



Lower Liassic Brachiopods from the Steinplatte-Kammerköhralm Area near Waidring (Northern Calcareous Alps, Salzburg)

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With 10 Text-Figures and 2 Plates

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Salzburg
Nördliche Kalkalpen
Steinplatte
Lias
Brachiopoden
Taxonomie

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Brachiopoden aus dem Unterlias des Gebietes Steinplatte – Kammerköhralm bei Waidring (Nördliche Kalkalpen, Salzburg)

Zusammenfassung

19 Brachiopoden-Taxa aus dem Unterlias (*Marmorea*-Zone) werden von drei Lokalitäten der Steinplatte beschrieben.

Abstract

The Lower Liassic (*Marmorea* Zone) of the Steinplatte area has yielded 19 brachiopod taxa that are studied in the present paper.

1. Introduction

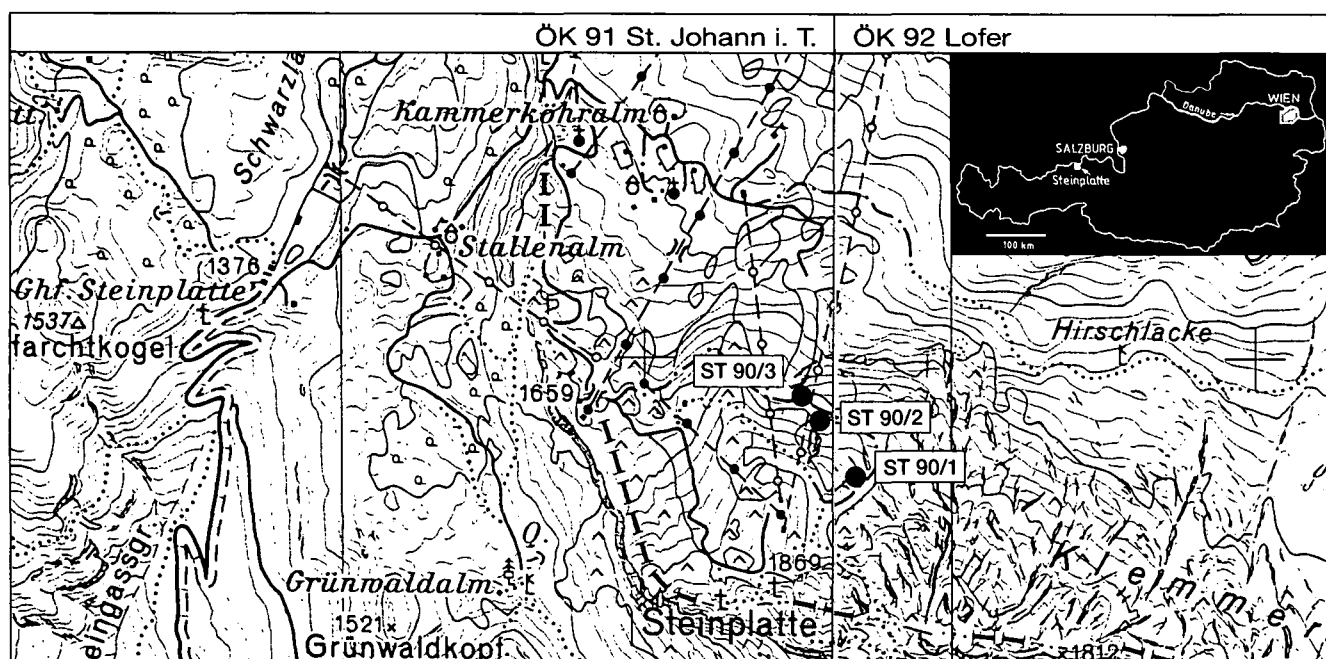
The present paper deals with the Lower Liassic brachiopod fauna coming from the Kammerköhralpe, NE of Steinplatte (1896 m) near Waidring, Salzburg. The study is based on my own collection made in 1991 and completed by several specimens found there by Dr. H. LOBITZER and Dr. M. RAKÚS in 1990.

The Liassic of the Steinplatte area was studied in detail by HAHN (1910) who mentioned 3 brachiopod species from the Lower Liassic variegated limestone ("Bunte Ammonitenkalke") of Kammerköhralpe: *Rhynchonella* cf. *fraasi* OPPEL, *Rhynchonella plicatissima* QUENSTEDT and *Pygope nimbata* OPPEL.

The new material described in the present paper comes from 3 localities (for the localities see Text-Fig. 1), where the following species were found:

- **Locality ST-1**
Zeilleria perforata (PIETTE).
- **Locality ST-2**
Calcirhynchia (?) *plicatissima* (QUENST.), *Cirpa planifrons* (ORMOS), *Prionorhynchia* (?) *polyptycha* (OPPEL), *Furcirhynchia emmrichi* (OPPEL), *Cuneirhynchia retusifrons* (OPPEL), "*Rhynchoella*" *fraasi* OPPEL, "*Rh.*" aff. *prona* OPPEL, *Liospiriferina alpina* (OPPEL), *L. obtusa* (OPPEL), *Liospiriferina* sp., *Lobothyris ovalissimaeformis* (BÖCKH), *Linguithyris aspasia* (MENEH.), *Zeilleria perforata* (PIETTE), *Z. mutabilis* (OPPEL), *Z. alpina* (GEYER), *Z. stapia* (OPPEL), *Z. aff. apenninica* (ZITT.).
- **Locality ST-3**
Calcirhynchia (?) *plicatissima* (QUENST.), "*Rhynchonella*" aff. *paolii* CAN., "*Rhynchonella*" sp., *Linguithyris aspasia* (MENEH.).

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Text-Fig. 1.
Situation map of sampling localities Steinplatte ST 90/1 (I), St 90/2 (II) and St 90/3 (III).

The accompanying ammonite fauna determined by M. RAKÚS (1993, this volume) indicates the *Marmorea* Zone. The preservation of brachiopods is relatively good, some specimens are fragmentary or unsuitable for sectioning due to the recrystallization of the inner parts of shell. If compared to the younger Hierlatz brachiopods, the Steinplatte brachiopod fauna seems to be slightly different, lacking in numerous *Terebratulidae* and strongly ribbed rhynchonellids of the "alberti" and "guembeli" types.

All figured specimens are deposited in the collection of the Geologische Bundesanstalt (Museum) in Vienna.

2. Descriptions

Order: Rhynchonellida KUHN, 1949
Superfamily: Rhynchonellacea GRAY, 1848
Family: Wellerellidae LIKHAREV
 in RZHONSNITSKAYA, 1956
Genus: *Calcirhynchia* BUCKMAN, 1917

Calcirhynchia (?) *plicatissima* (QUENSTEDT, 1852) (Pl. 1, Fig. 4; Text-Fig. 2)

- 1852 *Terebratula plicatissima* – QUENSTEDT, p. 451, Pl. 36, Fig. 3.
 1889 *Rhynchonella plicatissima* QUENST. – GEYER, p. 57, Pl. 6, Figs. 33–36, Pl. 7, Figs. 1–7 (cum syn.).
 ? 1889 *Rhynchonella latifrons* STUR m.s. – GEYER, p. 54, Pl. 6, Fig. 29 only.
 1893 *Rhynchonella plicatissima*, QUENST. – FUCINI, p. 295, Pl. 4, Figs. 1–2.
 1909 *Rhynchonella plicatissima* QUENST. sp. – TRAUTH, p. 64, Pl. 2, Fig. 1.
 1926 *Rhynchonella plicatissima*, QU. – PETERHANS, p. 363, Pl. 2, Figs. 5–8.
 1932 *Rhynchonella plicatissima* QUENSTEDT – RENZ, p. 55 (cum syn.).
 1936 *Rhynchonella plicatissima* F.A. QUENSTEDT – JOLY, p. 151 (cum syn.).
 1937 *Rhynchonella plicatissima* QUENST. – ORMOS, p. 32.

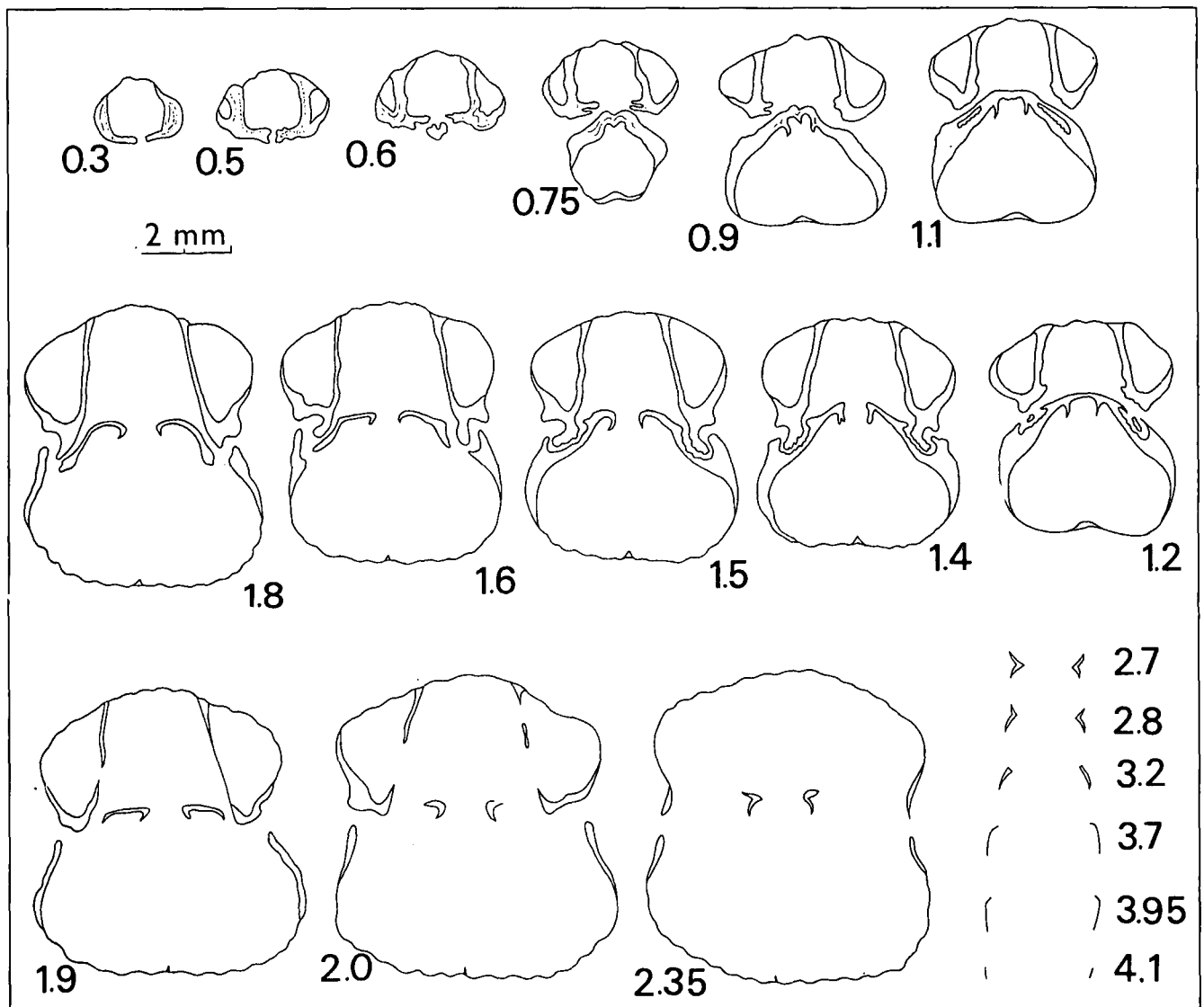
- 1943 *Rhynchonella plicatissima* QU. – VIGH, p. 339, Pl. 26, Figs. 11–16.
 ? 1957 *Rhynchonella plicatissima* QUENSTEDT – MAHEL, p. 182, Pl. 8, Figs. 13–14.
 1970 "*Rhynchonella*" *plicatissima* (QUENSTEDT) – GAETANI, p. 381, Text-Fig. 9.
 non 1954 *Rhynchonella plicatissima* QUENSTEDT – CONTI, p. 197, Pl. 9, Fig. 12 (= *Calcirhynchia rectemarginata* (VECCHIA) fide GAETANI, 1970).

Material: 11 specimens preserved as partly decorticated and fragmentary internal moulds. The dimensions (in mm) of the better preserved specimens are as follows:

Length	Width	Thickness	
15.2	17.3	10.8	
?14.5	?16.0	10.2	
14.0	16.5	9.0	sectioned
?13.8	16.0	7.8	Pl. 1, Fig. 4
13.7	14.9	9.3	
12.7	?	8.1	
11.0	13.6	7.0	sectioned

Internal characters: Lateral umbonal cavities sub-trigonal in cross-section. Dental lamellae strong and long, slightly divergent dorsally and anteriorly. Pedicle collar distinguished in 1 specimen sectioned. Double deltidial plates ascertainable. Hinge teeth expanded dorsally, crenulated and inserted into large, crenulated sockets. Squat denticula situated laterally. Hinge plates subhorizontal, at the distal ends with dorsally developed crural bases. Neither true median septum nor septalium observed. Crura prefalciform, extending slightly into pedicle valve.

Remarks: This species and its allies belong undoubtedly to the most difficult of all rhynchonellids which occur in the Lower Liassic. There exists a series of small to medium-sized, highly variable forms for which a great number of available names was used. Moreover, indistinct figures and insufficient original descriptions render the taxonomy rather difficult. Our specimens agree very well externally with those figured and described in detail by GEYER (1889). The only difference in external features is that the Hierlatz forms have, on the average,



Text-Fig. 2.
Calcirhynchia (?) plicatissima (QUENSTEDT).
 Serial transverse sections through the posterior part of shell.
 Original length of specimen 14.0 mm. ST 2. Magnified.

slightly more convex pedicle valves. The species is undoubtedly very close to "*Rhynchonella*" *latifrons* GEYER, 1889 that was distinguished chiefly by the more prominent beak and by the elliptic outline in anterior view. AGER (1962, p. 86) with doubt referred "*plicatissima*" to *Calcirhynchia* and mentioned close relation of serial sections of *Calcirhynchia* to those of *Cirpa*. GAETANI's sections (1970, Text-Fig. 9) of a topotypical specimen of "*plicatissima*" from Offerdingen in Germany that revealed long dorsal septum throw doubt on the attribution of "*plicatissima*" to *Calcirhynchia*. In the present paper, the question mark is used in connection with the generic name *Calcirhynchia* as the status of *Calcirhynchia* has still not been resolved satisfactorily and there have not been gained more recent data on the internal structures of "*plicatissima*" and other allocated species.

Distribution: Steinplatte – loc. 2 and 3 (Hierlatz, Barbarastollen in Hinterholz, Vils, Germany, Switzerland, Belgium, Italy, Greece, CSFR, Hungary).

Upper Hettangian to Upper Sinemurian–Lotharingian (according to ALMERAS, 1964). ?Middle Liassic of Greece.

Genus: *Cirpa* DI GREGORIO, 1930

***Cirpa planifrons* (ORMOS, 1937)**

(Pl. 1, Figs. 1–3; Text-Fig. 3)

1937 *Rhynchonella planifrons* nov.sp. – ORMOS, p. 35, 41, Pl. 1, Fig. 19.

?1964 *Rhynchonella rimata* OPP. – SACCHI VIALLI, p. 13, Pl. 2, Fig. 7.

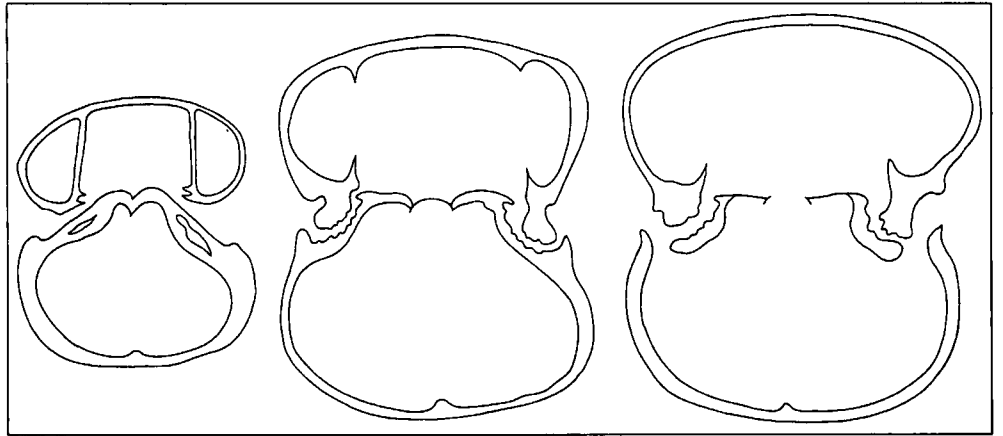
Material: 5 internal moulds with fragments of shell. The figured specimens have the following dimensions: 13.7 × 15.6 × 9.9 mm (Pl. 1, Fig. 1), ?11.5 × 13.0 × 8.8 mm (Pl. 1, Fig. 2) and 11.4 × 12.4 × 8.8 mm (Pl. 1, Fig. 3).

Internal characters: Could not be completely ascertained owing to the partial recrystallization of both specimens sectioned, but serial sections revealed the internal characters typical of *Cirpa*: pedicle collar, double deltidial plates, short dental lamellae, fused hinge plates subhorizontally situated, neither septalium nor median septum developed, and raduliform crura.

Remarks: The specimens display externally the characteristic features of *Cirpa*: rectangular outline of shell in anterior view and flattening of its anterior end. Number

Text-Fig. 3.

Cirpa planifrons (ORMOS).
Three transverse sections showing subparallel hinge plates and absent median septum.
Original length of specimen c: 11.0 mm. ST 2. Magnified.



of the ribs confined to the fold is 4 (in 1 specimen) or 5 (in 4 specimens). This species is undoubtedly very close to *Cirpa fronto* (QUENSTEDT, 1871)

which can be distinguished by its stronger ribs and by producing common cynocephalous variants.

Distribution: ORMOS (1937) recorded her new species as coming from the *Oxynticeras oxynotum* horizon of the Lower Liassic succession in the Northern Bakony. Our specimens derive from Steinplatte – loc. 2.

Genus: *Prionorhynchia* BUCKMAN, 1917

Prionorhynchia(?) *polyptycha* (OPPEL, 1861)

- 1861 *Rhynchonella polyptycha* OPP. – OPPEL, p. 544, Pl. 12, Fig. 4.
1889 *Rhynchonella polyptycha* OPP. – GEYER, p. 51, Pl. 6, Figs. 15–17.
1911 *Rhynchonella Greppini* OPP. m.f. *polyptycha* OPP. – HAHN, p. 559, Pl. 21, Fig. 1.
1937 *Rhynchonella polyptycha* OPP. – ORMOS, p. 29.

Material: 3 fragmentary specimens. The best one measures ?14.5 × 15.3 × 8.8 mm.

Remarks: The material closely resembles the specimens figured by OPPEL (1861) and GEYER (1889) from Hierlatz and shows the only difference – straight anterior margin (in the dorsal view). The specimen figured by HAHN (1911, Pl. 21, esp. Fig. 1c) is well comparable to the Steinplatte material. The species itself could be distinguished from the similar "*Rhynchonella*" *fraasi* OPPEL by the lower and wider plication and by weaker ribs. Anyway, "*Rhynchonella*" *fraasi* and "*Rhynchonella*" *greppini* OPPEL may produce variants that can be distinguished from the species under consideration only with difficulties.

Distribution: Steinplatte – loc. 2 (Hierlatz, Achensee-hof, Germany, CSFR, Hungary, ?Bulgaria).

Family: *Rhynchonellidae* GRAY, 1848

Genus: *Furcirhynchia* BUCKMAN, 1917

Furcirhynchia emmrichi (OPPEL, 1861)

(Pl. 1, Fig. 9; Text-Fig. 4)

- 1861 *Rhynchonella Emmrichi* OPP. – OPPEL, p. 542, Pl. 12, Fig. 1.
1889 *Rhynchonella furcillata* THEOD. – GEYER, p. 60, Pl. 7, Figs. 8–12, 16, 17.

Material: 2 specimens with both valves and 1 incomplete brachial valve. Dimensions: 20.4 × 26.4 × 14.3 mm (figured) and ?16.0 × 21.5 × 10.8 mm (sectioned).

Internal characters: Delthyrial cavity characteristically quadrate in cross-section, between subparallel or

dorsally divergent dental lamellae. Lateral umbonal cavities subtrigonal in cross-section. Pedicle collar not ascertained. Hinge teeth strong, expanded dorsally and crenulated. Stout denticula developed laterally. Sockets large, crenulated, with better developed outer socket ridges. Hinge plates narrow, clearly demarcated from the inner socket ridges. Septalium narrow and deep. Median septum splitting early away from septalial plates. Crura raduliform but somewhat flattened and blade-like anteriorly, curving into cavity of pedicle valve.

Remarks: Our specimens have 5–9 sharp costae anteriorly on the brachial valves (3 or 5 in the fold), and 40–50 fine capillae posteriorly. The representatives of this genus are very distinctive, but only local and relatively uncommon in the Alpine Liassic. Nearly all Liassic *Furcirhynchia* forms showing combination of costae and capillae have been recorded as *Rhynchonella furcillata* in the older literature. The authorship of this species has been attributed to THEODORI but the name was first published by VON BUCH (1835, p. 43). His original material derived from the Upper Liassic (see also AGER, 1958, p. 72). OPPEL'S (1861) chief criterion for his new Lower Liassic species "*Emmrichi*" lay in the finer capillation of the posterior parts of valves. This did not seem to be sufficient ground for separating this form from "*furcillata*" and "*emmrichi*" has been usually included into the synonymy of "*furcillata*". The present author would, however, favour the separating of both species on the grounds that "*emmrichi*" seems to have a more pronounced and upright beak, and a slightly depressed outline in lateral view, with the two valves surfaces almost parallel. The stratigraphical difference between both species is also considered significant.

Distribution: Steinplatte – loc. 2 (Hierlatz). Sinemurian.

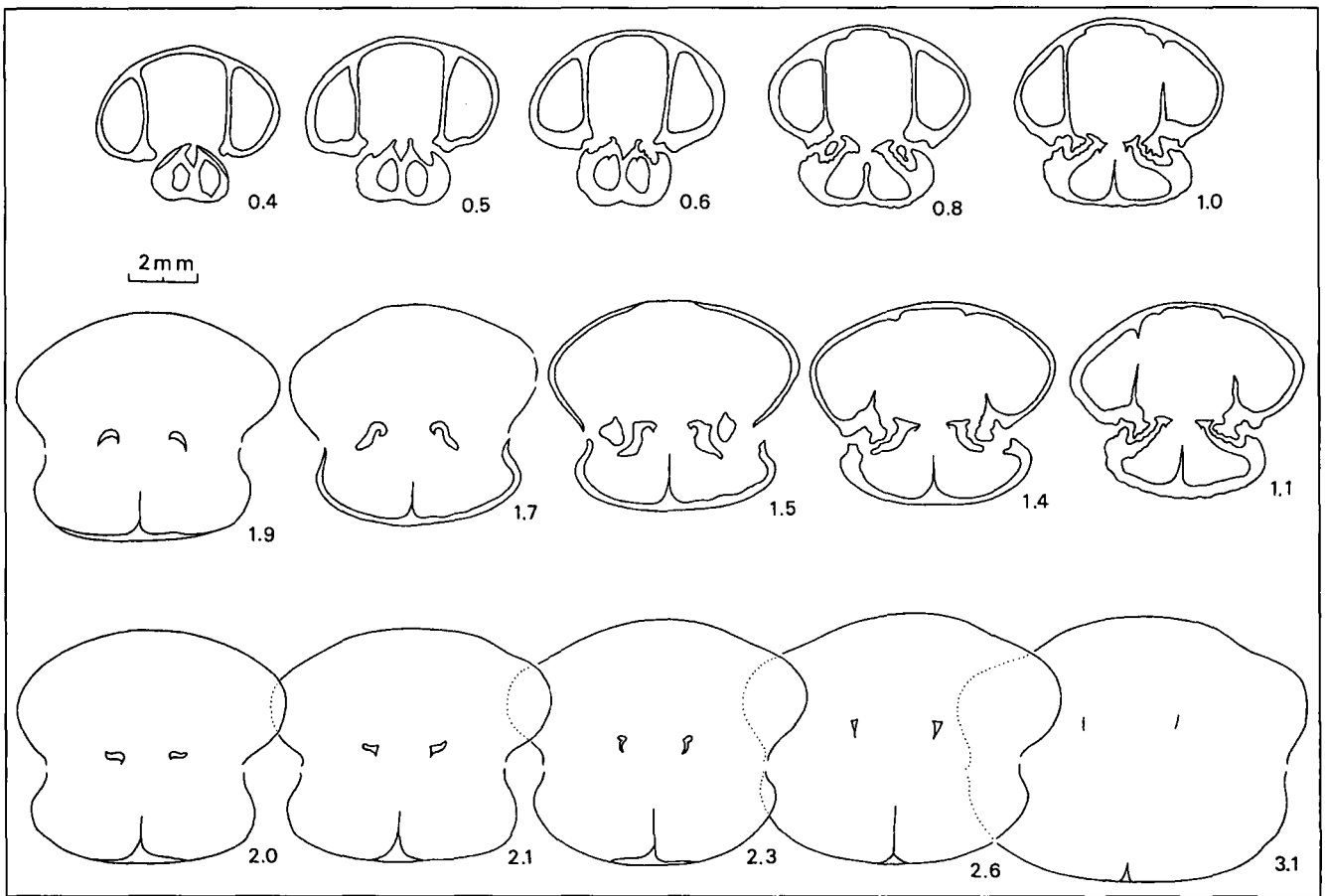
Genus: *Cuneirhynchia* BUCKMAN, 1917

Cuneirhynchia retusifrons (OPPEL, 1861)

(Pl. 1, Fig. 10)

- 1861 *Rhynchonella retusifrons* OPP. – OPPEL, p. 544, Pl. 12, Fig. 5.
1889 *Rhynchonella retusifrons* OPP. – GEYER, p. 62, Pl. 7, Figs. 8–12.
1932 *Rhynchonella retusifrons* OPP. – RENZ, p. 51 (cum syn.).
1936 *Rhynchonella retusifrons* A. OPPEL – JOLY, p. 152.
1957 *Rhynchonella retusifrons* OPPEL – MAHEL, p. 183, Pl. 8, Fig. 12.
1966 *Cuneirhynchia retusifrons* (OPPEL) – PEVNY, p. 273, Pl. 11, Fig. 2.

Material: 2 partly damaged specimens, the figured one with dimensions ?8.2 × 9.5 × 6.8 mm.



Text-Fig. 4.
Furcirhynchia emmrichi (OPPEL).
 Measured from dorsal umbo. Crura persisted to 3.6 mm. Original length ?16.0 mm. ST 2. Magnified.

Remarks: The specimens correspond well to the OPPEL's original figures and description and to the thorough description of GEYER (1889), and differ only by their more inflated posterior parts of pedicle valves. "*Rhynchonella cartieri* OPPEL, 1861 was thought by GEYER to be closely related to "*retusifrons*" but it could be differentiated by its relatively thicker shape and by its stronger and longer ribs. The type species of *Cuneirhynchia* – Middle Liassic *C. dalmasi* (DUMORTIER) – may develop specimens similar to "*retusifrons*" but these differ, however, from "*retusifrons*" in having a nearly flat pedicle valve.

Distribution: Steinplatte, loc. 2 (Hierlatz, Germany – Hindelang, Italy, Belgium, Hungary, CSFR). Hettangian to Upper Sinemurian (Lotharingian). Middle Liassic of Greece.

Genus: *Rhynchonella* FISCHER, 1809; s.l.

"*Rhynchonella*" *fraasi* OPPEL, 1861

(Pl. 1, Figs. 7–?8)

- 1861 *Rhynchonella fraasi* OPP. – OPPEL, p. 543, Pl. 12, Fig. 3.
- 1889 *Rhynchonella fraasi* OPP. – GEYER, p. 52, Pl. 6, Figs. 18–24.
- 1893 *Rhynchonella fraasi* OPPEL – BÖSE, p. 643.
- ?1907 *Rhynchonella fraasi*, OPP. – DAL PIAZ, p. 31, Pl. 2, Fig. 7.
- 1937 *Rhynchonella fraasi* OPPEL – ORMOS, p. 30.
- 1956 *Rhynchonella fraasi* OPPEL – SELLI, p. 9, Pl. 1, Fig. 5.
- 1964 "*Rhynchonella*" *fraasi* OPPEL – PEVNY, p. 164.

Material: One incomplete internal mould with dimensions ?11.0 × 12.0 × 8.4 mm and another 2 fragments probably belonging here.

Remarks: The specimen agrees very well externally with that figured by OPPEL, though the umbones cannot be compared since it has been damaged in our specimen. The planareas are shallow, not sharply limited. Branching of the ribs occurring according to GEYER in the posterior parts of the valves, is well recognizable in the Steinplatte specimen. On the contrary, the uniting of two faint posterior ribbles into one anterior rib that was observed occasionally in the Hierlatz material, is not present in the Steinplatte specimen. Such uniting occurs, however, in one (young) specimen from Steinplatte (Pl. 1, Fig. 8) that is included, with some hesitation, into the species under consideration. The catch-all genus *Rhynchonella* is used here as practically nothing is known about the internal characters of "*fraasi*" (except for three not much telling sections through the shell published by GEYER, 1889).

Distribution: Steinplatte – loc. 2 (Hierlatz, Germany – Hindelang, CSFR, Hungary, Italy). Sinemurian–Domerian (according to ALMERAS, 1964).

"*Rhynchonella*" aff. *prona* OPPEL, 1861

(Pl. 1, Fig. 5)

- aff. 1861 *Rhynchonella prona* OPP. – OPPEL, p. 547, Pl. 13, Fig. 7.
- 1886 *Rhynchonella prona* OPPEL – ROTHPLETZ, p. 37, Pl. 12, Fig. 35.
- aff. 1889 *Rhynchonella prona* OPPEL – GEYER, p. 68, Pl. 7, Figs. 24–25.
- 1911 *Rhynchonella* sp.aff. *prona* OPP. – HAHN, p. 547, Pl. 20, Fig. 5.
- 1966 *Rhynchonella prona* OPPEL – PEVNY, p. 277.

Material: 1 slightly damaged specimen with the dimensions $12.5 \times 15.1 \times 8.1$ mm.

Remarks: General shape and type of ribbing of the specimen from Steinplatte remind one of some West European species, e.g. *Stolmorhynchia bouchardi* (DAVIDSON, 1852), *Piarorhynchia* ex gr. *juvenis* (QUENSTEDT, 1852) etc. It could be, however, distinguished on the grounds of its weaker convexity of the brachial valve, by the lower plication and by the different outline, respectively. On the other side, our specimen is quite well comparable to those figured by ROTHPLETZ (1886) and HAHN (1911) as "aff. *prona*" OPPEL. They differ from true "*prona*", the original of which is rather peculiar (OPPEL, 1861, Pl. 13, Fig. 7) in having another form of the plication and a flatter brachial valve. Further comparison is for present made difficult owing to the scarcity of the material and to the damage of the posterior part of our specimen.

Distribution: Steinplatte – loc. 2 (Praghorn im Steinerne Meer, Germany – Reichenbachquelle near Pfronten, CSFR).

Lower Liassic (for "aff. *prona*"). According to ALMERAS, (1964) "*Rhynchonella*" *prona* ranges from Lower Sinemurian to Upper Sinemurian (Lotharingian).

"*Rhynchonella*" aff. *paolii* CANAVARI, 1880

(Pl. 2, Fig. 9)

aff. 1880 *Rhynchonella Paolii*, nov. form. – CANAVARI, p. 69, Pl. 1, Fig. 1.

? 1880a *Rhynchonella variabilis* SCHL. sp. var. – CANAVARI, p. 31, Pl. 4, Fig. 11 only.

? 1897 *Rhynchonella Paolii* CANAVARI-BÖSE, p. 191, Pl. 14, Fig. 3 only.

Material: 1 slightly damaged specimen measuring $8.9 \times 8.3 \times 5.6$ mm.

Remarks: The specimen shows considerable resemblances to the smooth variants of "*Rhynchonella*" *paolii* as figured by BÖSE, 1897 and to the specimen figured by CANAVARI, 1880a under the name *Rhynchonella variabilis* (this latter specimen was ascribed to "*Rhynchonella*" *paolii* already by GEYER, 1889, p. 67). It differs from them, however, apart from the smaller dimensions and narrower outline in having a lower plication and a massive beak. The typical "*Rhynchonella*" *paolii* is semiplicate.

Distribution: Steinplatte – loc. 3.

"*Rhynchonella*" *paolii* originates from Pliensbachian but it was described by GEYER, 1889 also from the Lower Liassic of Hierlatz.

"*Rhynchonella*" sp.

(Pl. 1, Fig. 6)

Material: 1 slightly damaged specimen of the dimensions $10.6 \times 14.6 \times 9.2$ mm.

Remarks: Despite relatively very good preservation, it is not possible to assign the specimen with certainty to a particular taxon, because it shows external features common to several species. The shape of shell and character of ribs suggest *Calcirhynchia* (?) *plicatissima* (QUENSTEDT) which has, however, a slightly different type of plication and a more convex brachial valve. Interesting is a strong resemblance to some English variants of *Squamirhynchia squamiplex* (QUENSTEDT, 1871), esp. to that on Pl. 12, Fig. 7 by AGER (1967), which only differs in hav-

ing a flatter pedicle valve. According to AGER (1967) *Squamirhynchia* is a rare genus and "*squamiplex*" has not been reported from the Alpine Liassic with certainty so far. Only with a further material enabling also the study of internal characters, it would be possible to make a specific determination of this specimen under consideration.

Distribution: Steinplatte – loc. 3.

Order: Spiriferida WAAGEN, 1883
Superfamily: Spiriferinacea DAVIDSON, 1884
Family: Spiriferinidae DAVIDSON, 1884
Genus: *Liospiriferina* ROUSSELLE, 1977

Liospiriferina alpina (OPPEL, 1861)

(Pl. 2, Fig. 7)

- 1861 *Spiriferina alpina* OPP. – OPPEL, p. 541, Pl. 11, Fig. 5.
1889 *Spiriferina alpina* OPP. – GEYER, p. 71, Pl. 8, Figs. 4–8 (cum syn.).
1894 *Spiriferina alpina* OPP. – FUCINI, p. 34, Pl. 6, Fig. 10 (cum syn.).
1907 *Spiriferina alpina*, OPP. – DAL PIAZ, p. 11, Pl. 1, Fig. 1 (cum syn.).
1937 *Spiriferina alpina* OPP. – ORMOS, p. 15 (cum syn.).
1943 *Spiriferina alpina* OPP. – VIGH, p. 349, Text-Fig. 14.
? 1954 *Spiriferina alpina* OPPEL – CONTI, p. 194, Pl. 9, Figs. 5–9.
1956 *Spiriferina alpina* OPPEL – SELLI, p. 14.
1964 *Spiriferina alpina* OPPEL – SIBLIK, p. 158, Pl. 7, Fig. 2.
1966 *Spiriferina alpina* OPPEL – SIBLIK, p. 143, Pl. 1, Fig. 3.
1969 *Spiriferina alpina* OPPEL – DELANCE, p. 9, Pl. A, Figs. 4, 6.
1990 *Spiriferina alpina alpina* OPPEL – TCHOUMATCHENCO, p. 6, Text-Figs. 2–3, Pl. 3, Figs. 4–7, Pl. 4, Figs. 1–5.

Material: 1 well-preserved internal mould of the dimensions $12.6 \times 12.9 \times 8.8$ mm.

Remarks: The specimen is placed under this variable species because of its outline, straight and long hinge line, and its flat brachial valve. It differs from OPPEL's original specimen in the narrower cardinal area, in the lower curved beak and in the development of weak sulcation of the pedicle valve resulting in the uniplication of the anterior commissure. These characters were ascertained also later in larger material e.g. by GEYER (1889, Pl. 8, Fig. 8 – curved beak and uniplication of the anterior commissure), by DAL PIAZ (1907, Pl. 1, Fig. 1 – narrower cardinal area) etc. Considerable external resemblances to our specimen could be also found in *Spiriferina Pichleri* NEUMAYR, 1879 (differing in outline and in much shorter hinge line) and in the Middle Liassic *Spiriferina cantianensis* CANAVARI, 1881 (straight beak, no sulcus and no anterior uniplication). A very similar, but uncomplete specimen was described by RENZ (1932, p. 15, Pl. 1, Fig. 8) from the Upper Liassic of Greece as *Spiriferina Pichleri* mut. Spanish representatives of "*alpina*" as figured by DELANCE (1969) and by ROUSSELLE (1977) possess short hinge lines. The latter author put surprisingly "*alpina*" into the synonymy of *Liospiriferina rostrata* (SCHLOTH.). However, I adhere to a moderately conservative concept of "*alpina*" and keep both these species separate.

Distribution: Steinplatte – loc. 2 (Hierlatz, Seehofgraben/Achensee, Breitenberg/Attersee; Germany – Hindelang, France, Switzerland, Belgium, Spain, Italy, CSFR, Hungary, Bulgaria, Roumania, Turkey, Greece, ?Morocco).
Sinemurian–Domerian (according to ALMERAS, 1964), ?Toarcian.

***Liospiriferina obtusa* (OPPEL, 1861)**

(Pl. 2, Fig. 6)

- 1861 *Spiriferina obtusa* OPP. – OPPEL, p. 542, Pl. 11, Fig. 8.
 1889 *Spiriferina obtusa* OPP. – GEYER, p. 75, Pl. 8, Figs. 13–15, Pl. 9, Figs. 1–5 (cum syn.).
 1907 *Spiriferina obtusa*, OPP. – DAL PIAZ, p. 17 (cum syn.).
 ?1932 *Spiriferina obtusa* OPPEL var. – RENZ, p. 11 (cum syn.).
 1937 *Spiriferina obtusa* OPP. – ORMOS, p. 17 (cum syn.).
 1943 *Spiriferina obtusa* OPP. – VIGH, p. 351, Pl. 27, Figs. 33–35.
 1956 *Spiriferina obtusa* OPPEL – SELLI, p. 17.
 1957 *Spiriferina obtusa* OPPEL – MAHEL, p. 187, Pl. 8, Figs. 6–10.
 1964 *Spiriferina obtusa* OPPEL – SIBLIK, p. 159.
 1967 *Spiriferina obtusa* OPP. sensu GEYER – SACCHI VIALLI & CANTALUPPI, p. 89, Pl. 13, Fig. 8.

Material: 1 slightly damaged specimen with both valves (dimensions 18.2 × 18.9 × 13.8 mm), 1 pedicle and 1 brachial valve.

Remarks: The specimens agree in all observed external features with the Hierlatz forms as described in detail and figured by GEYER (1889). He discussed also very similar species *Liospiriferina angulata* (OPPEL, 1861). The differences are probably not granted specific rank and it is possible that *L. obtusa* is the same species as *L. angulata*. But proof of identity will require a revisional study of the Hierlatz material. Another species, which has to be considered here, is Middle Liassic *Liospiriferina sicula* (GEMMELLARO, 1874). It is distinctive in its almost equi-dimensional form and in wider and deeper ventral sulcus. Judging from the illustration of *L. obtusa* by GEYER, 1889, Pl. 9, Fig. 1 there is every reason to believe that “*obtusa*” and “*sicula*” should be considered closely allied.

Distribution: Steinplatte – loc. 2 (Hierlatz, Germany – Hindelang, Switzerland, Italy, CSFR, Hungary, ?Greece).

Lower Sinemurian – Upper Sinemurian (Lotharingian) – ?Domerian (according to ALMERAS, 1964).

***Liospiriferina* sp.**

(Pl. 2, Fig. 5)

Material: 1 damaged internal mould of the dimensions 14.7 × 13.5 × 10.1 mm.

Remarks: The specimen resembles some variants of *Liospiriferina rostrata* (ZIETEN, 1830) but differs from them in having lesser convexity of brachial valve, lower beak and shorter hinge line. In regard to this last character, the specimen is comparable to *Liospiriferina terebratuloidea* (SEGUENZA, 1883) from the Upper Liassic that is, however, much bigger and lacks ventral sulcation. The definite specific attribution of the specimen is, for the present, made difficult owing to the scarcity of material.

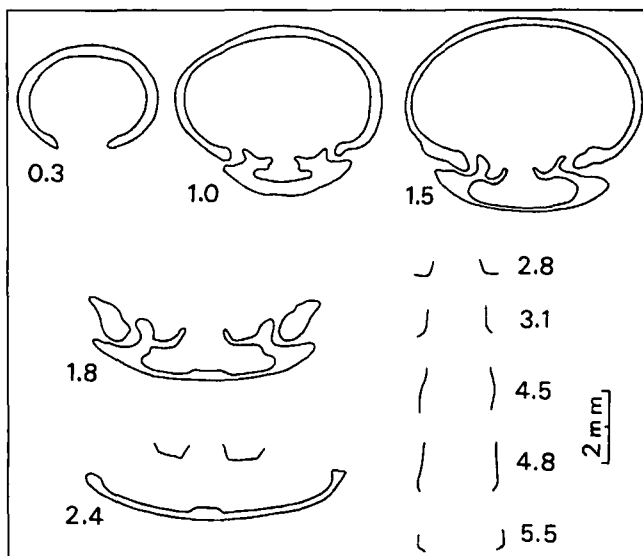
Distribution: Steinplatte – loc. 2.

Order: Terebratulida WAAGEN, 1883
Superfamily: Terebratulacea GRAY, 1840
Family: Terebratulidae GRAY, 1840
Genus: *Lobothyris* BUCKMAN, 1917

***Lobothyris ovatissimaeformis* (BÖCKH, 1874)**

(Text-Fig. 5)

- 1874 *Terebratula ovatissimaeformis* n.sp. – BÖCKH, p. 141, Pl. 1, Figs. 11–14.
 1970 *Lobothyris ovatissimaeformis* (BÖCKH) – GAETANI, p. 384, Pl. 30, Figs. 2–6, Text-Fig. 10 (cum syn.).



Text-Fig. 5.
Lobothyris ovatissimaeformis (BÖCKH).
 Incomplete series of transverse sections, due to the bad preservation.
 Length of specimen 19.0 mm. ST 2. Magnified.

Material: 3 partly damaged specimens. The sectioned one measures 19.0 × 15.5 × 9.4 mm.

Internal characters: The complete absence of dental lamellae and of a median septum leave no doubt that the specimen belongs to the *Terebratulidae*. Internal details are basically the same as those made known by GAETANI (1970). Our specimen showed lateral insertion of teeth, very wide sockets with flat bottoms, clearly separated from strongly bent hinge plates, and a short loop.

Remarks: BÖCKH (1874) distinguished his new species from *Terebratula ovatissima* QUENSTEDT, 1858 above all by its smaller size and narrower beak. The material from Steinplatte corresponds well to BÖCKH’s description and resembles considerably the specimen figured by him on Pl. 1, Fig. 12. Externally very similar “*Terebratula*” *juvavica* GEYER, 1889 from Hierlatz is well distinguishable from “*ovatissimaeformis*” by its sharp beak ridges.

Distribution: Steinplatte – loc. 2 (Hungary, Italy). Hettangian–?Lower Sinemurian.

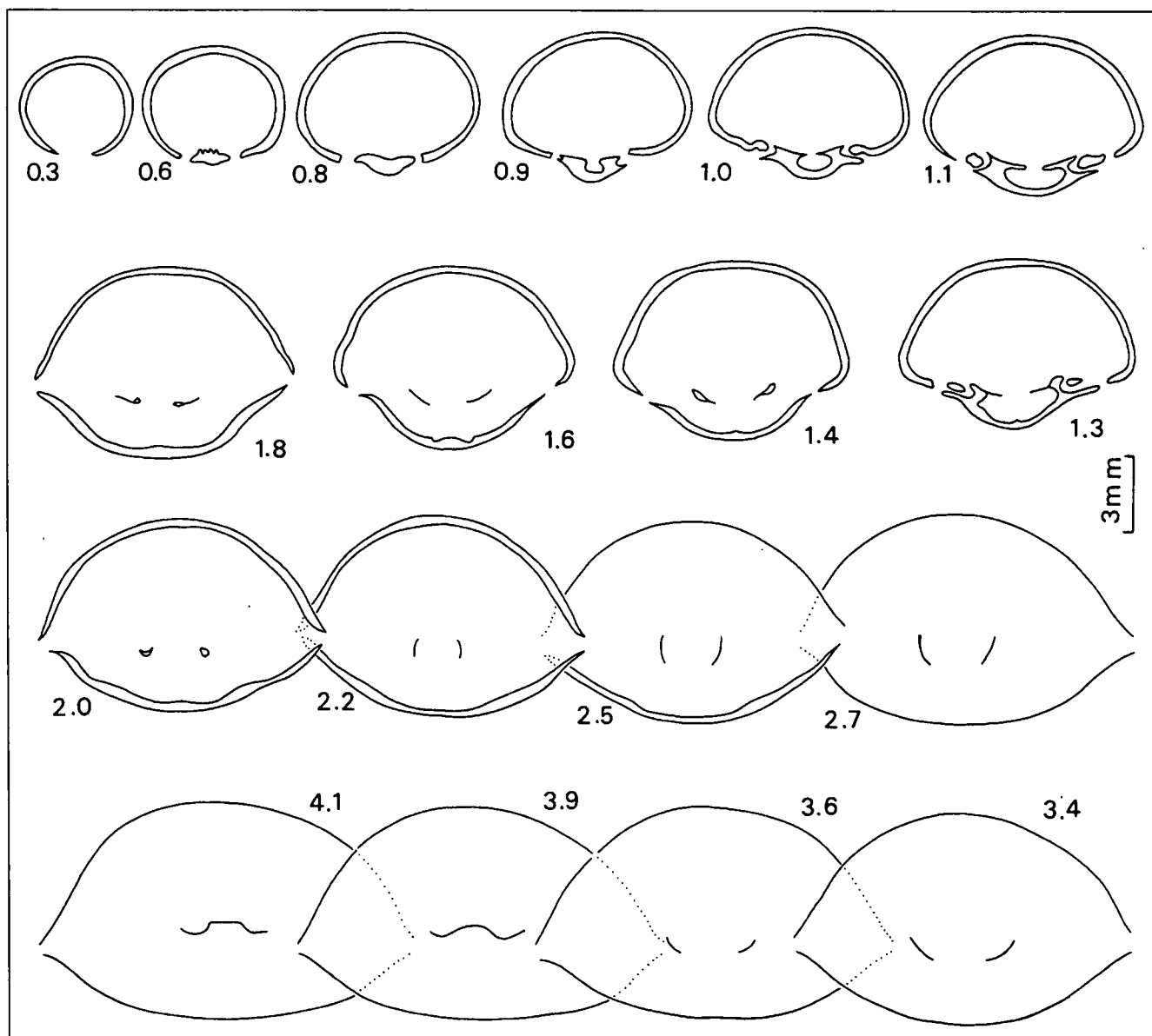
Family: Pygopidae MUIR-WOOD, 1965.

Genus: *Linguithyris* BUCKMAN, 1917

***Linguithyris aspasia* (MENEHINI, 1853)**

(Pl. 2, Figs. 1,8, Text-Fig. 6)

- 1853 *Terebratula Aspasia* – MENEHINI, p. 13 (non vidi).
 1880 *Terebratula Aspasia* – UHLIG, p. 274 (cum syn.).
 1887 *Terebratula (Pygope) Aspasia* MENEHINI – DE STEFANI, p. 43, Pl. 1, Figs. 6–9.
 1889 *Terebratula Aspasia* MENEGH. – GEYER, p. 14, Pl. 2, Figs. 13–15.
 1932 *Terebratula (Pygope) Aspasia* MENEHINI – RENZ, p. 28, Pl. 2, Figs. 3,5 (cum syn.).
 1943 *Glossothyris aspasia* MGH. – VIGH, p. 331 (cum var. *major* ZITT., *minor* ZITT., *dilatata* CAN., *comparabile* CAN., var.(?), n.var.), Text-Figs. 9,10a, Pl. 25, Figs. 20–27, Pl. 26, Figs. 1–2.
 1953 *Pygope aspasia* MENEHINI – ROSSI RONCHETTI & BRENA, p. 10, Pl. 10, Fig. 3.
 1959 *Propygope aspasia* MENEHINI – AGER, p. 1024, Pl. 128, Fig. 6.
 1964 *Propygope ? aspasia* (MENEHINI) – SIBLIK, p. 163, Pl. 7, Fig. 3.
 1967 *Nucleata aspasia* (MGH.) – SACCHI VIALLI & CANTALUPPI, p. 100, Pl. 14, Figs. 13–15, Text-Fig. 24.



Text-Fig. 6.
Linguithyris aspasia (MENEHINI).
 Original length c. 14.0 mm. ST 2. Magnified.

Material: 6 partly damaged specimens with both valves and 4 single valves. The figured specimens measure $13.9 \times 17.9 \times 8.8$ mm (Pl. 2, Fig. 1) and $8.8 \times 12.0 \times 7.1$ mm (Pl. 2, Fig. 8).

Internal characters: There are no dental lamellae and pedicle collar present. Cardinal process unclearly suggested (?). Short hinge teeth inserting laterally into sockets that are well separated from the thin hinge plates. Dorsal median septum absent. Short loop about 0.3 length of valve developed.

Remarks: *Linguithyris aspasia* together with its "varieties" and with a series of allied sulcate species are characteristic elements of the Tethyan brachiopod fauna. "*Aspasia*" is no more attributed to *Propygope* BITTNER, 1890 because this genus develops a strong dorsal septum which is missing in the species under consideration. It seems that there is a continuous range of variation between "*aspasia*" and "*Terebratula nimbata* OPPEL, 1861. Our two narrower specimens with only shallow sulcation approach externally to the latter species and could be easily determined as "*nimbata*". The material at disposal

does not warrant a study of the taxonomic relations between these two species. According to VÖRÖS in PROSOROVSKAYA & VÖRÖS (1988), ZITTEL (1869) should be considered the author of "*aspasia*" as he described it for the first time.

Distribution: Steinplatte - loc. 2 and 3 (Hierlatz, Breitenberg/Attersee, Aurikelwand and Ob. Brunntal/Untersberg, Schafberg, Enzesfeld, Germany - Fagstein, Switzerland, CSFR, Hungary, Italy, Spain, Greece, Turkey, ?Tunis).

The species ranges from the Hettangian to the Upper Liassic and seems to be nearly useless from the stratigraphical point of view. Its long-ranging stratigraphical distribution was mentioned already by UHLIG, 1880, p. 275.

Superfamily: Zeilleriacea ALLAN, 1940
Family: Zeilleriidae ALLAN, 1940
Genus: *Zeilleria* BAYLE, 1878

***Zeilleria perforata* (PIETTE, 1856)**

(Pl. 2, Fig. 4, Text-Fig. 7)

- 1856 *Terebratula perforata* – PIETTE, p. 206, Pl. 10, Fig. 1.
- ? 1909 *Waldheimia (Zeilleria) perforata* PTT.sp. – TRAUTH, p. 71, Pl. 2, Fig. 11 (cum syn.).
- 1936 *Zeilleria perforata* E. PIETTE – JOLY, p. 157 (cum syn.).
- 1970 *Zeilleria perforata* (PIETTE) – GAETANI, p. 387, Pl. 30, Figs. 7–15 (cum syn.).
- 1974 *Zeilleria (Zeilleria) perforata* (PIETTE) – DELANCE, p. 75, Pl. 1, Figs. 1–7, Text-Figs. 6–1 to 6–9 (cum syn.).
- non 1967 *Lobothyris perforata* (PIETTE) – SACCHI VIALLI & CANTALUPPI, p. 94, Pl. 14, Figs. 9–10, Text-Fig. 19.

Material: 2 internal moulds with shell remains. The dimensions: 19.8 × 14.1 × 11.3 mm (sectioned) and 19.4 × 14.0 × 9.1 mm (figured).

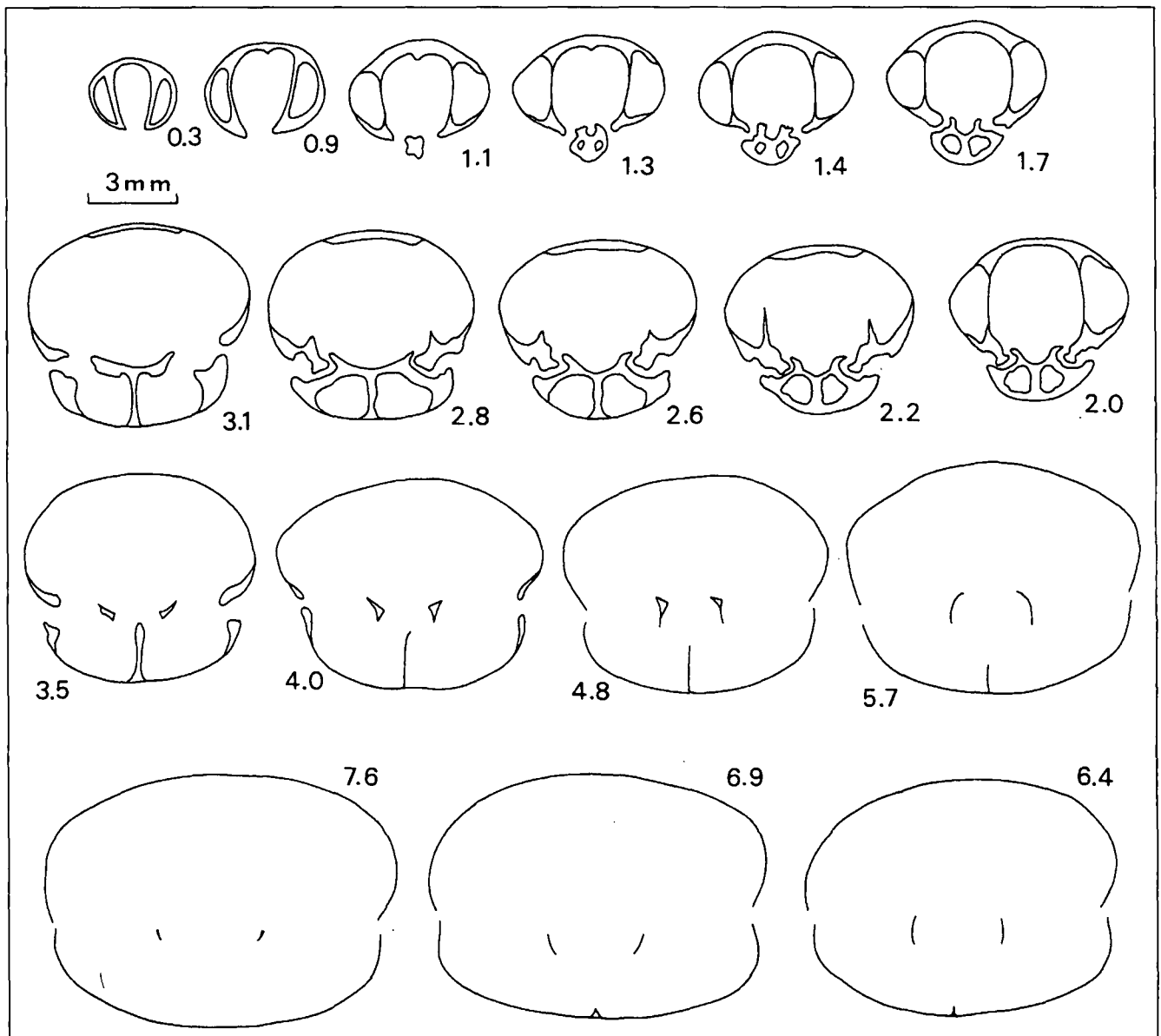
Internal characters: Pedicle collar and clear cardinal process were not observed. Dental lamellae rather short, dorsally convergent and then subparallel. Low denticula developed laterally. Hinge teeth without crenulation, in free contact with large sockets. Outer socket ridges better developed than the inner ones.

Septalium large. Median septum persisting for about one third of the length of shell. All details concerning loop not known due to bad preservation.

Remarks: The species was very thoroughly described by DELANCE (1974) and nearly nothing can be added to it. The specimens figured by him are, on the average, wider if compared with our material. The outlines of Steinplatte specimens approach to those of PIETTE's specimen (the longer one) or of GAETANI's Figs. 11 and 14 on Pl. 30. TULUWEIT (1965) referred "*perforata*" to his new genus *Keratothyris*, but this is not thought to be likely. Moreover, the diagnosis of the new genus is vague and fits equally well with *Zeilleria*. *Keratothyris* was later reasonably included in the synonymy of *Zeilleria* by DELANCE (1974).

Distribution: Steinplatte – loc. 1 and 2 (Breitenberg/Attersee, Germany – Pfonsojoch, Italy, England, France, Belgium, Switzerland, CSFR, Hungary, ?Crimea, ?Caucasus).

Hettangian to lowermost Lotharingian – *Obtusum* Zone (according to DELANCE, 1974).



Text-Fig. 7.
Zeilleria perforata (PIETTE).
Median septum persisted as a low ridge to a point 7.1. Original length of specimen 19.8 mm. ST 2. Magnified.

***Zeilleria mutabilis* (OPPEL, 1861)**

(Pl. 2, Fig. 3, Text-Figs. 8, 9)

- 1861 *Terebratulata mutabilis* OPP. (WALDHEIMIA) – OPPEL, p. 538, Pl. 10, Fig. 7.
- 1889 *Waldheimia mutabilis* OPP. – GEYER, p. 18, Pl. 2, Figs. 31–36, Pl. 3, Figs. 1–7 (cum syn.).
- 1893 *Waldheimia mutabilis* OPPEL – BÖSE, p. 639.
- 1895 *Waldheimia mutabilis* OPPEL – FUCINI, p. 84, Pl. 7, Figs. 29–31.
- 1907 *Waldheimia mutabilis* OPP. – DAL PIAZ, p. 48, Pl. 3, Fig. 7.
- 1911 *Waldheimia mutabilis* OPP. – HAHN, p. 557, Pl. 20, Fig. 8.
- 1937 *Waldheimia mutabilis* OPP. – ORMOS, p. 21.
- 1943 *Waldheimia mutabilis* OPP. – VIGH, p. 327, Text-Figs. 7 left, 8c, Pl. 25, Figs. 9–10.
- 1956 *Zeilleria mutabilis* (OPPEL) – SELLI, p. 21, Pl. 2, Fig. 1.
- 1964 *Zeilleria mutabilis* (OPPEL) – SIBLIK, p. 165, Text-Fig. 2.
- 1966 *Zeilleria mutabilis* (OPPEL) – PEVNY, p. 280.
- 1967 *Zeilleria mutabilis* (OPP.) – SACCHI VIALLI & CANTALUPPI, p. 108, Text-Fig. 29, Pl. 15, Fig. 10.

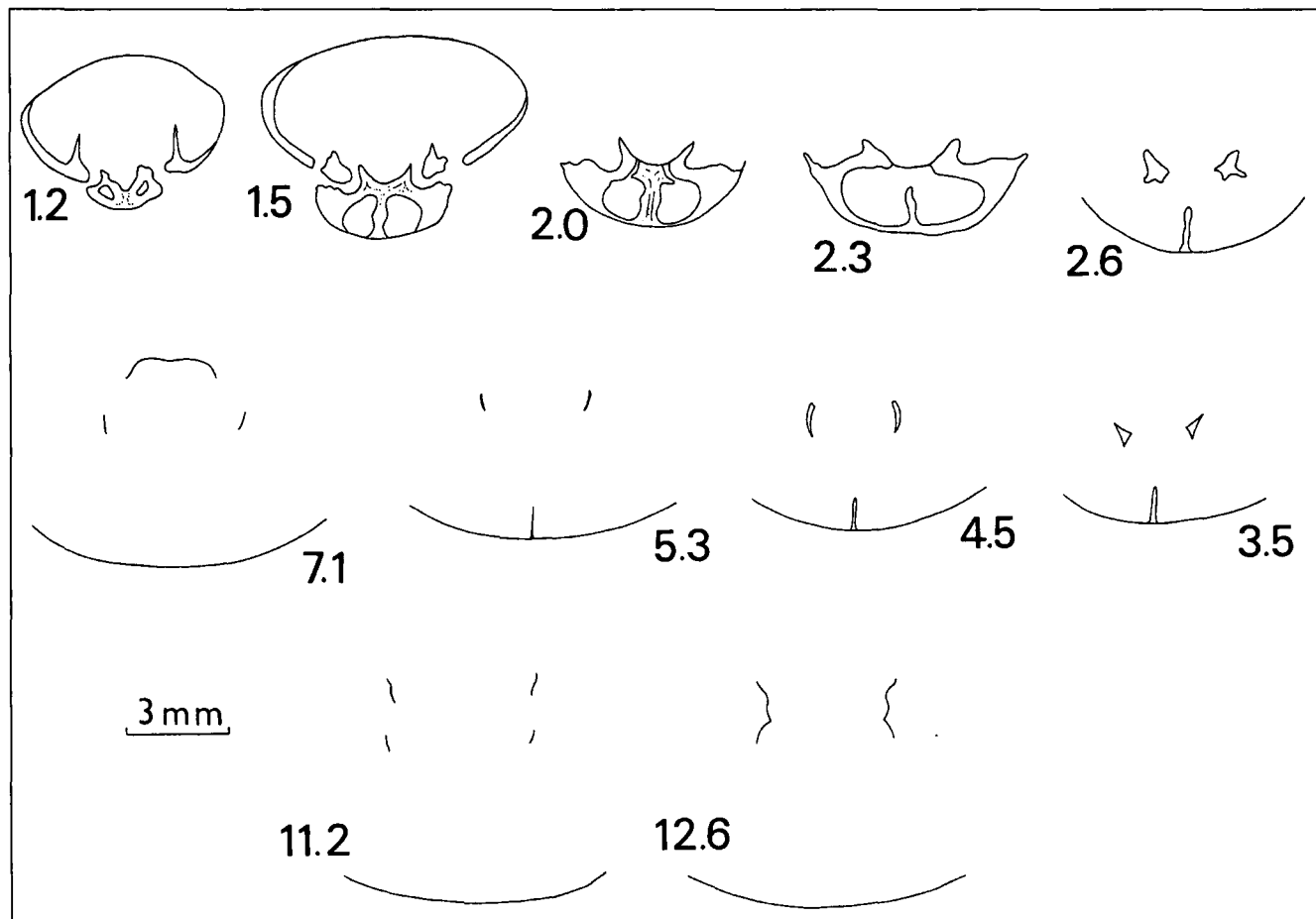
Material: 8 more or less fragmentary internal moulds.

The better preserved specimens measure: 17.5 × 14.3 × 8.8 mm, 17.4 × 16.3 × 8.5 mm, 17.0 × ? × 9.2 mm, ?16.7 × 14.8 × 8.6 mm (figured), 13.6 × 12.3 × 6.8 mm.

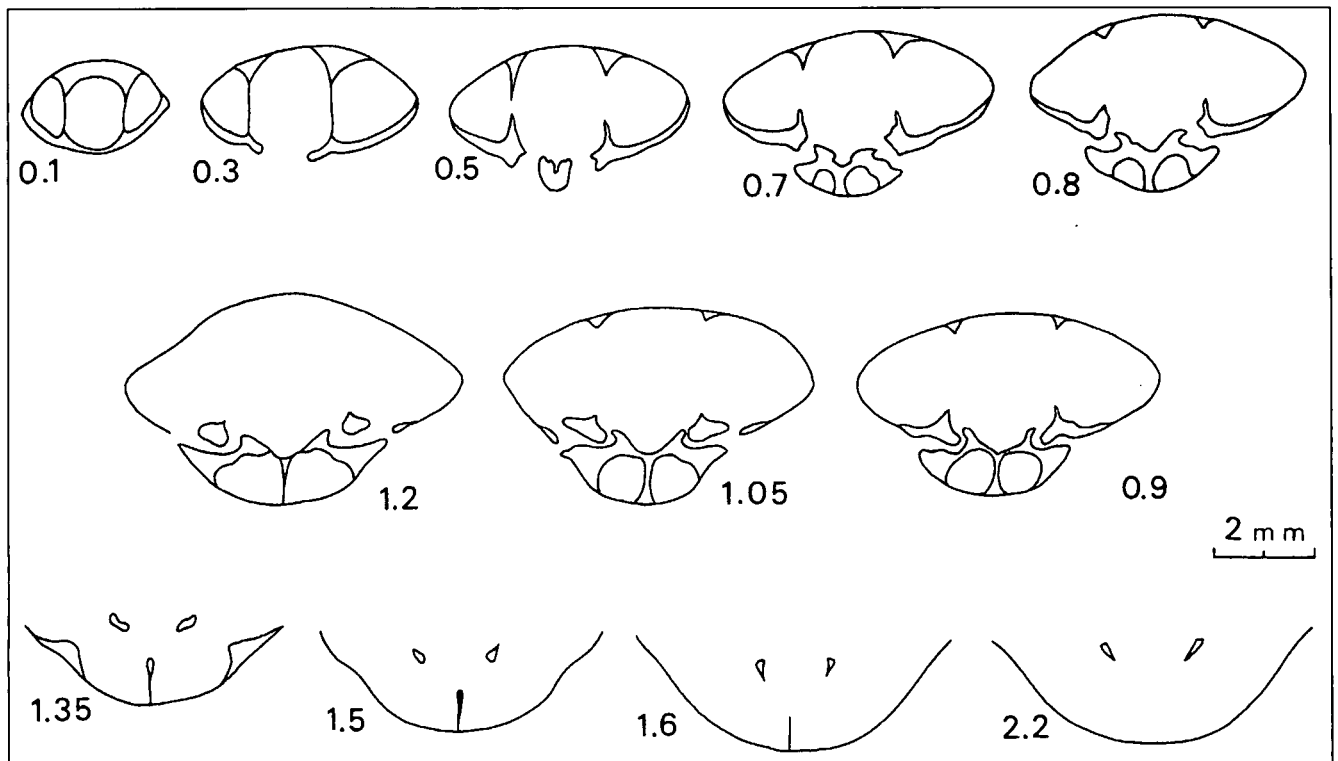
Internal characters: Dental lamellae subparallel and very short. Cardinal process not ascertained. Hinge plates thick and narrow, poorly separated from the inner socket ridges. Septalium broad, but shallow. Median septum strong and extending less than a third of the length of valve. Long loop with undulated ascending branches.

Remarks: Our specimens correspond well to those figured by OPPEL (1861) and GEYER (1889) and show the same variability which was discussed in detail by the latter author. *Zeilleria mutabilis* is by far the most common and most varied of all Lower to Middle Liassic zeillerids from Alpine domain. A great number of different names have been given to the "mutabilis" group of zeillerids that should be taken into consideration during the determination. However, the present material does not warrant a further discussion of the complex synonymies involved. ANTOSTCHENKO (1973) erected a new genus *Spinulothyris* (with *S. patilensis* sp.n. from the Sinemurian of Caucasus as the type-species) and referred "mutabilis" to it. As one of the most important features distinguishing new genus from *Zeilleria* the absence of the inner cardinal plates was reported. DELANCE (1974, p. 31) in the comprehensive monograph on West European zeillerids negates, however, the possibility of discerning between inner and outer parts of zeillerid cardinal plates. A more detailed study is required to support ANTOSTCHENKO's opinion before definite taxonomic conclusions can be drawn. In the present paper the traditional affiliation of "mutabilis" to "*Zeilleria*" is still used.

Distribution: Steinplatte – loc. 2 (Hierlatz, Aurikeland/Untersberg, Kramsach bei Rattenberg, Germany – Hindelang, Switzerland, CSFR, Hungary, Italy, Turkey, ?Crimea, ?Caucasus).
Sinemurian to Domerian (according to ALMERAS, 1964).



Text-Fig. 8.
Zeilleria mutabilis (OPPEL).
Due to the bad preservation, only discontinuous series of transverse sections has been made.
Original length 16.8 mm. ST 2. Magnified.



Text-Fig. 9.
Zeilleria mutabilis (OPPEL).
 Sections through another specimen showing a large septalium.
 Original length 12.0 mm. ST 2. Magnified.

Zeilleria stapia (OPPEL, 1861)

(Pl. 2, Fig. 2, Text-Fig. 10)

- 1861 *Terebratula stapia* OPP. (*Waldheimia*) – OPPEL, p. 539, Pl. 11, Fig. 2.
 1889 *Waldheimia stapia* OPP. – GEYER, p. 16, Pl. 2, Figs. 25–30.
 1936 *Zeilleria stapia* A. OPPEL – JOLY, p. 157.
 1943 *Waldheimia stapia* OPP. – VIGH, p. 327.
 1964 *Zeilleria stapia* OPP. – SACCHI VIALLI, p. 19, Pl. 2, Fig. 11.

Material: 5 internal moulds. The best preserved ones measure 20.5 × 14.0 × 10.0 mm and 16.5 × 14.1 × 9.7 mm (figured).

Internal characters: Delthyrial cavity subquadrate in cross-section, separated from semicircular umbonal cavities by short, ventrally divergent dental lamellae. Strong teeth inserted into deep sockets. Denticula not observed. Hinge plates practically horizontal, fused or forming very shallow septalium. Median septum extending for about one third of the length of valve. Loop about 2/3 length of valve, with undulated ascending branches.

Remarks: The specimens agree in all observed external features with those described in detail and figured by GEYER (1889) who discussed the great variability of the species and its “passages” to *Zeilleria mutabilis*. Thicker specimens resemble in some respect *Zeilleria venusta* (UHLIG, 1880) but differ from it in the absence of planareas. It is probable that “*stapia*” is the same species as “*mutabilis*”, but proof of identity will require a revisional study of the Hierlitz material.

Distribution: Steinplatte – loc. 2 (Hierlitz, Belgium, CSFR, Hungary, Italy, ?Crimea).
 Sinemurian.

Zeilleria alpina (GEYER, 1889)

(Pl. 2, Fig. 10)

- 1889 *Waldheimia alpina* nov.sp. – GEYER, p. 29, Pl. 3, Figs. 33–38.
 1937 *Waldheimia alpina* GEYER – ORMOS, p. 24.
 1943 *Waldheimia alpina* GEY. – VIGH, p. 324, Text-Fig. 5c, Pl. 25, Fig. 4.
 1966 *Zeilleria alpina* (GEYER) – PEVNY, p. 281.

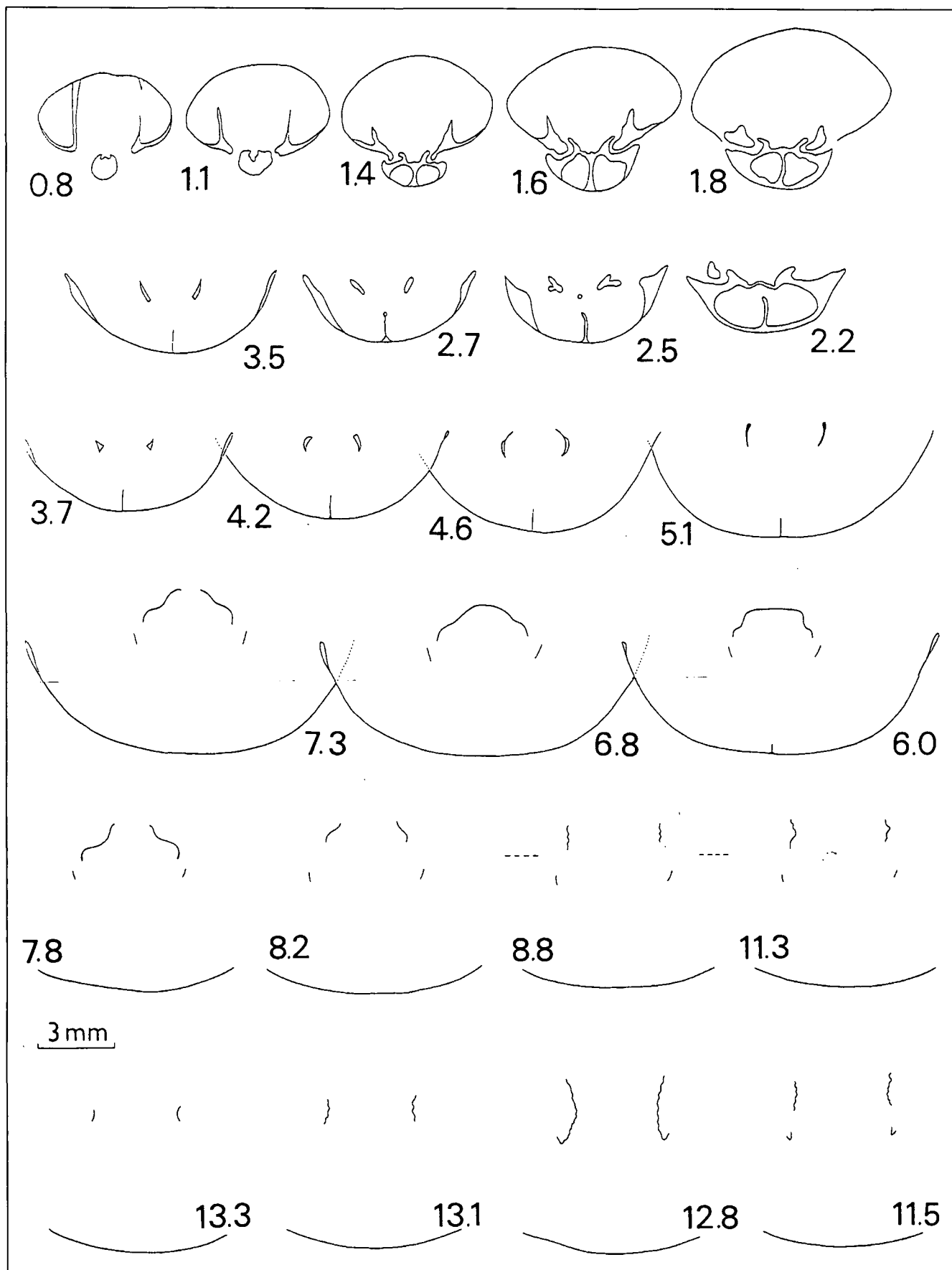
Material: 3 more or less damaged specimens. The figured one measures 10.1 × 10.2 × 5.4 mm.

Remarks: The material shows all the characters given by GEYER and differs in having a very shallow sulcation in the brachial valves, and a rounded cardinal margin which is observable in the figured specimen only. The same rounded character of the cardinal margin was ascertained also in the Hungarian material (VIGH, 1943, Text-Fig. 5c). From the mutual morphological “passages” among “*alpina*”, *Zeilleria engelhardti* (OPPEL), *Z. ewaldi* (OPPEL) and *Z. mutabilis* (OPPEL) is it clear that the conventional species concept within this group needs reconsideration and that the variation could well be intraspecific. Hungarian *Zeilleria baconica complanata* (BÖCKH, 1874) seems to belong to the same morphological group.

Distribution: Steinplatte – loc. 2 (Hierlitz, CSFR, Hungary, Italy, ?Crimea).
 Hettangian to Upper Sinemurian–Lotharingian (according to ALMERAS, 1964).

Zeilleria aff. *apenninica* (ZITTEL, 1869)

- aff. 1869 *Terebratula* (*Waldheimia*) *Apenninica*. ZITT. – ZITTEL, p. 127, Pl. 14, Fig. 9.
 aff. 1889 *Waldheimia Apenninica* v. ZITTEL – GEYER, p. 33, Pl. 4, Figs. 8–12.
 aff. 1892 *Waldheimia Apenninica* ZITT. – PARONA, p. 49, Pl. 2, Fig. 27.



Text-Fig. 10.
Zeilleria stapia (OPPEL).
 Length of specimen ? 17.0 mm. ST 3. Magnified.

Material: 2 incomplete internal moulds. The better preserved one measures 11.2 × 11.5 × 7.8 mm.

Remarks: The specimens are quite well comparable to those described and figured by GEYER and PARONA but differ from them, however, in having subtrigonal outlines with the maximum width situated near the anterior margin of shell. A median septum persisting for about one third of the length of valve, and short dental lamellae are ascertainable on our material. *Zeilleria ampezzana* (BÖSE & SCHLOSSER, 1900) is distinguishable from our specimens by its subpentagonal outline with strongly emarginate anterior margin.

Distribution: Steinplatte – loc. 2.

Zeilleria apenninica comes from the Middle Liassic but was reported by GEYER, 1889 from the Lower Liassic of Hierlatz, too.

Acknowledgements

I am particularly indebted to Dr. Harald LOBITZER (Geologische Bundesanstalt, Vienna) who kindly offered me the possibility to participate in the biostratigraphical research of the Steinplatte area, and gave me advice on field work and assistance with collecting. The financial support by the Geologische Bundesanstalt in Vienna that made my field work possible is heartily acknowledged.

Plate 1

- Fig. 1: *Cirpa planifrons* (ORMOS).
Locality ST 3.
Collection of the Geologische Bundesanstalt Wien (Museum).
GBA no. 1992/6/1.
×2.
- Fig. 2: *Cirpa planifrons* (ORMOS).
Locality ST 2. GBA no. 1992/6/2.
×2.
- Fig. 3: *Cirpa planifrons* (ORMOS).
Locality ST 3. GBA no. 1992/6/3.
×2.
- Fig. 4: *Calcirhynchia* (?) *plicatissima* (QUENSTEDT).
Locality ST 2. Unusually flat specimen. GBA no. 1992/6/4.
×2.
- Fig. 5: "*Rhynchonella*" *aff. prona* OPPEL.
Locality ST 2. GBA no. 1992/6/5.
×2.
- Fig. 6: "*Rhynchonella*" *sp.* .
Locality ST 3. GBA no. 1992/6/6.
×2.
- Fig. 7: "*Rhynchonella*" *fraasi* OPPEL.
Locality ST 2. GBA no. 1992/6/7.
×2.
- Fig. 8: ? "*Rhynchonella*" *fraasi* OPPEL.
Locality ST 2. Young specimen (?). GBA no. 1992/6/8.
×3.
- Fig. 9: *Furcirhynchia emmrichi* (OPPEL).
Locality ST 2, GBA no. 1992/6/9.
×1.5.
- Fig. 10: *Cuneirhynchia retusifrons* (OPPEL).
Locality ST 2. GBA no. 1992/6/10.
×2.5.

All specimens were coated with ammonium chloride before photographing.
Photographs (Pls. 1 and 2) by Mr. J. BROZEK (Prague).

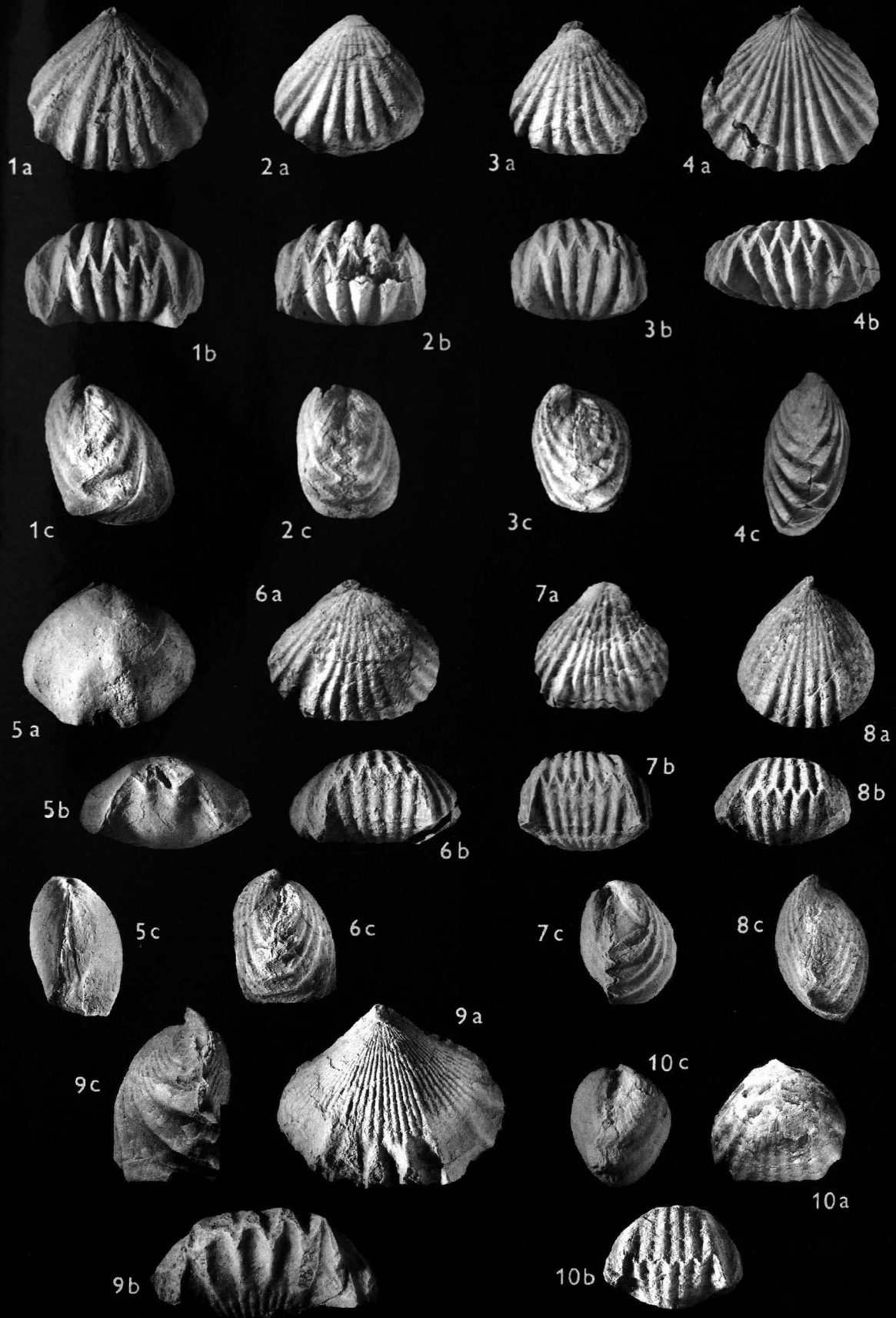
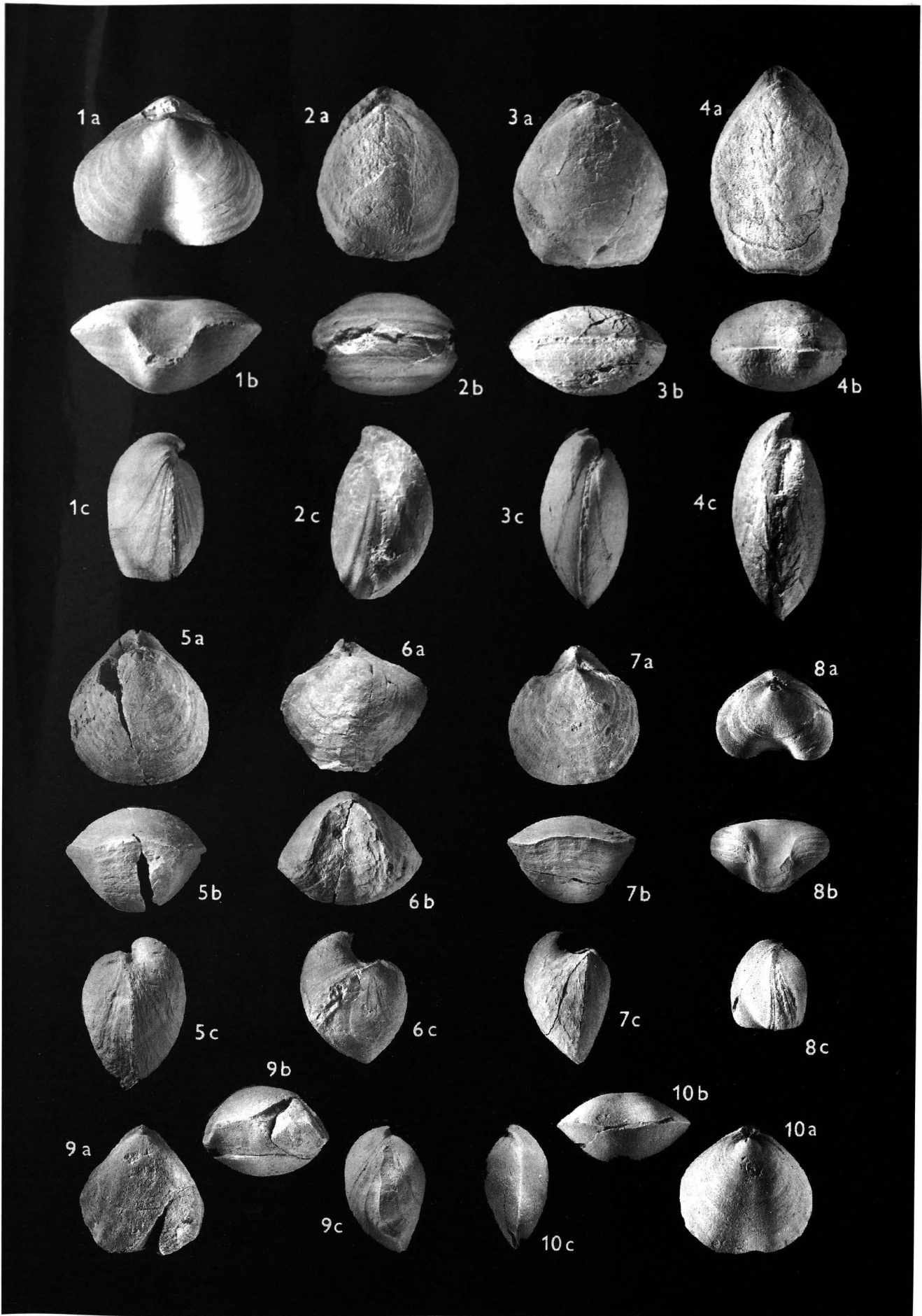


Plate 2

- Fig. 1: *Linguithyris aspasia* (MENEHINI).
Locality ST 2. GBA no. 1992/6/11.
× 2.
- Fig. 2: *Zeilleria stapia* (OPPEL).
Locality ST 2. GBA no. 1992/6/12.
× 2.
- Fig. 3: *Zeilleria mutabilis* (OPPEL).
Locality ST 2. GBA no. 1992/6/13.
× 2.
- Fig. 4: *Zeilleria perforata* (PIETTE).
Locality ST 1. GBA no. 1992/6/14.
× 2.
- Fig. 5: *Liospiriferina* sp. .
Locality ST 2. GBA no. 1992/6/15.
× 2.
- Fig. 6: *Liospiriferina obtusa* (OPPEL).
Locality ST 2. GBA no. 1992/6/16.
× 1.5.
- Fig. 7: *Liospiriferina alpina* (OPPEL).
Locality ST 2. GBA no. 1992/6/17.
× 2.
- Fig. 8: *Linguithyris aspasia* (MENEHINI).
Locality ST 2. GBA no. 1992/6/18.
× 2.
- Fig. 9: "*Rhynchonella*" aff. *paolii* CANAVARI.
Locality ST 3. GBA no. 1992/6/19.
× 3.
- Fig. 10: *Zeilleria alpina* (GEYER).
Locality ST 2. GBA no. 1992/6/20.
× 2.5.



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