead of it, *Pygmaella* has a pair of dorsally directed crural apophyses terminating with hook-like extensions (BARANOV 1977, text-fig. 4a).

Molongia MITCHELL (Upper Silurian–Lower Devonian; redescribed by STRUSZ 1984) differs from the new genus in having strong ribs extending from the posterior margin of shell, uniplicate anterior commissure, and short median septum supporting a small septalium.

By its inner morphology, *Gissarina* MENAKOVA & NIKIFOROVA (Upper Silurian, Central Asia, Zeravšano-Gissarskaja gornaja oblasť) is closely similar to *Argorhynx*; it differs from the latter in having more numerous ribs originating at posterior margin of shell, in having ventral sulcus and fairly well-developed growth lamellae. Spiralium in *Gissarina* consists of more than 6 whorls, that of *Argorhynx* has 3 (maximum 4) whorls.

Species assigned: Type species only.

Argorhynx prokopensis (HAVLÍČEK, 1956)

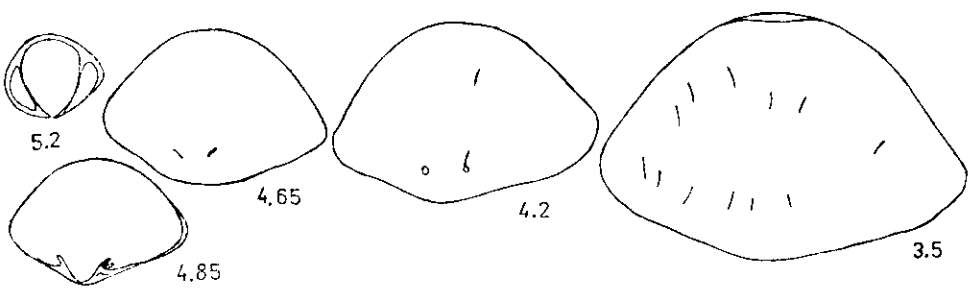
Pl. XVI, figs. 1, 2

1956 *Monticola prokopensis* n. sp.; HAVLÍČEK, p. 575, pl. 3, figs. 13–15.

Holotype: Shell figured by HAVLÍČEK in 1956, pl. 3, figs. 13–15; VH 3667.
Type horizon and locality: Dvorce-Prokop Limestone, Hlubočepy (Švarcenberský quarry).
Material: About 200 shells (usually corroded and incomplete).

Exterior: Shell pentagonal in outline, 4.3–7.0 mm wide in adults, 96–107 % as long as wide (extreme: 81 %), and 54–63 % as high as maximum width; both valves moderately convex in lateral profile. In anterior view, pedicle valve more con-

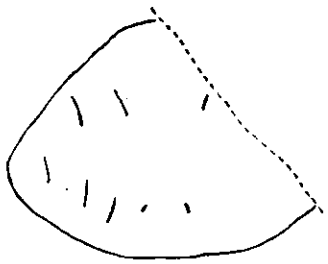
20. *Argorhynx prokopensis* (HAVL.). Transverse sections, × 10



21. *Argorhynx prokopensis* (HAVL.). Transverse sections, × 10

vex medianly than on flanks; ventral sulcus absent, anterior commissure gently curved ventrally. Ventral beak small, sharp, postero-dorsally directed; interarea minute, orthocline to anacline, bounded by obtuse edges; pedicle foramen partly modified by tiny deltidial plates. Brachial valve evenly convex in posterior view; dorsal sulcus originates at about mid-length as a shallow depression located between moderately elevated flanks.

Both beaks smooth; ribs appear between a third and mid-length of valve as low, rounded ridges that become rounded-angular towards front margin. Pedicle valve bears 3 (exceptionally 2) pairs of ribs; median costa absent. Dorsal sulcus occupied



22. *Argorhynx prokopensis* (HAVL.). Transverse section, × 10

by 2 ribs which may be accompanied by one, usually slender, accessory rib. Dorsal flanks bear 2 or 3 (exceptionally 4) costae.

Interior: Dental plates thin, gently diverging, as long as 9–10 % of the valve length. Hinge plates minute, neither supported by any plates nor underlain by pads of callosity. Cardinal process and median septum absent.

Occurrence: Dvorce-Prokop Limestone, Hlubočepy (Švarcenberský quarry, frequent; collected by M. Šnajdr) and Zlíchov (Konvářka: layer overlying the pink Slivenec Limestone, one shell only).

Ufonicoelia g. n.

Type species: *Monticola torleyi* HAVLÍČEK, 1956.

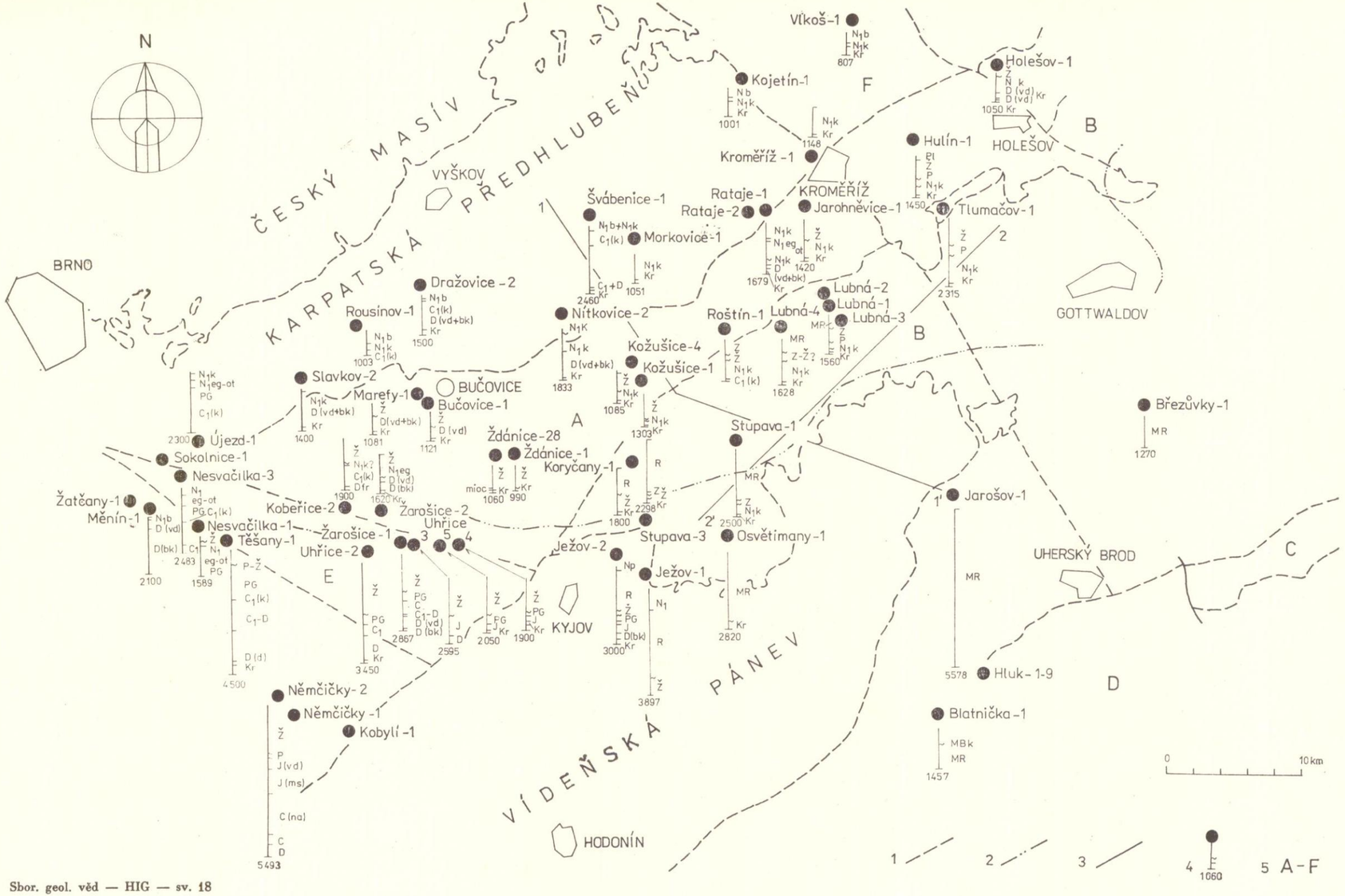
Diagnosis: Very small, unisulcate, elongate-oval shells devoid of ventral sulcus; dorsal sulcus shallow to obscure, anterior commissure gently curved in ventral direction. Strong ribs originate at posterior margins of both valves; lateral ribs unbranched, mid-rib in pedicle valve bifurcates a short distance from the beak; a second-order median rib usually intercalates in the narrow field between the left and right branches of the forked primary rib. Bifurcating median rib also present in brachial valve. Interior the same as in *Argorhynx*; spiralia ill-preserved in all specimens examined.

Comparison: *Argorhynx* differs from *Ufonicoelia* in lacking a median costa in its pedicle valve; further, all its ribs are unbranched and originate between a third and mid-length of valve, whereas the ribs extend from the posterior margin in *Ufonicoelia*.

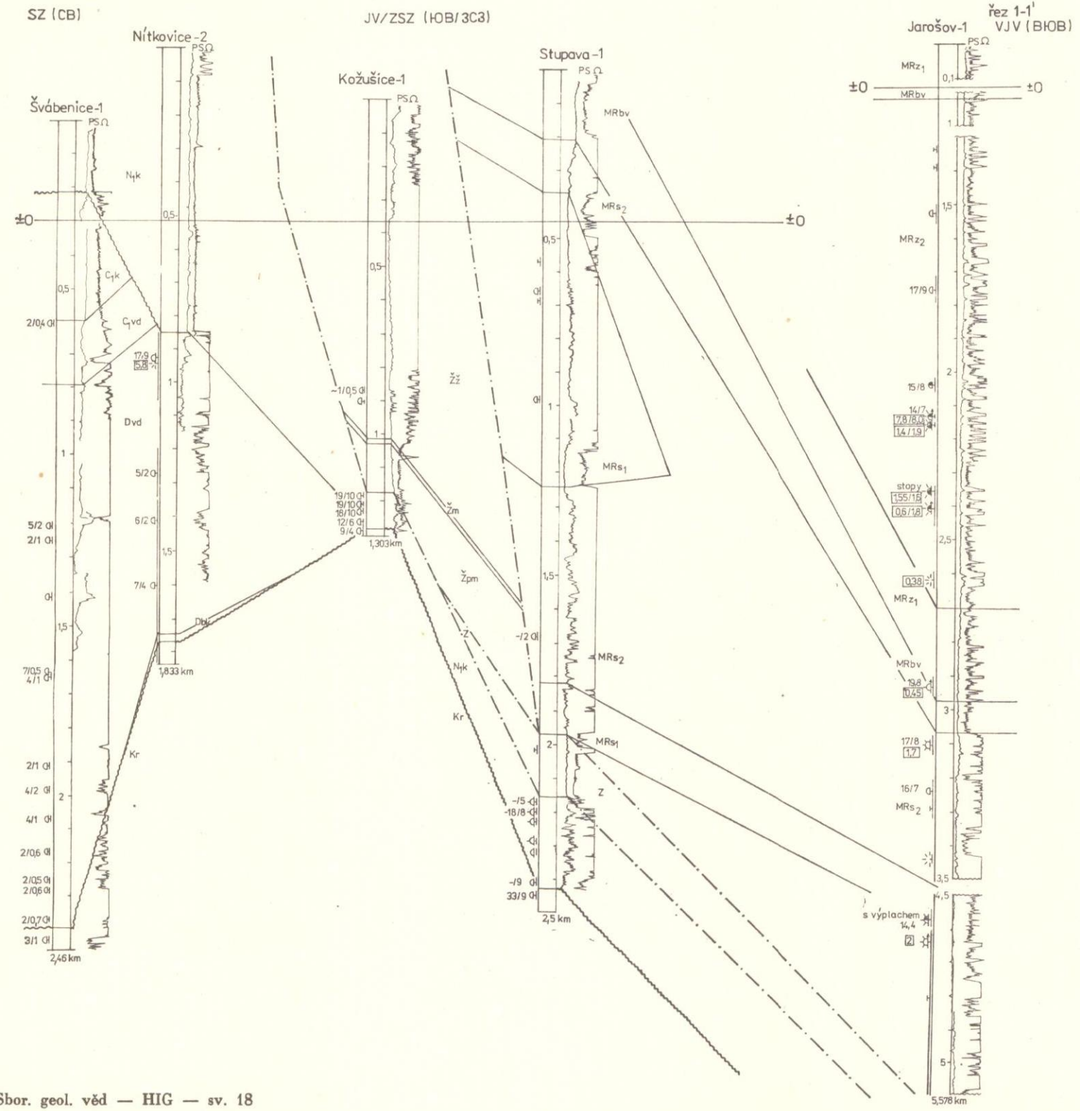
M. Michalíček: Geochemie hlubinných vod a plynů střední Moravy

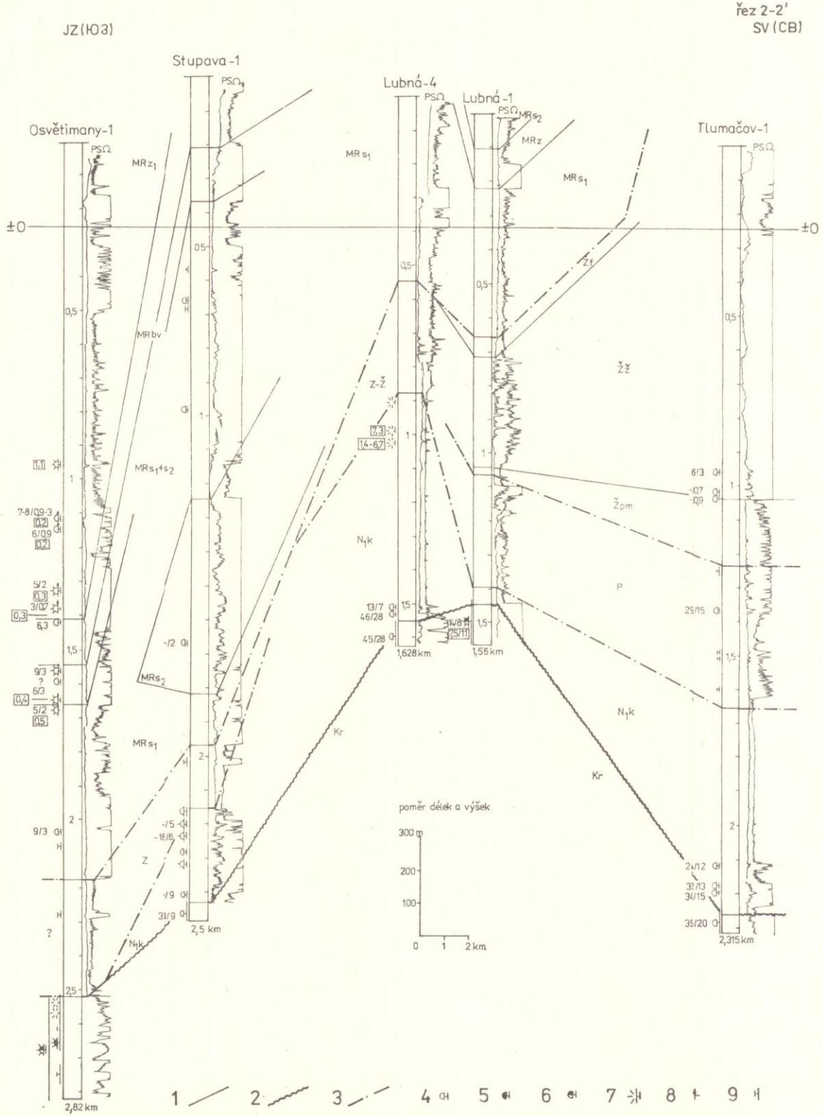
KARTOGRAM VRTŮ V OBLASTI STŘEDNÍ ČÁSTI JV. SVAHŮ ČESKÉHO MASÍVU
S VYSVĚTLIVKAMI (stručně litostratigrafické profily vrtů a výsledky čerpacích zkoušek)

Viz tabulka 1



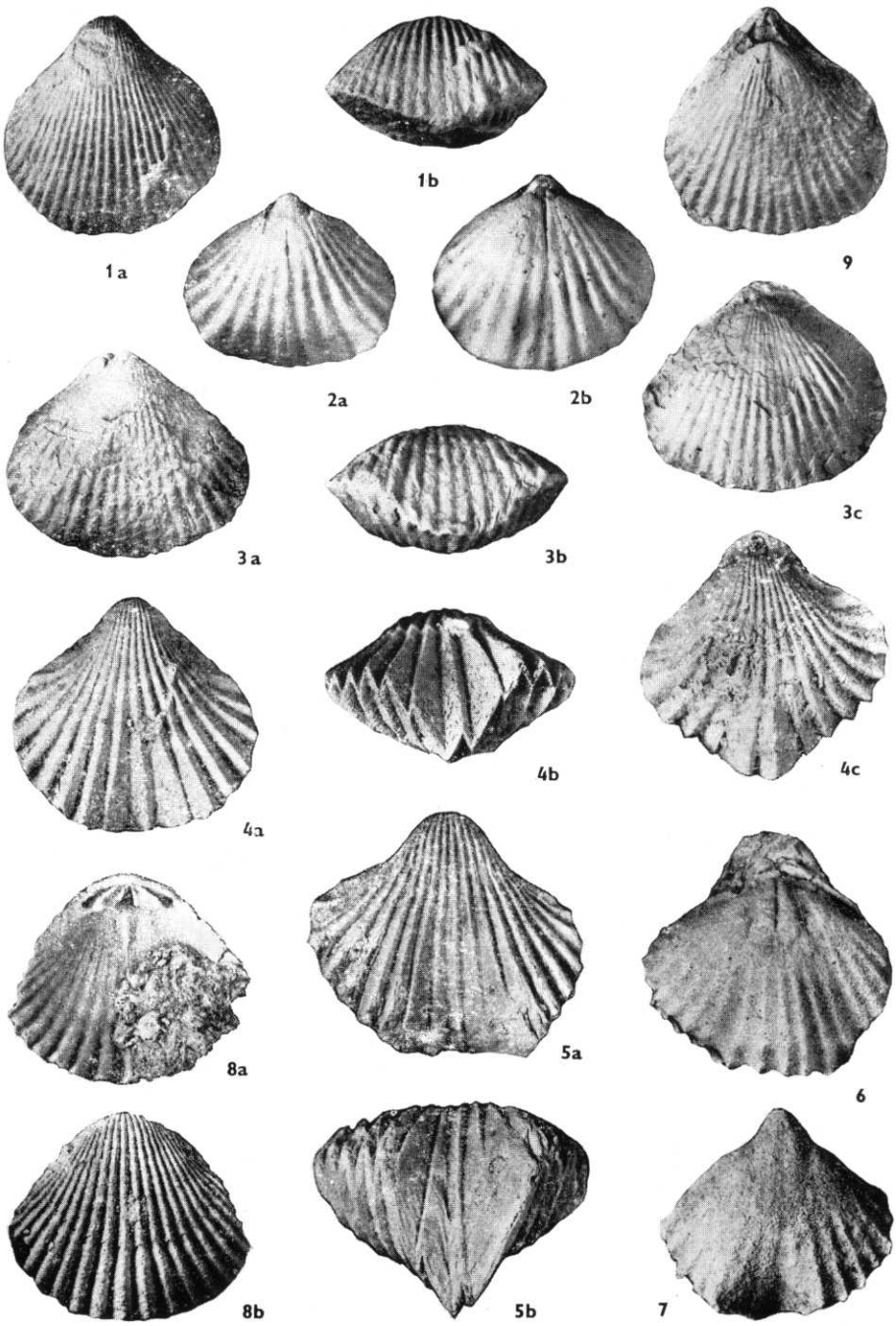
1 — hranice hlavních geologických celků, *2* — prohyb platformy, *3* — hydrogeochemické korelační řezy 1—1′, 2—2′ (příloha 2), *4* — situace vrtů a jejich litostratigrafické profily, *5* — jednotky vnějšího flyšového pásma: *A* — ždánicko-podslezská, zdounecká a pouzdřanská jednotka; jednotky magurského (vnitřního) flyšového pásma Karpat: *B* — račanská jednotka, *C* — bystrická jednotka, *D* — bělokarpatská jednotka, *E* — nesvačilský příkop, *F* — Hornomoravský úval





HYDROGEOCHEMICKÝ KORELAČNÍ ŘEZ (1—1'), (2—2')

1 — korelační rozhraní; *2* — transgresívní rozhraní; *3* — hlavní násunové plochy v příkrovové stavbě flyšových Karpat; *4—9* přítok: *4* — vody, *5* — ropy, *6* — ropy a vody, *7* — plynu, *8* — přeliv, *9* — zkoušený interval bez přítoku
Použité zkratky litostratigrafického profilu vrtů viz Úvod. Karotážní křivky *PS* — spontánní polarizace, *Ω* — přirozeného odporu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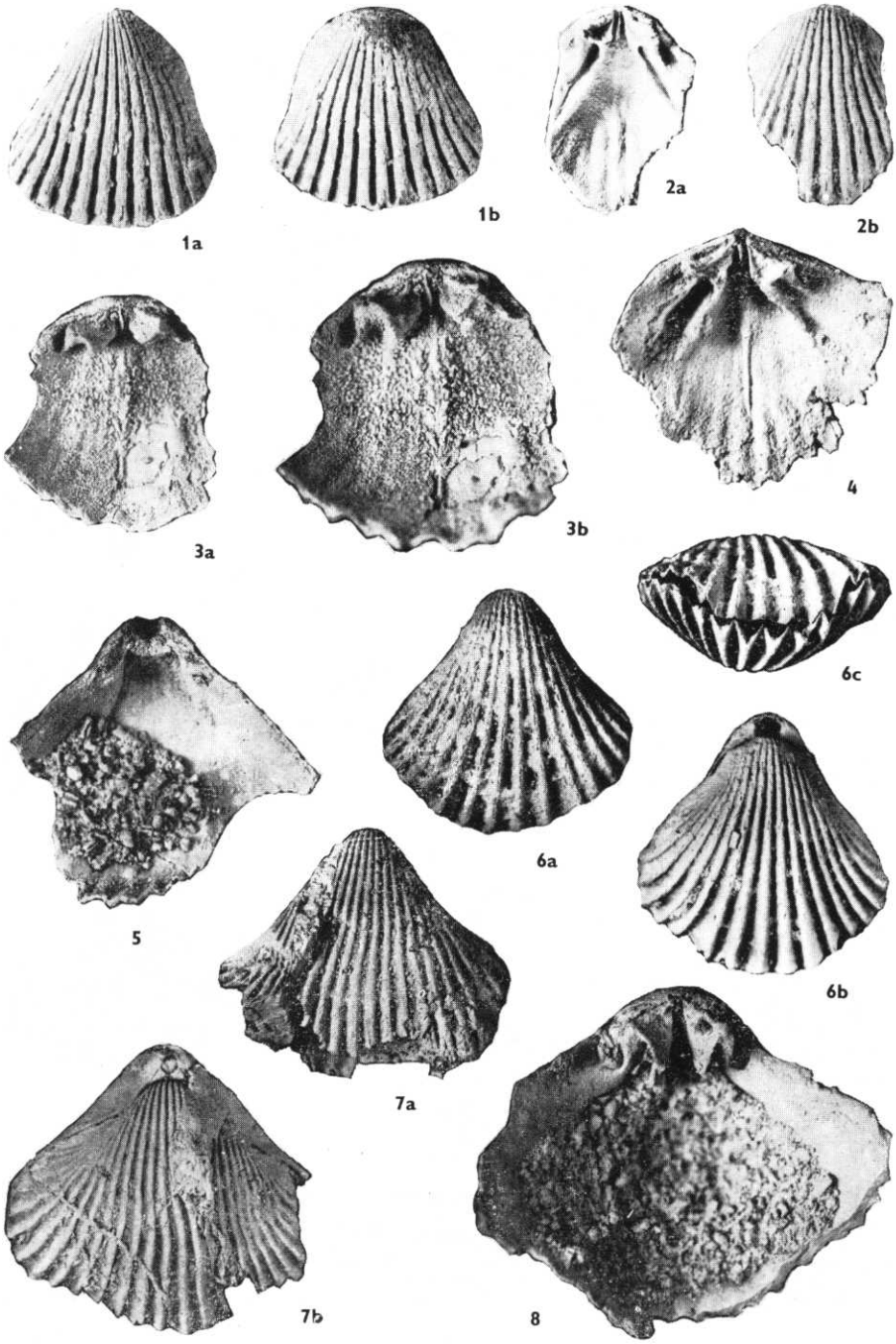
7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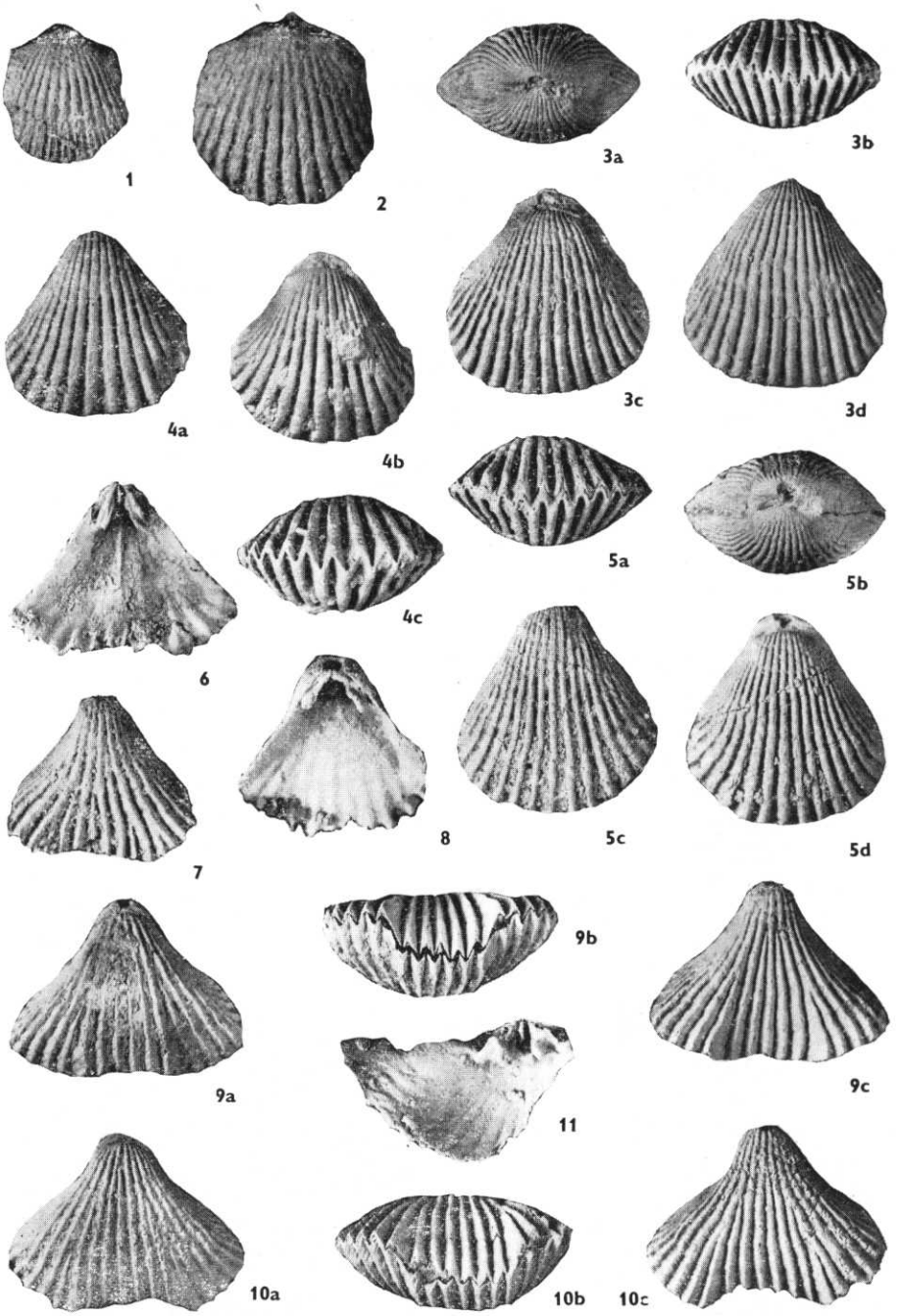
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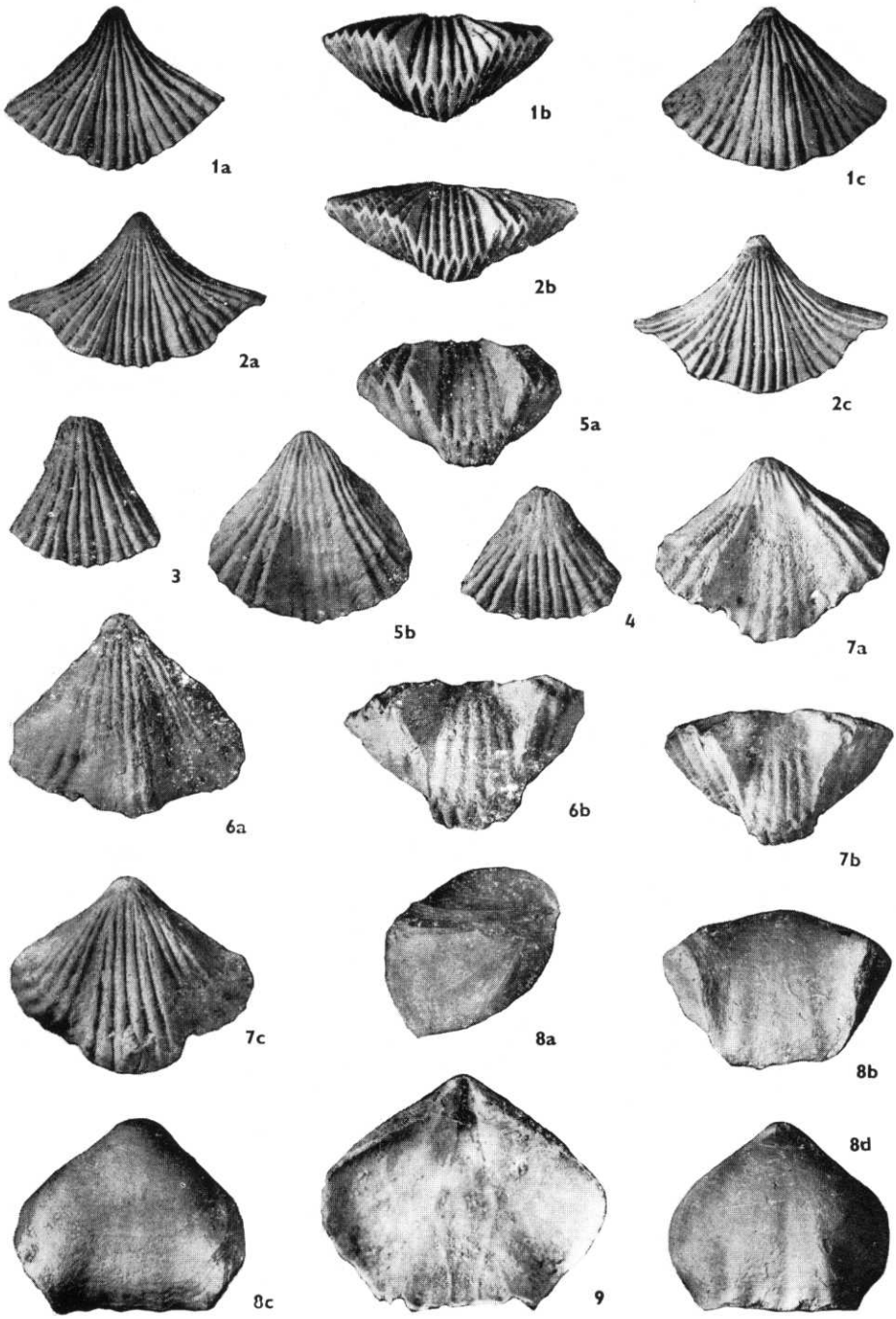
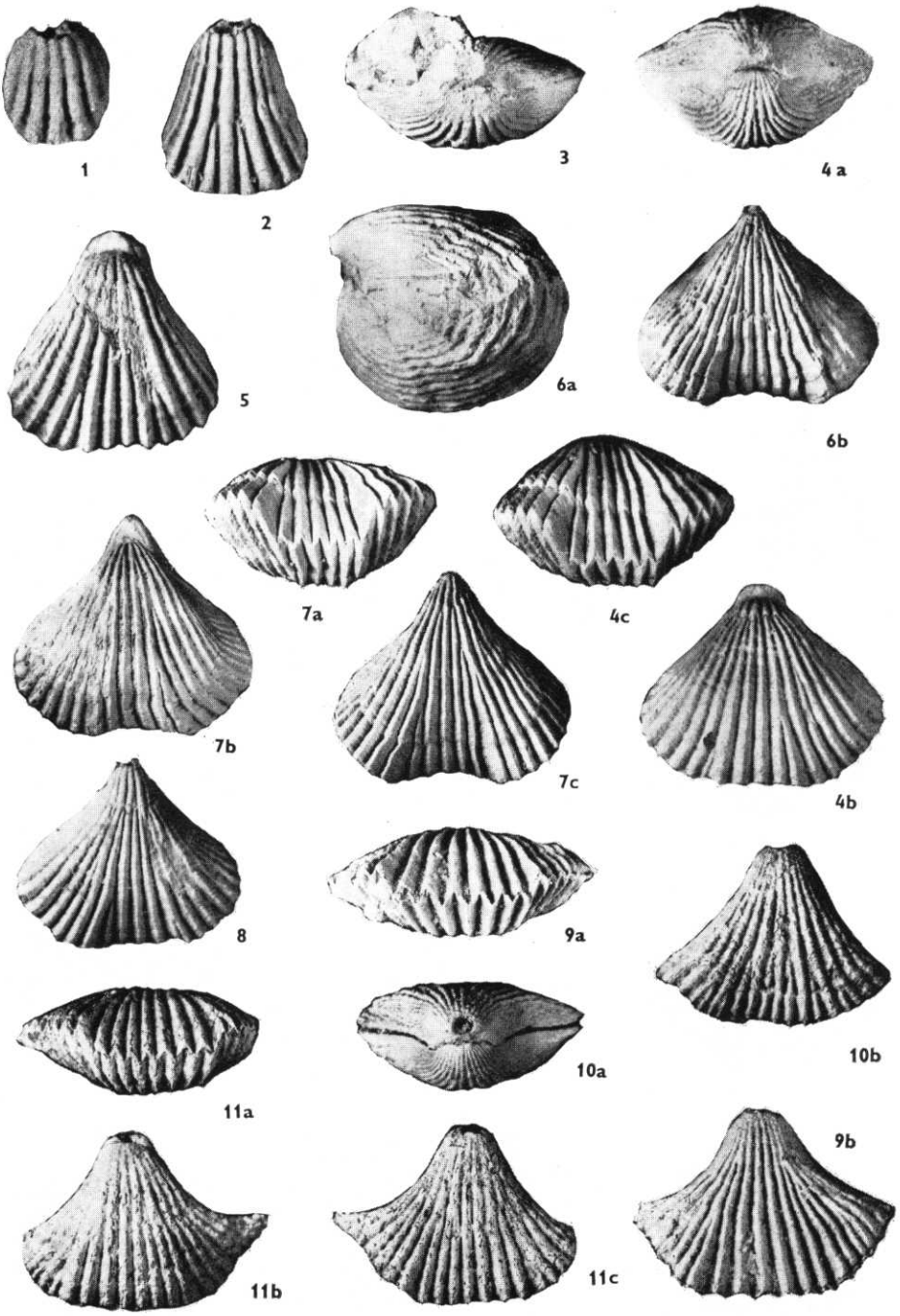
Pl. IV

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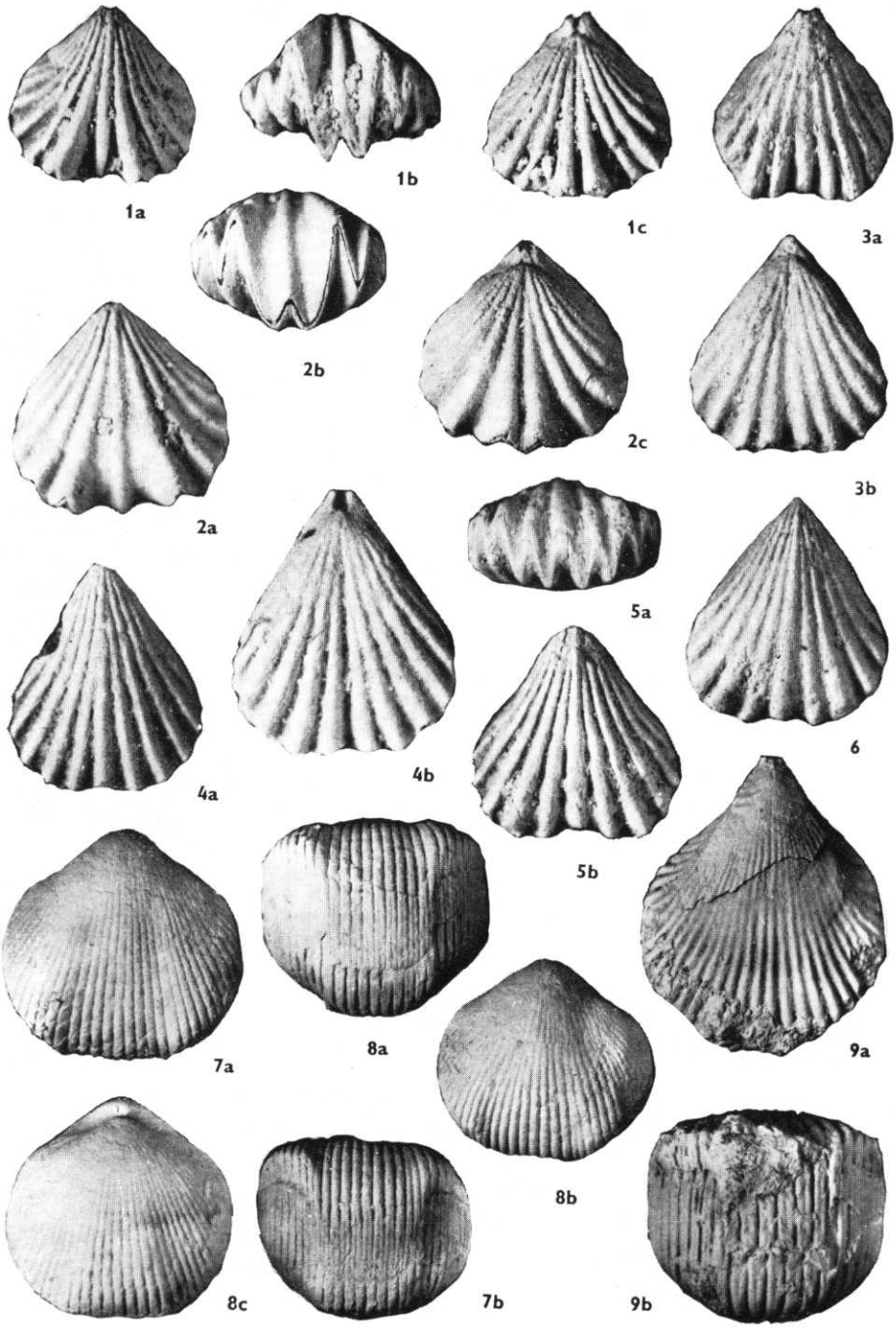
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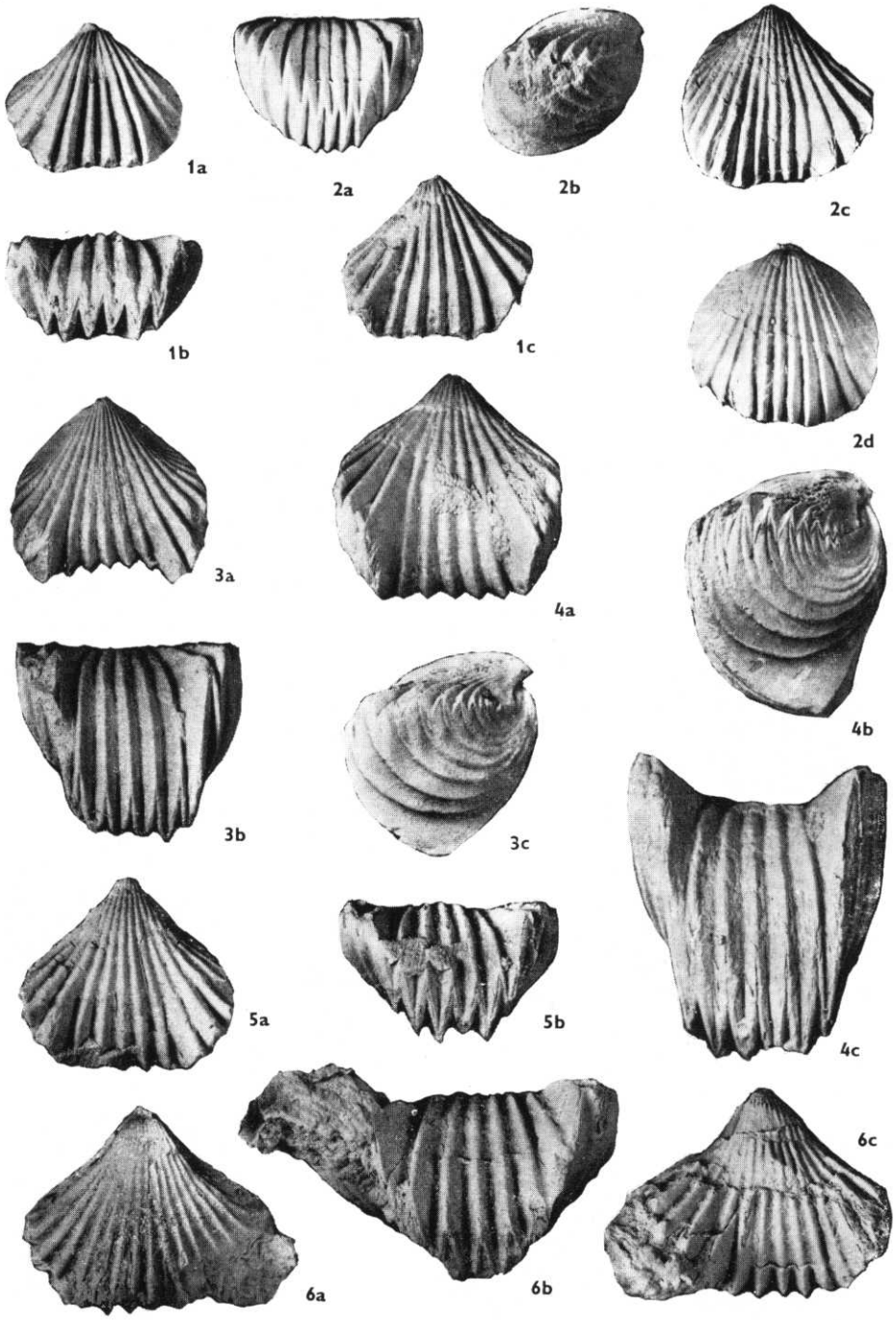
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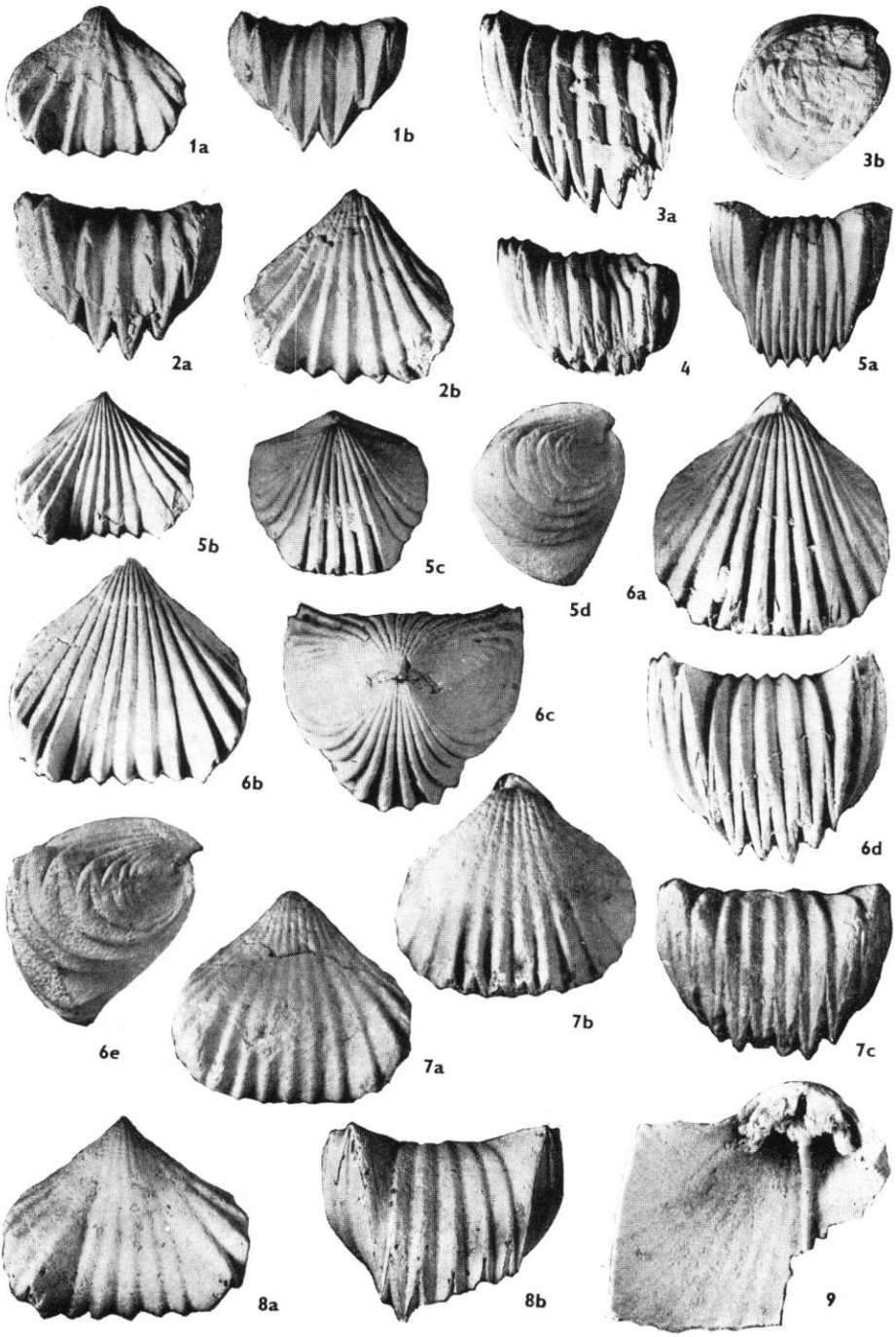
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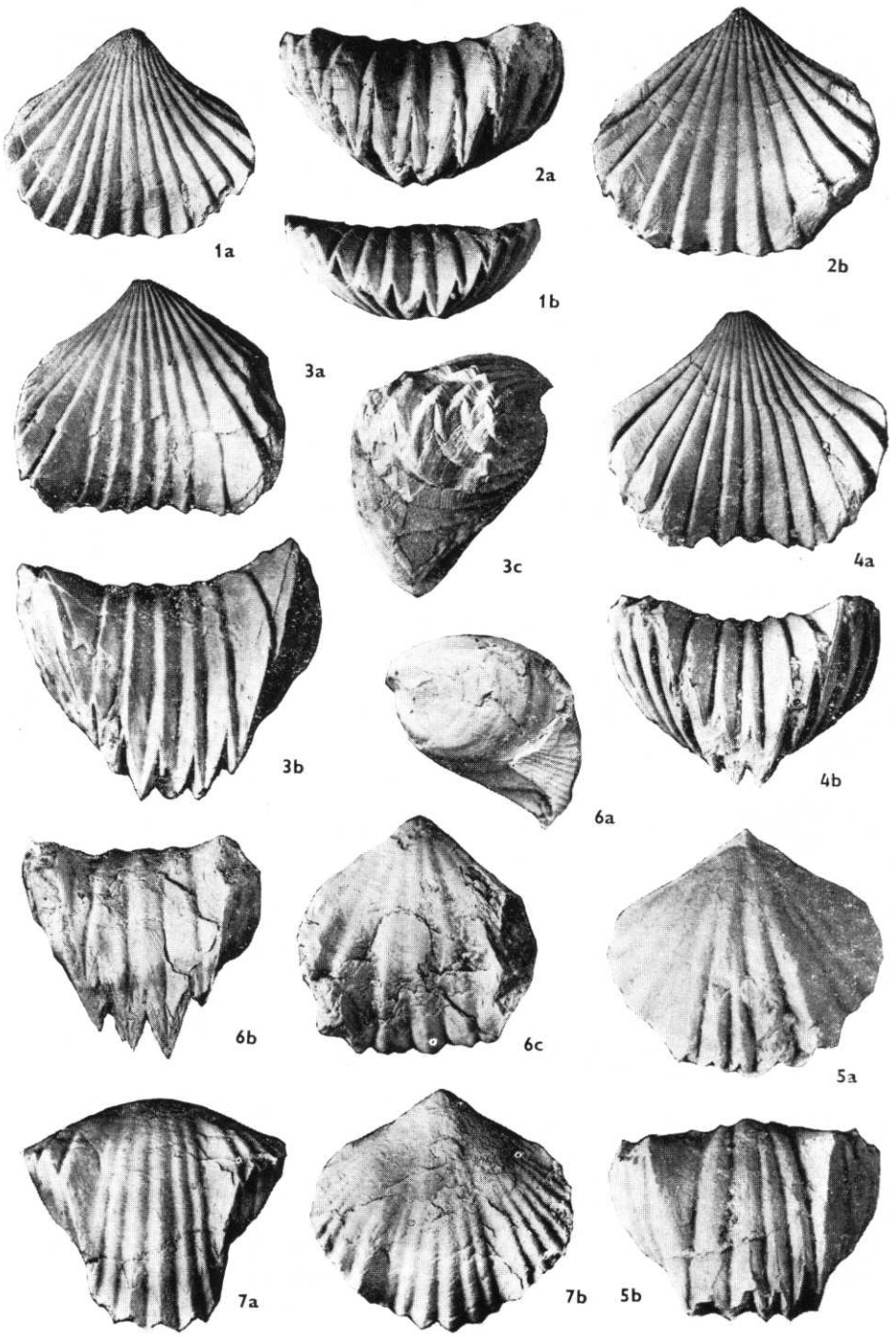
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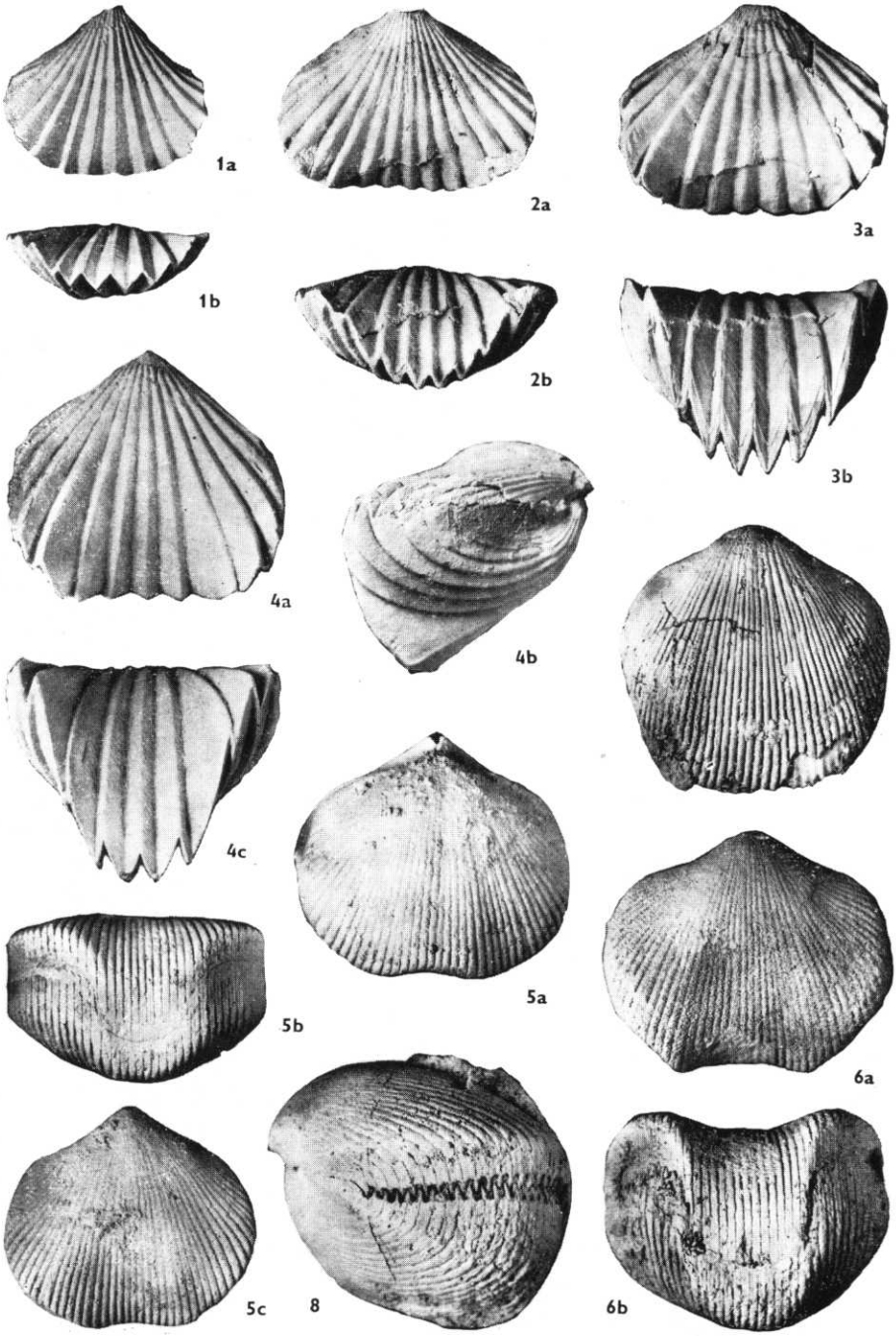
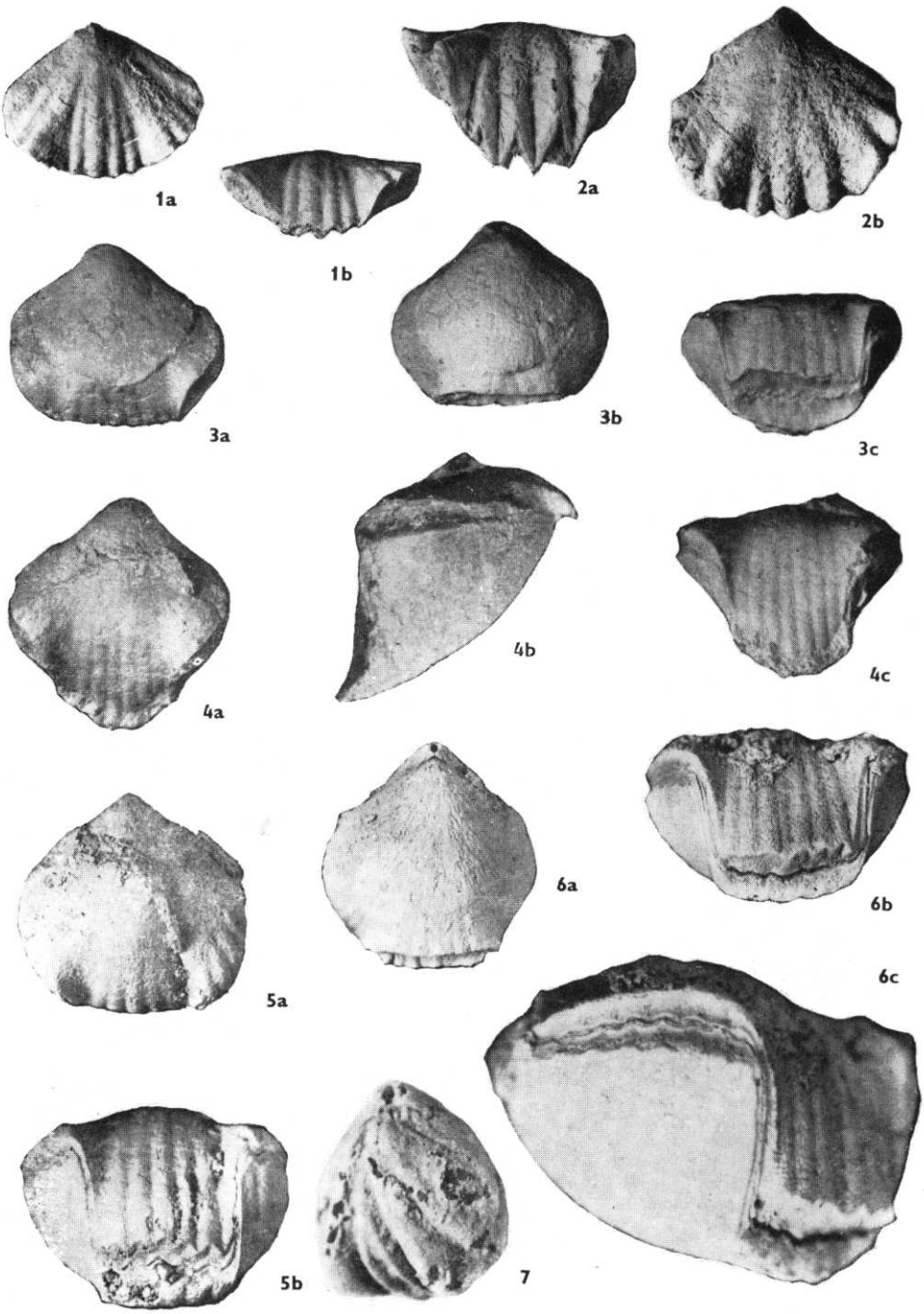
Pl. X

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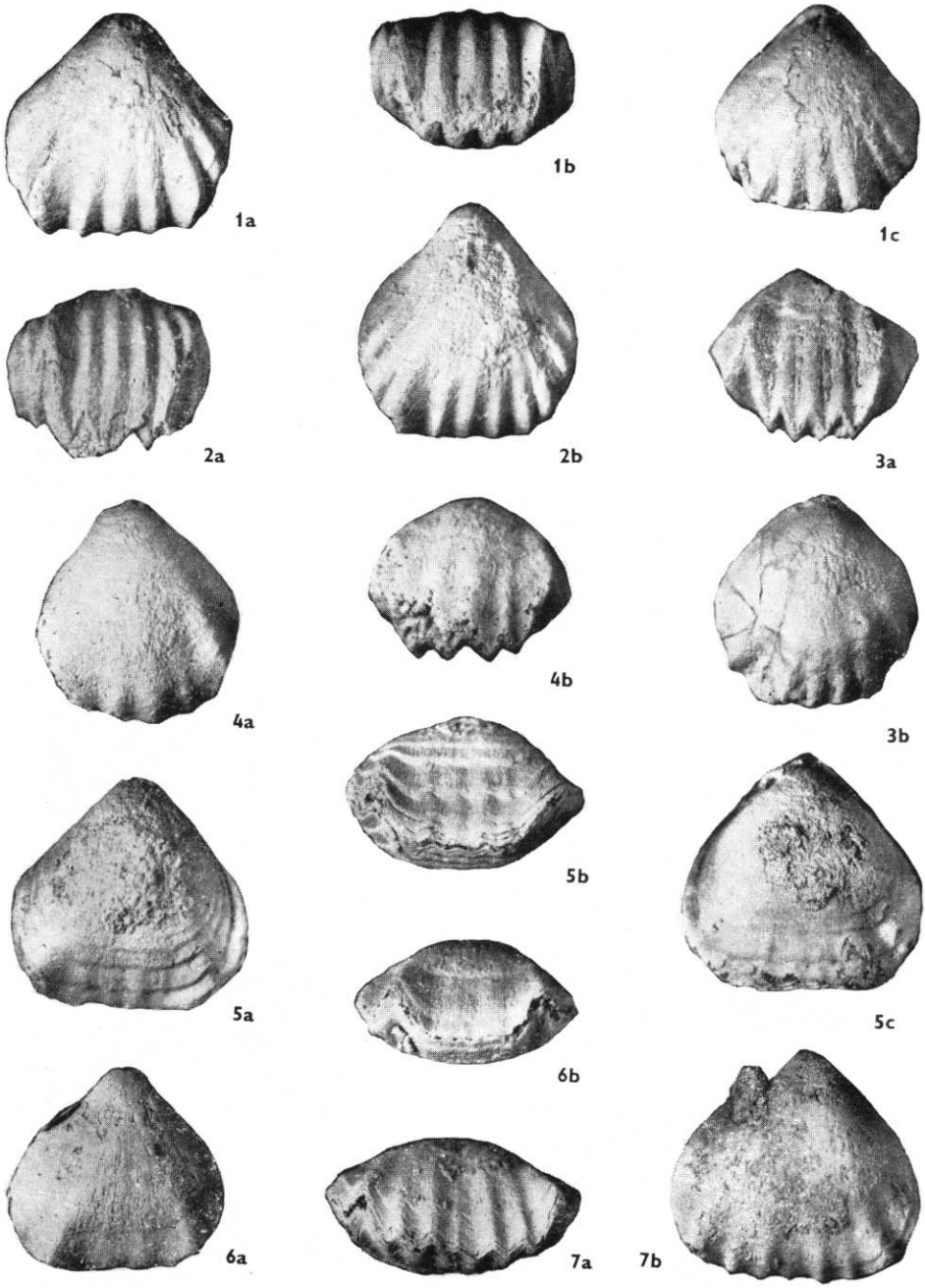
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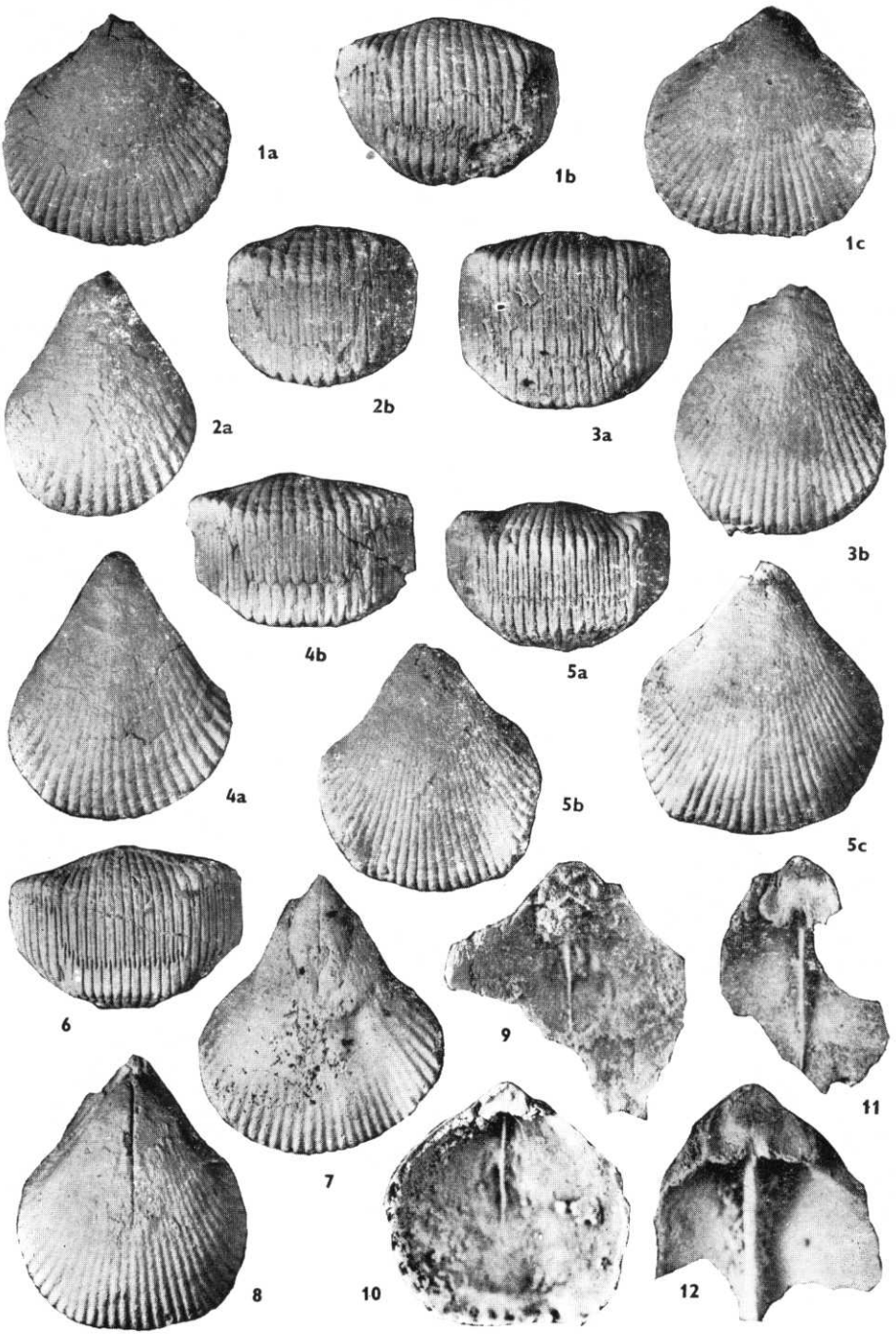
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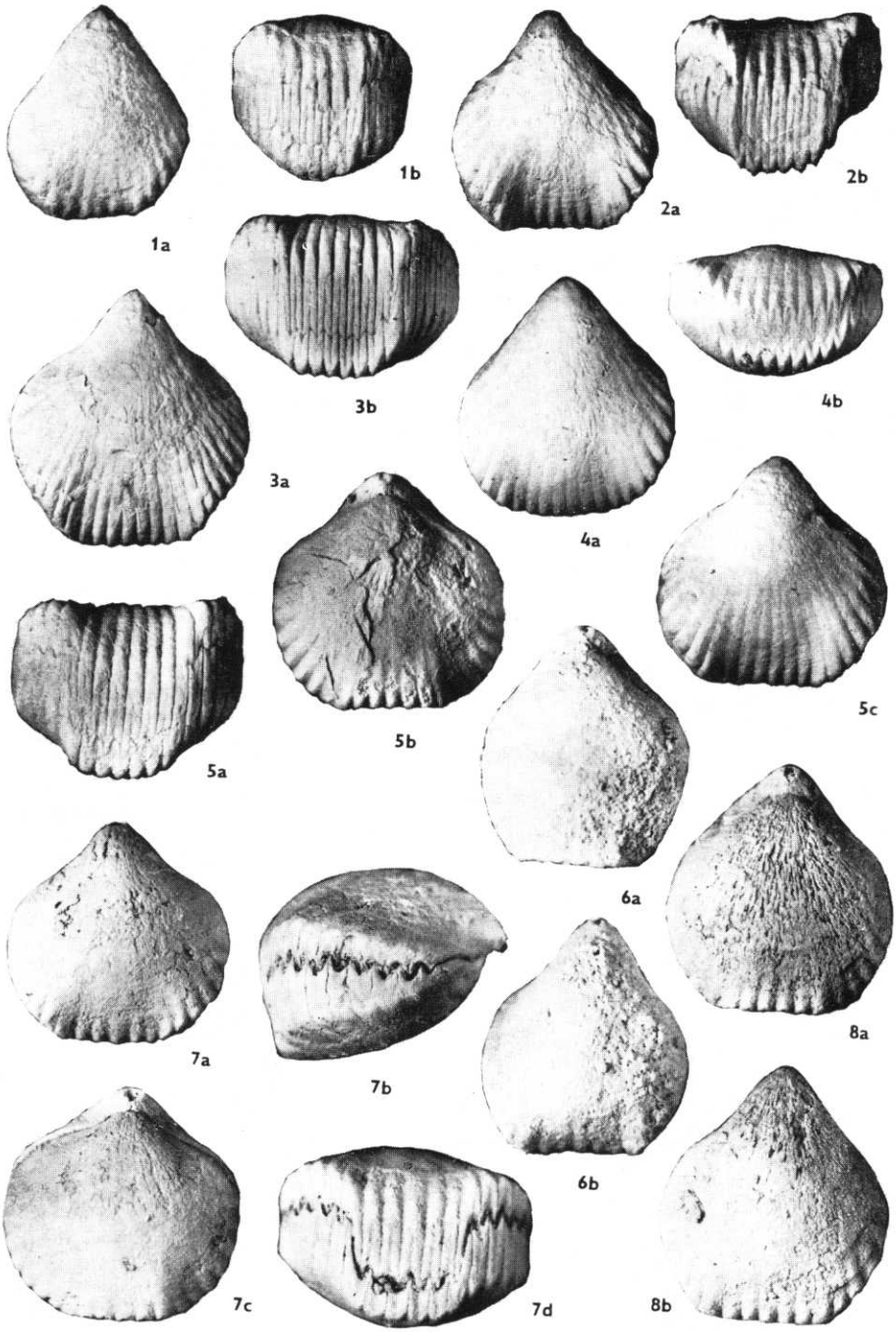
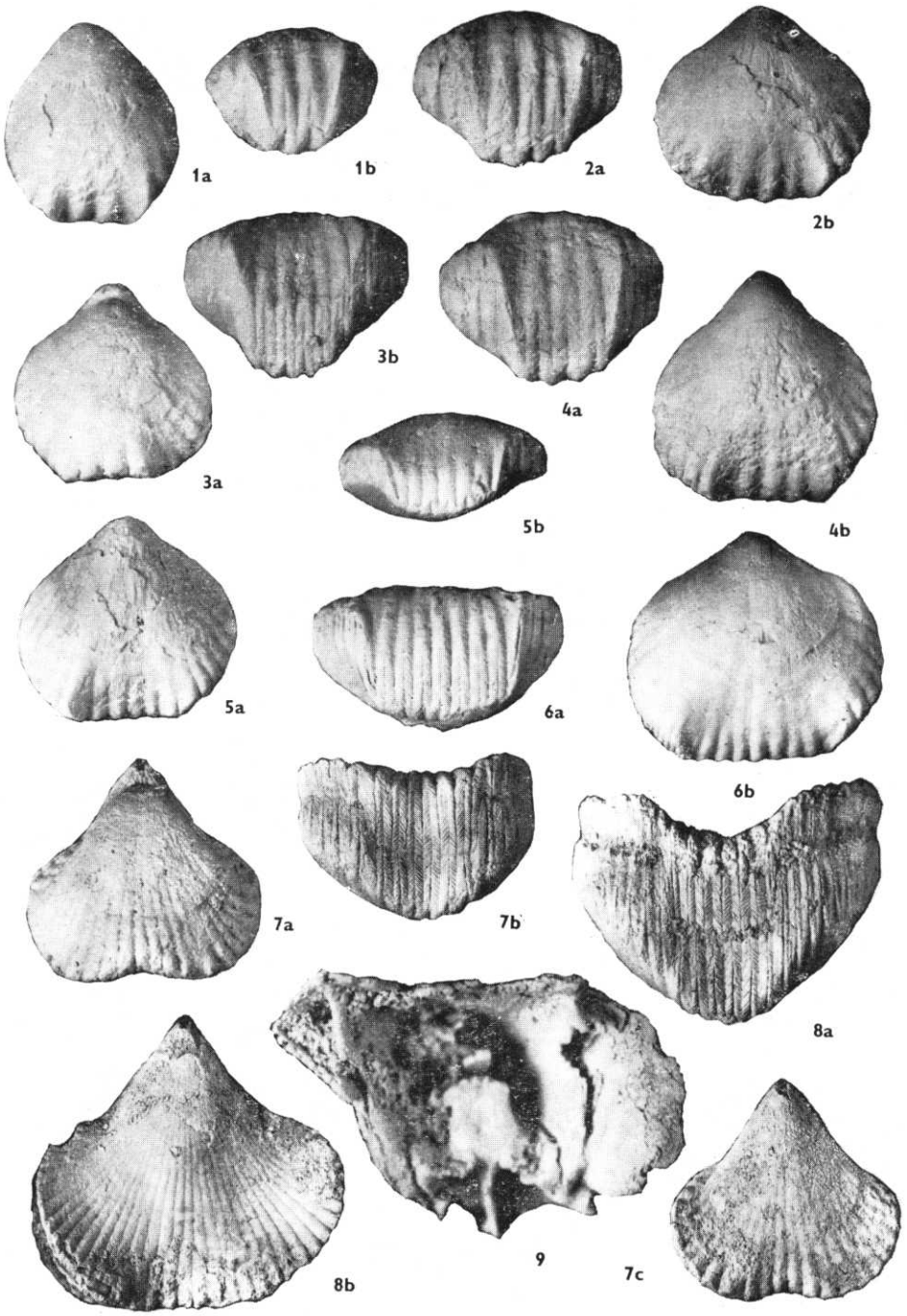
Pl. XIV

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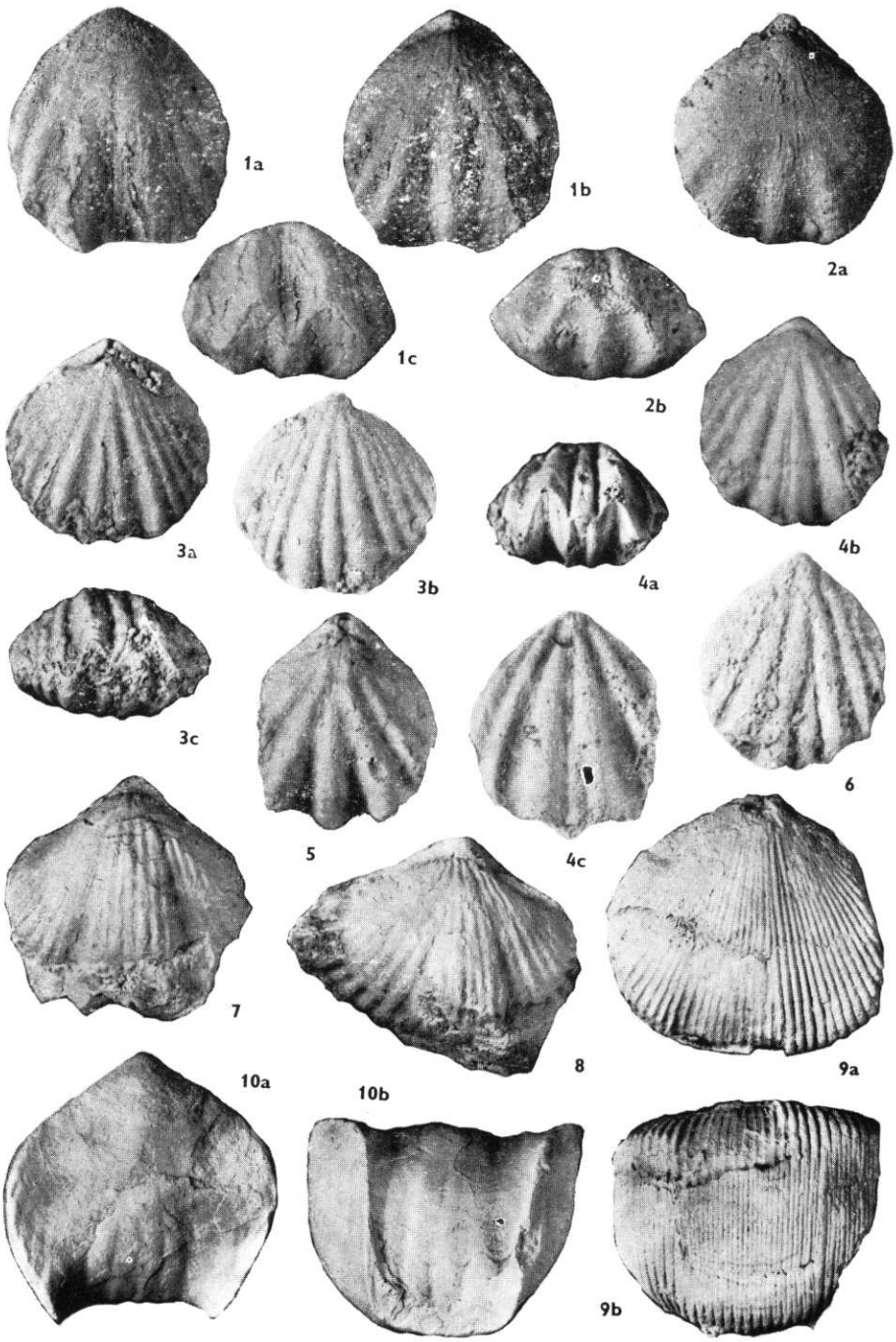
Pl. XVI



Gissarina MENAKOVA & NIKIFOROVA differs from *Ufonicoelia* in having more numerous ribs, well-developed ventral sulcus, uniplicate anterior commissure, and evenly spaced growth lamellae.

Unlike *Ufonicoelia, Molongia* MITCHELL has a shallow ventral sulcus, uniplicate anterior commissure, and short median septum that supports a small septalium.

Species assigned:
Monticola torleyi HAVLÍČEK, 1956; Zlíchovian; Bohemia;
Ufonicoelia archibalda sp. n.; Pragian, Bohemia.

Ufonicoelia torleyi (HAVLÍČEK, 1956)

Pl. XVI, figs. 3–5

1956 *Monticola torleyi* sp. n.; HAVLÍČEK, p. 576, pl. 2, figs. 12–16.

Holotype: Shell figured by HAVLÍČEK in 1956, pl. 2, figs. 12, 13; VH 177.
Type horizon and locality: Zlíchov Limestone, Hlubočepy (U kapličky quarry).
Material: 120 shells.

Exterior: Shell subpentagonal to drop-shaped in outline, elongate, 3.0–5.1 mm wide, and 110–130 % as long as wide; a few shells over 4.5 mm in width are slightly elongate. Pedicle valve evenly convex in lateral profile; in transverse profile, it is somewhat more convex medianly than on flanks. Ventral beak incurved, sharp, posteriorly to postero-dorsally directed; interarea not examined. Brachial valve widest at about its mid-length, moderately convex with a very shallow sulcus in its anterior part.

Ribs start at posterior margins of both valves as low, rounded ridges becoming fairly high, rounded to rounded-angular towards front margin; anterior commissure gently unisulcate and deeply indented. On pedicle valve, medial costa originates just in front of the beak; it bifurcates 0.3–0.5 mm from apex to give rise to two subparallel ribs bounding a narrow field that often bears a medial costa of the second order intercalated about at mid-length of valve or even later. The second-order medial costa is usually less strong than the adjacent ribs. On brachial valve, the medial costa originates slightly later than the adjacent costae and bifurcates in various distances from the posterior margin (between 1/5 and 3/5 of the valve length); in very small (young?) specimens (less than 3.2 mm wide) it usually does not bifurcate. Lateral ribs simple, 2 or 3 (exceptionally 4) in number.

Interior: The same as in *Argorhynx prokopensis,* spiralia ill-preserved.

Occurrence: Type locality only.

Ufonicoelia archibalda sp. n.

Pl. XI, fig. 7; pl. XVI, fig. 6

Holotype: Shell figured on pl. XVI as fig. 6; VH 6263c.

Type horizon and locality: Dvorce-Prokop Limestone, layer just overlying the Slivenec Limestone; Zlíchov (Konvářka).

Material: 3 shells and several fragments.

Exterior: Externally similar to *U. torleyi* but even smaller, 2.5–2.9 mm wide, elongate-oval, 111–118 % as long as maximum width. Sulcus and fold absent, anterior commissure rectimarginate and serrate. Ribs high, rounded, separated by deep rounded interspaces; medial costa bifurcates 0.3–0.4 mm from apex; medial costa of second order intercalates at or in front of the mid-length; mid-costa in brachial valve either bifurcates or remains simple throughout ontogeny. All secondary ribs about as strong as the primary ones; lateral ribs 2 in number.

Interior: Not investigated.

Comparison: *U. archibalda* differs from *U. torleyi* in having deep rounded intercostal furrows and narrow, high ribs, all almost of the same size. By contrast, *U. torleyi* has ribs somewhat weaker namely in umbonal regions, and its second-order medial ribs are clearly finer than its primary costae.

Occurrence: Type locality only.

K tisku doporučil M. Siblík

Přeložil autor

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Explanations of plates

Photographed in the Geological Survey, Prague, by V. Skala. All figured specimens are in collection of the author; they all are intended to be housed in the Museum at Rokycany.

Pl. I

Yukiangites vesta (BARR.); Radotín Limestone, Lochkov
1. Ventral and anterior views; VH 6011b, × 3.3.
2. Internal mould, ventral and dorsal views; VH 6012, × 3.3.
3. Ventral, anterior, and dorsal views; VH 6010d, × 2.8.
9. Young shell, dorsal view; VH 6011a, × 4.5.

Latonotoechia latona (BARR.); Koněprusy Limestone, Zlatý kůň hill
4. Ventral, anterior, and postero-dorsal views; VH 5862a, × 1.5.
5. Ventral and anterior views; VH 5864a, × 1.4.
6. Internal mould of brachial valve; VH 5862c, × 1.5.
7. Internal mould of pedicle valve; VH 5863a, × 1.6.

Machaeratoechia sp. n.; Koněprusy Limestone, Zlatý kůň hill
8. Brachial valve, interior and exterior; VH 5869, × 2.2.

Pl. II

Zlichorhynchus hiatus HAVL.; Zlíchov Limestone, Praha-Hlubočepy
1. Holotype, ventral and dorsal views; VH 3678a, × 3.1.
2. Brachial valve, interior and exterior; VH 3678c, × 3.1.
4. Brachial valve interior; VH 3678b, × 3.1.

Machaeratoechia sp. n.; Koněprusy Limestone, Zlatý kůň hill
3. Brachial valve interior, dorsal and antero-dorsal views; VH 4896, × 2.8 and × 3.0.

Machaeratoechia marsyas sp. n.; Zlíchov Limestone, Praha-Hlubočepy
5. Pedicle valve interior; VH 6028b, × 2.8.
6. Ventral, dorsal, and anterior views; VH 6008, × 2.4.
7. Ventral and dorsal views; VH 6027, × 1.5.
8. Brachial valve interior, VH 6028a, × 3.7.

Pl. III

Zlichorhynchus hiatus HAVL.; Koněprusy Limestone, Zlatý kůň hill (figs. 1, 3, 4) and Zlíchov Limestone, Praha-Hlubočepy (figs. 2, 5)
1. Young shell, dorsal view; VH 6017b, × 2.6.
2. Young shell, dorsal view; VH 3682a, × 6.8.
3. Posterior, anterior, dorsal, and ventral views; VH 4897d, × 3.3.
4. Ventral, dorsal, and anterior views; VH 4897a, × 2.6.
5. Anterior, posterior, ventral, and dorsal views; VH 3682c, × 2.8.

Sicorhyncha trinacria (HAVL.); Zlíchov Limestone, Praha-Hlubočepy
6. Brachial valve interior, VH 5976h, × 2.7.
7. Young shell, ventral view; VH 5976d, × 3.8.
8. Pedicle valve interior; VH 65, × 2.8.

9. Dorsal, anterior, and ventral views; VH 5976f, × 2.3.
10. Dorsal, anterior, and ventral views; VH 5976e, × 2.4.
11. Brachial valve interior; VH 5976g, × 3.9.

Pl. IV

Cherubicornea amalthea (BARR.); Koněprusy Limestone, Zlatý kůň hill
1. Ventral, anterior, and dorsal views; VH 6000b, × 2.3.
2. Ventral, anterior, and dorsal views; VH 6000c, × 1.8.
3. Young shell, ventral view; VH 6000a, × 2.9.

Sicorhyncha sella sp. n.; Vinařice Limestone, Čertovy schody
4. Young shell, ventral view; VH 6004a, × 3.2.
5. Anterior and ventral views; VH 6004b, × 2.9.
6. Dorsal and anterior views; VH 6004c, × 2.3.
7. Ventral, anterior, and dorsal views; VH 6004d, × 2.2.

Carolirhynchia carolina sp. n.; Zlíchov Limestone, Karlštejn (fig. 8) and Dvorce-Prokop Limestone, Holyně (fig. 9)
8. Lateral, anterior, ventral, and dorsal views; VH 5778, × 2.2.
9. Pedicle valve interior; VH 6031b, × 2.3.

Pl. V

Sicorhyncha tenuirostris HAVL.; Koněprusy Limestone, Zlatý kůň hill
1. Protegular stage, ventral view; VH 5985a, × 8.4.
2. Very young shell, ventral view; VH 5985b, × 7.2.
3. Posterior view (pedicle foramen sealed); VH 5986e, × 3.3.
4. Posterior, dorsal, and anterior views; VH 5985c, × 3.2.
5. Young shell, dorsal view; VH 5986c, × 3.8.
6. Late adult shell, lateral and ventral views; VH 5986h, × 2.2.
7. Anterior, dorsal, and ventral views; VH 5986f, × 2.5.
8. Adult shell, ventral view; VH 5985c, × 3.2.

Cherubicornea cherubina sp. n.; Zlíchov Limestone, Praha-Hlubočepy
9. Anterior and ventral views; VH 5977c, × 1.7.
10. Posterior and ventral views; VH 5977b, × 2.1.
11. Anterior, dorsal, and ventral views; VH 5977a, × 2.0.

Pl. VI

Tetratomia elegans HAVL.; Zlíchov Limestone, Praha-Hlubočepy
1. Ventral, anterior, and dorsal views; VH 6037b, × 4.8.
2. Ventral, anterior, and dorsal views; VH 6037a, × 8.8.

Tetratomia pandora sp. n.; Koněprusy Limestone, Plešivec hill (fig. 3) and Dvorce-Prokop Limestone, Praha-Barrandov (figs. 4—6)
3. Ventral and dorsal views; VH 6035, × 7.4.
4. Ventral and dorsal views; VH 6038b, × 3.5 and × 4.0.
5. Anterior and ventral views; VH 6038c, × 5.5.
6. Very young shell, ventral view; VH 6038a, × 13.4.

Uncinulus altifrons HAVL.; Koněprusy Limestone, Plešivec hill
7. Ventral and anterior views; VH 6072b, × 3.1.
8. Anterior, ventral, and dorsal views; VH 6072a, × 3.1.

Eoglossinotoechia marocanensis DROT; Chýnice Limestone, Herinky hill
9. Ventral and anterior views; VH 3861a, × 2.6.

Pl. VII

Stenorhynchia hetaera sp. n.; Koněprusy Limestone, Zlatý kůň hill

1. Dorsal, anterior, and ventral views; VH 4849e, × 2.7.
3. Ventral, anterior, and lateral views; VH 4849f, × 3.5.
4. Ventral, lateral, and anterior views; VH 4849g, × 3.0.

Iberirhynchia sp.; Koněprusy Limestone, Zlatý kůň hill

2. Anterior, lateral, ventral, and dorsal views; VH 4854b, × 3.8.

Stenorhynchia ida sp. n.; Vinařice Limestone, Čertovy schody

5. Ventral and anterior views; VH 6016a, × 2.3.
6. Dorsal, anterior, and ventral views; VH 6016b, × 2.1.

Pl. VIII

Stenorhynchia nympha (BARR.); Koněprusy Limestone, Zlatý kůň hill (figs. 1—6), Koněprusy Limestone, Plešivec hill (fig. 7) and Zlíchov Limestone, Praha-Hlubočepy (figs. 8, 9)

1. Adult shell, three ribs in sulcus; ventral and anterior views; VH 4855b, × 2.0.
2. Adult shell, four ribs in sulcus; anterior and ventral views; VH 4855c, × 2.2.
3. Adult shell, right flank truncated; anterior and lateral views; VH 4855i, × 2.3.
4. Distorted shell, anterior view; VH 4855f, × 2.8.
5. Adult shell, five ribs in sulcus; anterior, ventral, dorsal, and lateral views; VH 4857a, × 2.0.
6. Adult shell, dorsal, ventral, posterior, anterior, and lateral views; VH 4858f, × 2.2.
7. Ventral, dorsal, and anterior views; VH 6013, × 2.4.
8. Ventral and anterior views; VH 6014a, × 2.1.
9. Brachial valve interior; VH 6015, × 4.0.

Pl. IX

Stenorhynchia pseudolivonica (BARR.); Koněprusy Limestone, Zlatý kůň hill

1. Young shell, ventral and anterior views; VH 4871b, × 2.0.
2. Young shell, ventral and anterior views; VH 4871d, × 2.0.
3. Slightly distorted shell, ventral, anterior, and lateral views; VH 4871c, × 1.7.
4. Adult shell, ventral and dorsal views; VH 4871e, × 2.1.

Astutorhyncha saxana sp. n.; Koněprusy Limestone, Zlatý kůň hill

5. Dorsal and anterior views; VH 4895, × 2.0.

Nasonirhynchia naso sp. n.; Koněprusy Limestone, Zlatý kůň hill

6. Lateral, anterior, and ventral views; VH 4880a, × 2.0.

Astua astuta (BARR.); Lochkov Limestone, Skalice hill

7. Anterior and ventral views; VH 229, × 1.8.

Pl. X

Stenorhynchia fryne sp. n.; Koněprusy Limestone, Zlatý kůň hill

1. Young shell, ventral and anterior views; VH 4860a, × 2.1.
2. Young shell, ventral and anterior views; VH 4860b, × 2.0.
3. Adult shell, ventral and anterior views; VH 4860c, × 1.9.
4. Ventral, lateral, and anterior views; VH 4860e, × 2.1.

Uncinulus pila (SCHNUR); Zlíchov Limestone, Praha-Hlubočepy

5. Dorsal, anterior, and ventral views; VH 6073b, × 2.5.
6. Ventral and anterior views; VH 6073d, × 2.4.
7. Ornamentation on pedicle valve; VH 6073b, × 2.7.
8. Lateral view showing marginal spines; VH 6073f, × 2.0.

Pl. XI

Astutorhyncha saxana sp. n.; Vinařice Limestone, Oujezdce hill (fig. 1) and Čertovy schody (fig. 2)

1. Young shell, ventral and anterior views; VH 5777, × 1.8.
2. Anterior and ventral views; VH 5775a, × 1.6.

Onugorhynchia matercula (BARR.); Koněprusy Limestone, Plešivec hill

3. Ventral, dorsal, and anterior views; VH 5855b, × 3.6.
4. Adult shell; growth lamella well-preserved at anterior margin of the tongue; ventral, lateral, and anterior views; VH 5855a, × 4.3.

Onugorhynchia onuga sp.; Zlichov Limestone, Praha-Hlubočepy

5. Ventral and anterior views; VH 6030b, × 3.2.
6. Dorsal, anterior, and lateral views; anterior and lateral introverted wall well-exposed; VH 6030a, × 3.9 and × 8.6.

Ufonicoelia archibalda sp. n.; Dvorce-Prokop Limestone, Praha-Smíchov

7. Dorsi-lateral view; VH 6263b, × 10.3.

Pl. XII

Monadotoechia prunella sp. n.; Slivenec Limestone, Srbsko

1. Ventral, anterior and dorsal views; VH 6032d, × 4.3.
2. Anterior and ventral views; VH 6032c, × 4.4.

Monadotoechia paulimonas sp. n.; Dvorce-Prokop Limestone, Praha-Hlubočepy

3. Anterior and dorsal views; VH 6033e, × 5.5.
4. Ventral and anterior views; VH 6033a, × 9.0.

Pseudocamarophoria leidholdi (HAVL.); Zlichov Limestone, Praha-Hlubočepy

5. Ventral, anterior, and dorsal views; VH 6029b, × 4.0.
6. Ventral and anterior views; VH 6029a, × 3.9.
7. Anterior and ventral views; VH 6029c, × 3.4.

Pl. XIII

Eoglossinotoechia doris sp. n.; Radotín Limestone, Kosoř

1. Ventral, anterior, and dorsal views; VH 6077a, × 3.2.

Eoglossinotoechia cacuminata HAVL.; Vinařice Limestone, Čertovy schody (figs. 2—5) and uppermost Lochkov Formation, Praha-Hlubočepy (figs. 6—8)

2. Ventral and anterior views; VH 242a, × 3.8.
3. Anterior and ventral views; VH 242b, × 3.6.
4. Ventral and anterior views; VH 242e, × 3.2.
5. Anterior, ventral, and dorsal views; VH 242d, × 3.5.
6. Internal mould, anterior view; VH 6075c, × 2.6.
7. Internal mould, ventral view; VH 6075d; × 2.4.
8. Internal mould, dorsal view; VH 6075b, × 2.6.

Markitoechia marki (HAVL.); Zlichov Limestone, Praha-Hlubočepy

9. Brachial valve interior; VH 6041e, × 4.7.
10. Brachial valve interior; VH 6041d, × 5.0.

Chlupacitoechia chlupaci (HAVL.); Zlichov Limestone, Praha-Hlubočepy

11. Brachial valve interior; VH 6043c, × 3.8.
12. Brachial valve interior; VH 6043b, × 4.7.

Pl. XIV

Eoglossinotoechia surgens (BARR.); Koněprusy Limestone, Plešivec hill

1. Ventral and anterior views; VH 6076a, × 5.4.

2. Ventral and anterior views; VH 6076b, × 4.5.
3. Ventral and anterior views; VH 6076e, × 4.1.
4. Ventral and anterior views; VH 6076c, × 4.4.
5. Anterior, dorsal, and ventral views; VH 6076d, × 4.0.

Markitoechia marki (HAVL.); Zlíchov Limestone, Praha-Hlubočepy

6. Dorsal and ventral views; VH 6041a, × 5.3.
7. Ventral, lateral, dorsal, and anterior views; VH 6041c, × 4.5.
8. Dorsal and ventral views; VH 6041b, × 5.0.

Pl. XV

Voskopitoechia orbona sp. n.; Koněprusy Limestone, hills "Na Voskopě" (figs. 1, 2, 4, 5, 6) and Zlatý kůň (fig. 3)

1. Adult shell, two ribs in sulcus; ventral and anterior views; VH 6070a, × 6.4.
2. Adult shell, three ribs in sulcus; anterior and ventral views; VH 6070c, × 5.0.
3. Adult shell, one parietal rib present; dorsal and anterior views; VH 6069b, × 4.2.
4. Adult shell, anterior and ventral views; VH 6070d, × 4.7.
5. Concha plana, five ribs in sulcus; ventral and anterior views; VH 6070b, × 5.5.
6. Adult shell, seven ribs in sulcus; anterior and ventral views; VH 6070e, × 3.8.

Chlupacitoechia chlupaci (HAVL.); Zlichov Limestone, Praha-Hlubočepy

7. Dorsal, anterior, and ventral views; VH 6042b, × 2.4.
8. Ventral and anterior views; VH 6044, × 1.8.
9. Umbonal part of shell, interior view showing dental plates and high cardinal process; VH 6043a, × 7.5.

Pl. XVI

Argorhynx prokopensis (HAVL.); Dvorce-Prokop Limestone, Praha-Hlubočepy

1. Ventral, dorsal, and anterior views; VH 6018a, × 6.1.
2. Dorsal and anterior views; VH 6018b, × 5.5.

Ufonicoelia torleyi (HAVL.); Zlichov Limestone, Praha-Hlubočepy

3. Dorsal, ventral, and anterior views; VH 6040c, × 5.8.
4. Anterior, dorsal, and ventral views; VH 6040b, × 7.2.
5. Dorsal, view; VH 6040a, × 8.3.

Ufonicoelia archibalda sp. n.; Dvorce-Prokop Limestone, Praha-Smichov

6. Adult shell, ventral view; VH 6263c, × 8.9.

Sicorhyncha praesella sp. n.; Kotýs Limestone, Svatý Jan pod Skalou

7. Partly exfoliated shell, dorsal view; VH 6003a, × 1.9.
8. Partly exfoliated shell, dorsal view; VH 6003b, × 2.0.

Taymirrhynx knjaspensis (CHODAL.); Koněprusy Limestone, Plešivec hill

9. Ventral and anterior views; VH 560, × 1.5.

Eucharitina oehlerti (BAYLE); Koněprusy Limestone, Zlatý kůň hill

10. Ventral and anterior views; VH 5867a, × 1.5.

Noví rhynchonellidní brachiopodi ze spodního devonu (lochkov-zlíchov) pražské pánve

(*Résumé anglického textu*)

VLADIMÍR HAVLÍČEK

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Práce je věnována rhynchonellidním ramenonožcům českého spodního devonu, a to intervalu lochkov-zlíchov. Je stanoveno osmnáct nových druhů a 9 nových rodů, které náleží čeledím *Rhynchotrematidae, Katuniidae, Wellerellidae, Trigonirhynchiidae, Septalariidae, Glossinotoechiidae, Hebetoechiidae* a *Uncinulidae*. Dále jsou publikovány nové údaje týkající se některých druhů, známých již BARRANDOVI (1847, 1879) a HAVLÍČKOVI (1961). Čeleď Glossinotoechiidae je nově stanovena. U všech spodnodevonských druhů je revidováno jejich geografické a stratigrafické rozšíření. Skupina druhu *„Monticola" prokopensis* je vyloučena z nadčeledi *Rhynchonellacea*; vzhledem k přítomnosti ramenních spirál je převedena do nadčeledi *Athyrisinacea*.

Новые плеченогие отряда *Rhynchonellida* из нижнего девона (лохковского до злиховского ярусов) Пражского бассейна

Представленная работа занимается плеченогими отряда *Rhynchonellida* из нижнего девона Чехии, именно промежутка с лохковского до злиховского ярусов. Определено 18 новых видов и 9 новых родов, относящихся к семействам *Rhynchotrematidae, Katuiniidae, Wellerellidae, Trigonirhynchiidae, Septalariidae, Glossinotoechiidae, Hebetoechiidae* и *Uncinulidae*. Опубликованы также новые данные, касающиеся некоторых видов, известных уже Барранду (BARRANDE 1847, 1879) и Гавличеку (HAVLÍČEK 1961). Вновь определено семейство *Glossinotoechiidae*. Проведена ревизия географического и стратиграфического распространения всех нижнедевонских видов. Группа вида *„Monticola" prokopensis* исключена из надсемейства *Rhynchonellacea* и в связи с присутствием у ней спиралей брахидиума переведена к надсемейству *Athyrisinacea*.

Přeložil A. Kříž