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Representatives of the genus *Coenothyris* DOUVILLÉ, 1879, from the Terebratula Bed (Upper Muschelkalk) of the Holy Cross Mts, Central Poland

ABSTRACT: Studies on the morphology of abundant coenothyrid brachiopods from the Terebratula Bed (Upper Muschelkalk) of the Holy Cross Mts, Central Poland, show that the assemblage is composed of two separate species, *Coenothyris vulgaris* (SCHLOTHEIM) and *C. cycloides* (ZENKER).

INTRODUCTION

A complex of gray limestones at the top of the Upper Muschelkalk in the Mesozoic margins of the Holy Cross Mts, Central Poland, is known of mass occurrence of the coenothyrid brachiopods. Tremendous quantity of individuals that make the bed and their feebly diversified external appearance as well as a lack of sufficient information about internal characters of the shells caused their assessment as a cosmopolitan species *Coenothyris vulgaris* (SCHLOTHEIM). Locally associated is the form confined to the Upper Muschelkalk, namely *Coenothyris cycloides* (ZENKER), as well as *Waldheimia ladina* BITTNER and *W.* cf. *edlingeri* ASSMANN reported both from Lower and Upper Muschelkalk (SENKOWICZOWA 1961, 1970; SENKOWICZOWA & KOTAŃSKI 1979).

The up-to-date paleontological studies on the genus *Coenothyris* DOUVILLÉ in Poland dealt only with the species *C. vulgaris* (SCHLOTHEIM) from the Lower Muschelkalk of Upper Silesia (ASSMANN 1915, 1937; NOWAKOWSKI 1972; MAŁKOWSKI 1975; USNARSKA-TALERZAK 1981, 1983, 1985, 1988).

In order to study the internal characters of the coenothyrids from the Terebratula Bed of Holy Cross Mts and to check their systematic position the authoresses have examined specimens from over a dozen exposures (Text-fig. 1). The collected material, however, appeared to be rather poor as the shells are

crushed and incomplete, commonly preserved as a more or less fragmented debris (*see* Pl. 3, Fig. 4).

The shells which are preserved complete display their interiors infilled with calcite crystals. Nevertheless, over 30 specimens have been selected from which serial sections have been done and in some cases also partial reconstructions of the interiors. The information obtained abount internal characters, combined with the analysis of external features of the studied specimens, allowed to state that the assemblage is composed of representatives of one genus represented by two species.

New informations on the internal characters and microstructure of shell of the both coenothyrid species from the Terebratula Bed supplement the hitherto obtained data concerning the studied genus from other regions of Poland (NOWAKOWSKI 1972; MAŁKOWSKI 1975; SENKOWICZOWA & KOTAŃSKI 1979; USNARSKA-TALERZAK 1981, 1983, 1985, 1988; SENKOWICZOWA 1985).

The material studied is stored in the Museum of State Geological Survey in Warsaw with collection numbers *Muz. IG 1182 II* and *1362 II* (specimens) and in the Paleozoology Department of the Museum of the Earth (Polish Academy of Sciences) in Warsaw with numbers *MZ VIII Pp 54–59* (bed samples).

LITHOLOGY AND AGE OF THE TEREBRATULA BED

The Terebratula Bed is a well-known horizon developed at the top of the Upper Muschelkalk sequence in the Mesozoic margins of the Holy Cross Mts (KOWALCZEWSKI 1926; KLECZKOWSKI 1959; SENKOWICZOWA 1961, 1970; TRAMMER 1975). A lack of mass occurrence of the terebratulid shells is noted in

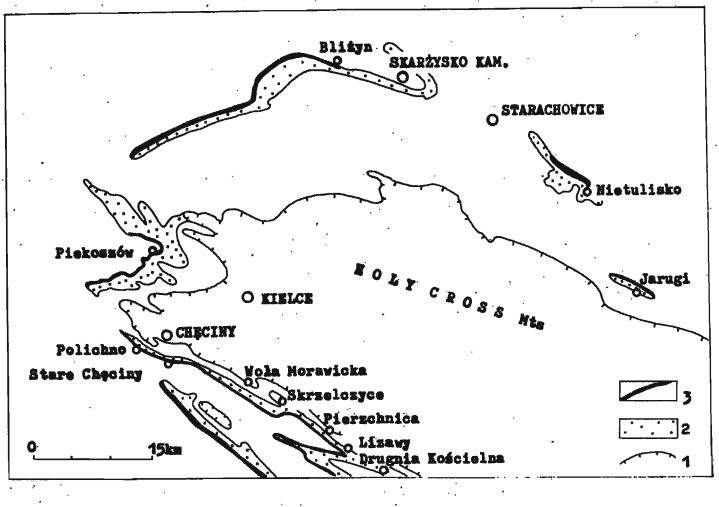

Fig. 1. Schematic map showing distribution of the Terebratula Bed in the Holy Cross Mts, Central Poland

1 – Boundary of Paleozoic outcrops. 2 – occurrence zone of the Upper Muschelkalk. 3 – Terebratula Bed

the Upper Muschelkalk only between villages Jarugi and Bliżyn which has probably been caused by an epeiric uplift of this area at the Keuper/Raethian boundary during which erosion reached the Muschelkalk series or even was deeper. In some places this bed may have not been formed at all as suggested *e.g.* at Bukowie (RDZANEK 1981) and Nietulisko (PTASZYŃSKI 1981). Field observations in this area show that the Keuper facies might have appeared there slightly earlier than in other regions of the Holy Cross Mts, namely at the time of the *3rd* conodont zone (Text-fig. 2).

The Terebratula Bed consists almost entirely of more or less destroyed brachiopod shells, which are so densely packed that touch one another. The matrix is limestone, dolomite, marly limestone or claystone. The major part of the material that makes the Bed is shell debris in which larger fragments are cracked and show imprints resulting from pressure-solution processes (*see* RADWAŃSKI 1965, pp. 187 and 205). Shell debris infills interiors of partly damagad shells, and very fine fragments are sometimes pressed into the pedicle foramen. Complete shells, especially those well preserved, are less frequent than it seems to be as the bed is observed macroscopically. Interiors of complete shells are usually infilled by calcite crystals and, less frequently, by limy mud or marl. As a rule the shells are only partly infilled with sediment and the rest is infilled with calcite. The shell debris is gray-violet, pinkish or reddish-brown in color. The brachiopod shell dimensions are smaller in the Terebratula Bed than those encountered in the underlying limestone beds of Upper Muschelkalk age.

The species *Coenothyris vulgaris* (SCHLOTHEIM) within the Terebratula Bed is associated with *Coenothyris cycloides* (ZENKER) which occurs in great abundance of specimens. The shell length of the latter species does not exceed 14 mm (KIRCHNER 1934), and average specimens are usually smaller than those of *C. vulgaris* (SCHLOTHEIM). In both species adult individuals prevail in the

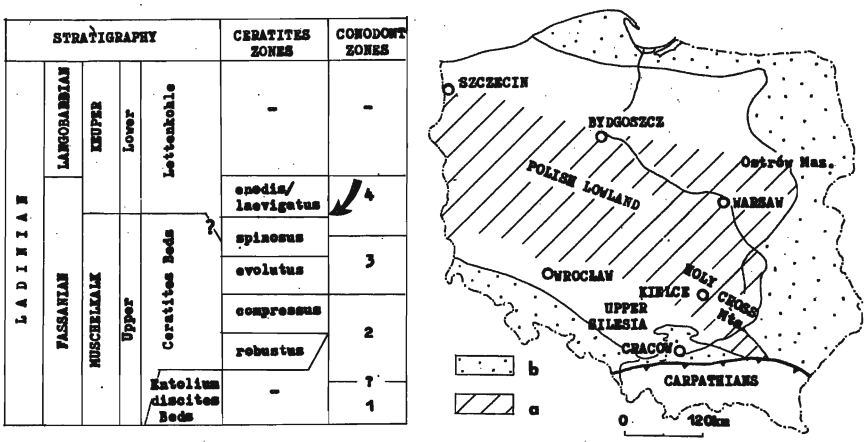

Fig. 2. Distribution of the Terebratula Bed in Poland and its position (*arrowed*) in the stratigraphic column

Legend to the map: **a** – area in which the Terebratula Bed is present, **b** – areas devoid of the Terebratula Bed

Bed. It should be noticed that no structures of the *Podichnus*-type are present on the shell surfaces, although these trace fossils are locally quite common on the coenothyrids from Upper Silesia (MAŁKOWSKI 1975).

The mass development of *Coenothyris cycloides* (ZENKER) is usually related to shallow marine basins of increased salinity (*see* TRAMMER 1975, p. 195). Accumulation of the shells in result of which the Terebratula Bed originated had evidently taken place in very mobile environment (DŻUŁYŃSKI & KUBICZ 1975, TRAMMER 1975). This is suggested by strong reworking and crushing of the shells, and by their chaotic arrangement. Common one-inside-another shell arrangement frequently observed in the Bed points to storm conditions. The biocenic and sedimentary conditions under which the Terebratula Bed was formed over so large area in Central Europe is as yet not clearly recognized.

The thickness of the Terebratula Bed ranges from 30 cm near Pierzchnica to about 1 m at Bliżyn and Jarugi, and 1.7 m at Wola Morawicka. Associated with brachiopods are such bivalves as *Velopecten alberti* (GOLDFUSS), *Plagiostoma striatum* (SCHLOTHEIM) and undeterminable fragments of ceratitids at Piekoszów, instead of *Myophoria vulgaris* (SCHLOTHEIM), *Terquemia complicata* (GOLDFUSS), *Nucula* cf. *elliptica* (GOLDFUSS), teeth and scales of fish at Lesica, as well as gastropods, conodonts and rounded bones of reptiles at Bliżyn.

The Terebratula Bed which in the Mesozoic margin of the Holy Cross Mts crops out at the surface has also been recognized in boreholes in the Polish Lowland (SENKOWICZOWA 1985), as far northward as the line running from Ostrów Mazowiecka to Bydgoszcz and Szczecin (*see* Text-fig. 2). In southern Poland it was recognized in boreholes in the Miechów Trough and in the Carpathian Foreland (SENKOWICZOWA 1959, MORYC 1971). It is however missing at the top of the Upper Muschelkalk in Upper Silesia, in the Opole area, and south and east of Wrocław, what is undoubtefly a result of higher salinity and shallowing of the basin at the Muschalkalk/Keuper boundary.

The stratigraphic position of the Terebratula Bed in the Holy Cross Mts is determined by its position directly over the limestones with ceratitids of the *Ceratites* (*Acanthoceratites*) *spinosus* group. At a waste-heap of the Bliżyn quarry a specimen has been found (SENKOWICZOWA 1957) which is determinable as *Gymnoceratites* cf. *enodis* (QUENSTEDT), and which supposedly comes from the Terebratula Bed. In the Germanies the species *Gymnoceratites enodis* occurs in the *Cycloidesbank* γ.

The distribution of the Terebratula Bed is thus regarded to be identical with that of the *Cycloidesbank* γ, being isochronous in Poland and in the Germanies, where it always occurs in the uppermost part of the Fassanian Substage in the *4th* conodont zone, at the base of the *Gymnoceratites enodis laevigatus* horizon (*see* Text-fig. 2; *and* KOZUR 1972, 1974; TRAMMER 1975; WIEFEL & WIEFEL 1980).

PALAEONTOLOGICAL PART

The studied specimens show shell length exceeding 10 mm and have been regarded to represent both juvenile and adult forms (*see* USNARSKA-TALERZAK

1983, p. 37). Outlines and shapes of shells, convexity of valves, size of hinge angle, width to length ratio and character of the anterior commissure allow an easy subdivision of the studied shells into two major groups of different external morphology, namely *Coenothyris vulgaris* (SCHLOTHEIM) and *C. cycloides* (ZENKER).

The three other groups can be distinguished among the specimens of *Coenothyris vulgaris* (SCHLOTHEIM). The first is composed of the specimens of oval outline with the rectimarginate anterior commissure (Pl. 1, Figs 3–7 and Pl. 4, Figs 2, 3). The second contains specimens of ovally-pentagonal outline and with the uniplicated anterior commissure (Pl. 1, Figs 1–2 and 8). The third takes specimens with the ovally-triangular outline, rectimarginate anterior commissure and an elongated umbo (Pl. 3, Figs 1–2). Nevertheless, no separate taxonomic categories are offered to the above morphological groups until a revision of *Coenothyris vulgaris* (SCHLOTHEIM) on the typical material is done.

The specimens of *Coenothyris cycloides* (ZENKER) display a moderating variability of their external morphology. The name "*cycloides*" was introduced by ZENKER in 1836 for a round, small variety of *Terebratula vulgaris* (SCHLOTHEIM) from the vicinity of Jena (KIRCHNER 1934). In later times of 19th century it has been regarded as a variety, and named "*Terebratula* (*Coenothyris*) *vulgaris* var. *cycloides*" by BITTNER (1890). In 20th century it was regarded as a separate species, and called either as "*Terebratula* (*Coenothyris*) *cycloides* Zenker sp." (SCHMIDT 1928) or "*Coenothyris cycloides* Zenker" (KIRCHNER 1934).

In newer descriptions of the genus *Coenothyris* DOUVILLÉ, 1879, there is certain discrepancy concerning internal morphology. MUIR-WOOD (1965) points to a lack of dental plates in the pedicle valve, whereas DAGIS (1974) claims that these plates occur and can be developed to various degrees. In the primary diagnosis by DOUVILLÉ (1879, p. 271) the lack of dental plates is stated: "*Il n'y a point de cloisons rostrales*". Disagreements concerning this internal element in *Coenothyris vulgaris* (SCHLOTHEIM) are known also from older (SEEBACH 1861, SCHLOENBACH 1869, KOSCHINKSY 1878, BITTNER 1890, SCHMIDT 1907) and newer (KIRCHNER 1934, NOWAKOWSKI 1972, USNARSKA-TALERZAK 1983) descriptions. Conclusions similar to those of DAGIS (1974) were also expressed earlier by NOWAKOWSKI (1972) and recently by USNARSKA-TALERZAK (1983, 1985, 1988) basing on the studies of *C. vulgaris* from Upper Silesia.

In some specimens of *Coenothyris vulgaris* (SCHLOTHEIM) coming from the beds older than the Terebratula Bed in the Holy Cross Mts and sectioned for comparative purposes (5 specimens from Młodzawy, and 2 from Wolica) the authoresses recognized the presence of the dental plates (POPIEL-BARCZYK & SENKOWICZOWA 1981). On the other hand, all the specimens of *Coenothyris vulgaris* (SCHLOTHEIM) and *C. cycloides* (ZENKER) sectioned during the present study do not possess dental plates and hence their generic assessment is compatible with the diagnosis given by DOUVILLÉ (1879) and by MUIR-WOOD (1965).

Family **Dielasmatidae** SCHUCHERT, 1913
Genus *Coenothyris* DOUVILLÉ, 1879
Coenothyris vulgaris (SCHLOTHEIM, 1820)
(Text-figs 3–7; Pl. 1, Figs 1–8; Pl. 3, Figs 1–3; Pl. 4, Figs 2–4)

1861. *Terebratula (Waldheimia) vulgaris* SCHLOTH.; SEEBACH, p. 561, Pl. 14, Fig. 1a–c.
1878. *Terebratula vulgaris* SCHLOTH.; C. KOSCHINSKY, p. 375, Pl. 16.
1879. *Coenothyris vulgaris*, SCHL. sp.; M. H. DOUVILLÉ, p. 270, Fig. 11.
1980. *Terebratula (Coenothyris) vulgaris* SCHLOTH. spec.; A. BITTNER, p. 5 (Text-fig.).
1907. *Terebratula (Coenothyris) vulgaris* v. SCHL.; M. SCHMIDT, p. 81, Pl. 1, Figs 14–24.
1915. *Terebratula (Coenothyris) vulgaris* v. SCHLOTHEIM sp.; P. ASSMANN, p. 588, Pl. 30, Fig. 5 (*only*).
1928. *T. (Coenothyris) vulgaris* v. SCHLOTH. sp.; M. SCHMIDT, p. 140, Fig. 284.
1934. *Coenothyris vulgaris* SCHLOTHEIM; H. KIRCHNER, p. 116, Text-figs 5–9, Pl. 2, Figs 17–19.
1937. *Coenothyris vulgaris* v. SCHLOTHEIM sp.; P. ASSMANN, p. 26, Pl. 7, Fig. 15a, b.
1967. *Coenothyris vulgaris* (SCHLOTHEIM); A. SPECIALE, p. 1089, Text-figs 9–14, Pl. 79, Figs 6 and 8; Pl. 80, Figs 1–2 and 4–7.
1972. *Coenothyris vulgaris* (v. SCHLOTHEIM) 1820; E. NOWAKOWSKI, p. 18, Text-figs 2–5, Pl. 1–7 [in Pl. 5, only Fig. 1].
1979. *Coenothyris vulgaris* (SCHLOTHEIM, 1820); H. SENKOWICZOWA & Z. KOTAŃSKI, p. 46, Pl. 8, Figs 7–10.
1983. *Coenothyris vulgaris* (SCHLOTHEIM, 1820); K. USNARSKA-TALERZAK, p. 19, Text-figs 3 and 6–30, Pl. 1.
1985. *Coenothyris vulgaris* (SCHLOTHEIM), 1820; H. SENKOWICZOWA, p. 25, Pl. 1, Figs 7–9.

MATERIAL: 9 specimens from Bliżyn, 13 from Jarugi, 4 from Piekoszów, 4 from Wola Morawicka, 6 from Skrzelczyce, 7 from Polichno, 12 from Stare Chęciny, 1 from Drugnia Kościelna.
Sectioned specimens: 4 from Jarugi, 2 from Stare Chęciny, 2 from Skrzelczyce, 1 from Bliżyn, 1 from Piekoszów, 1 from Drugnia Kościelna.

DIMENSIONS: Shell dimensions of 10 specimens from various localities are given in Table 1.

Table 1

No.	No.cat. 1362 II	L	W	T	W/L	T/L	hinge angle	Locality	Documentation
1	96	13.5	11.3	7.2	0.84	0.41	96	Stare Chęciny	non figured
2	105a	13.8	12.5	7.0	0.90	0.50	–	Piekoszów	ser.sec.
3	94	15.1	12.2	7.2	0.80	0.41	96	Stare Chęciny	Text-fig.5 Pl.1,Fig.4
4	95	15.8	14.3	7.4	0.90	0.46	94	Stare Chęciny	Pl.1,Fig.5
5	106	15.7	13.8	6.3	0.88	0.40	99	Piekoszów	Text-fig.7 Pl.3,Fig.2a
6	105	15.9	14.7	7.5	0.86	0.47	99	Piekoszów	Pl.1,Fig.6
7	109a	19.6	16.8	9.2	0.85	0.46	98	Skrzelczyce	Pl.1,Fig.1
8	109b	22.7	21.6	12.8	0.90	0.57	99	Skrzelczyce	Pl.1,Fig.2
9	107	23.0	19.3	12.8	0.83	0.55	98	Jarugi	Pl.1,Fig.3a
10	108	26.3	22.4	13.6	0.85	0.51	91	Bliżyn	Pl.1,Fig.8 Pl.3,Fig.4

REMARKS: A great variability of external characters in the studied specimens allows a good comparison with the conspecific specimens described from other Muschelkalk areas and from various time intervals of the Middle Triassic.

Specimens of ovally-elongated shell outline with rectimarginate anterior commissure (Text-figs 3 and, 5; Pl. 1, Figs 3–7; Pl. 4, Figs 2–3) seem to be the most similar to those described from the Middle Anisian of eastern Lombardy (SPECIALE 1967, Pl. 80, Figs 1–2), the Anisian near Stara Planina in Bulgaria (DAGIS 1974, Pl. 46, Fig. 2), the Upper Muschelkalk of Baden (KIRCHNER 1934, Pl. 2, Fig. 19), the Lower Muschelkalk of Württemberg (SCHMIDT 1907, Pl. 1, Figs 22–24) and of Upper Silesia (ASSMANN 1937, Pl. 7, Fig. 15; NOWAKOWSKI 1972, Pl. 7, Figs 6–7; MAŁKOWSKI 1975, Pl. 1, Figs 2–3), as well as from the Lower and Upper Muschalkalk of the Holy Cross Mts (SENKOWICZOWA & KOTAŃSKI 1979, Pl. 8, Figs 8–10) and of the Polish Lowland (SENKOWICZOWA 1985, Pl. 11, Figs 7–9).

Specimens with ovally-pentagonal shell outline and with the uniplicate anterior commissure (Text-figs 4, 6; Pl. 1, Figs 1–2, 8) show similarities to those described from the Middle Anisian of eastern Lombardy (SPACIALE 1967, Pl. 80, Figs 4 and 7), the Upper Muschelkalk of Baden (KIRCHNER 1934, Pl. 2, Fig. 18), the Lower Muschalkalk of Württemberg (SCHMIDT 1907, Pl. 1, Figs 19–20; and 1928, p. 141, Text-fig 284a-d), the Muschelkalk of Germany (MUIR-WOOD 1965,

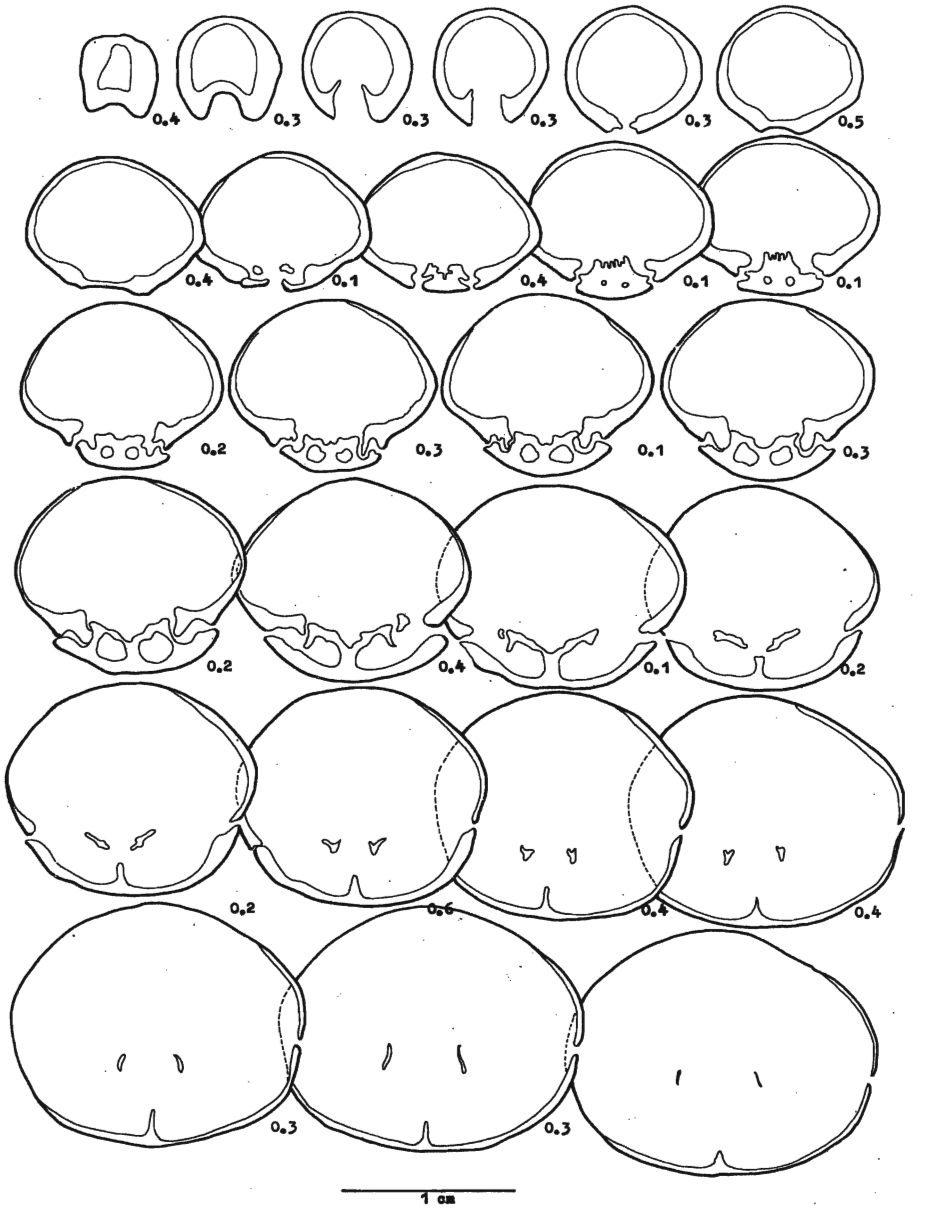

Fig. 3. Serial transverse sections of *Coenothyris vulgaris* (SCHLOTHEIM) from Jarugi (IG 1362 II 107; L = 23.0, W = 19.3, T = 12.8 mm), figured in Pl. 1, Fig. 3a

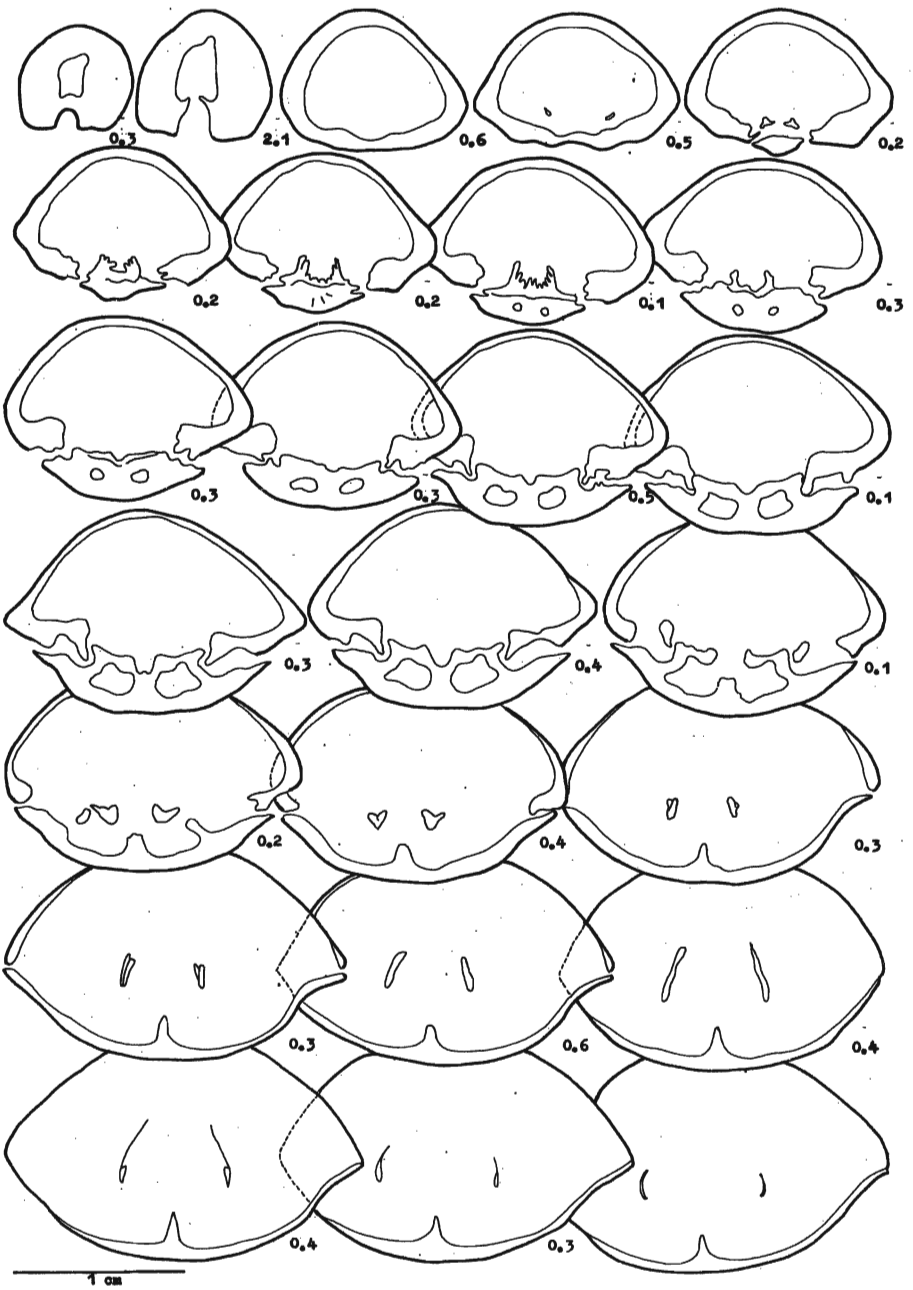

Fig. 4. Serial transverse sections of *Coenothyris vulgaris* (SCHLOTHEIM) from Bliżyn (IG 1362 II 108a; L = 26.8, W = 24.4, T = 13.7 mm); specimen similar to that figured in Pl. 1, Fig. 8a–c

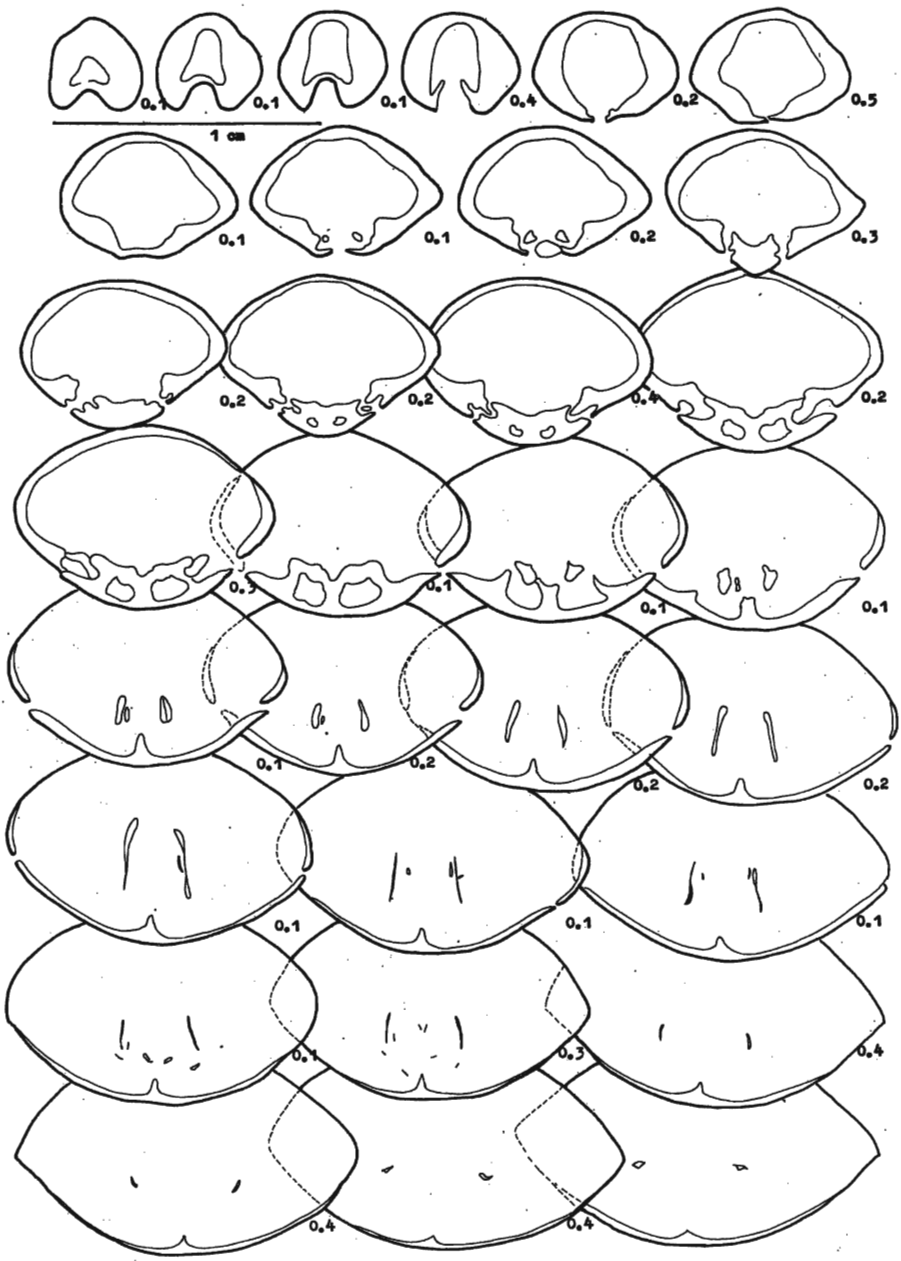

Fig. 5. Serial transverse sections of *Coenothyris vulgaris* (SCHLOTHEIM) from Stare Chęciny (IG 1362 II 94; L = 15.1, W = 12.2, T = 7.2 mm), figured in Pl. 1, Fig. 4a–c

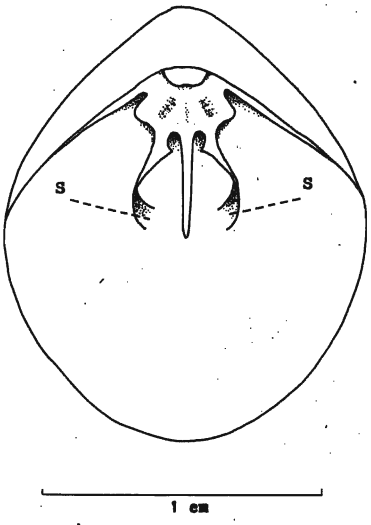

Fig. 5a
Coenothyris vulgaris (SCHLOTHEIM)
Interior of the brachial valve reconstructed from serial transverse sections presented in Text-fig. 5; S – spines

Text-figs 625/4 and 628/1), and the Lower Muschelkalk of Upper Silesia (NOWAKOWSKI 1972, Pl. 6, Figs 1–2 and Pl. 7, Fig. 4; SENKOWICZOWA & KOTAŃSKI 1979, Pl. 8, Fig. 7).

Specimens with ovally-triangular shell outline and rectimarginate anterior commissure (Text-fig. 7, Pl. 3, Figs 1–2) resemble those described from the Lower Muschelkalk of Württemberg (SCHMIDT 1907, Pl. 1, Fig. 21) and of the vicinity of Lieskau near Halle (SCHMIDT 1928, Text-fig. 284g). The studied specimens show a characteristic depression running through the center of the pedicle valve similar to that one illustrated by ASSMANN (1937, Pl. 7, Figs 1a and 6a) in "*Waldheimia edlingeri* n. sp." and "*W. ladina* BITTNER".

The ovally-elongated specimens prevail in the material from Stare Chęciny, Jarugi, and Piekoszów; those ovally pentagonal have been found only at Bliżyn and Skrzelczyce; the specimens ovally triangular come from Jarugi and Piekoszów.

In sectioned specimens the typical internal characters are quite well developed, such as the pedicle collar, massive teeth without dental plates, a bilobate cardinal process, a massive septum and distinct crural bases delimiting the septalium. These characters are comparable with those seen in serial sections shown by MUIR-WOOD (1965, Text-fig. 628/1), NOWAKOWSKI (1972, Pl. 5, Fig. 1), and USNARSKA-TALERZAK (1988, Figs 23 and 25).

The drawings of sectioned specimens presented earlier by BITTNER (1890, Text-fig. in p. 5), SCHMIDT (1907, Pl. 1, Fig. 19b), and KIRCHNER (1934, Text-fig. 7a–c in p. 120) differ in the presence of dental plates in the pedicle valve.

The reconstruction of the preserved parts of the loop (Text-fig. 5a) shows that its posterior part together with crural processes is convergent with illustrations given by NOWAKOWSKI (1972, Pl. 4, Fig. a; Pl. 5, Fig. 1) and by USNARSKA-TALERZAK (1988, Figs 24 and 26). It does not differ much from the drawings of the loop given by KOSCHINSKY (1878, Pl. 16, Fig. 10) and by DOUVILLÉ (1879, p. 270, Fig. 11A). The character of crura with prominent crural bases in the studied specimens (Text-figs 5 and 5a) is similar to the prefalcifer type which according to DAGIS (1974, Text-fig. 20w, g) is characteristic of the genus *Coenothyris*. The hinge plates in the studied specimens exhibit considerable variability but, nevertheless, their outlines are concordant with those given by BRÜGGE (1973, Fig. 1) and by DAGIS (1974, Fig. 18) for the genus *Coenothyris*. In some thin sections (Text-figs 5 and 7) one can observe traces of "spine elements" on descending branches of the loop at place of their widening and bending towards the interior of the brachial valve. Such elements were observed by USNARSKA-TALERZAK (1988, Figs 17–18 and 21) on the

loops in juvenile specimens from the Lower Muschelkalk of Upper Silesia. The whole length of the loop is unknown from the studied specimens, and it may be supposed on the basis of a reconstruction (Text-fig. 5a) that it does not reach the half-length of the brachial valve. The width of the loop in the sectioned specimens attains about 1/4 or 1/3 of the valve width. It is difficult to state whether the loop has attained the same stage of development as displayed by USNARSKA-TA-

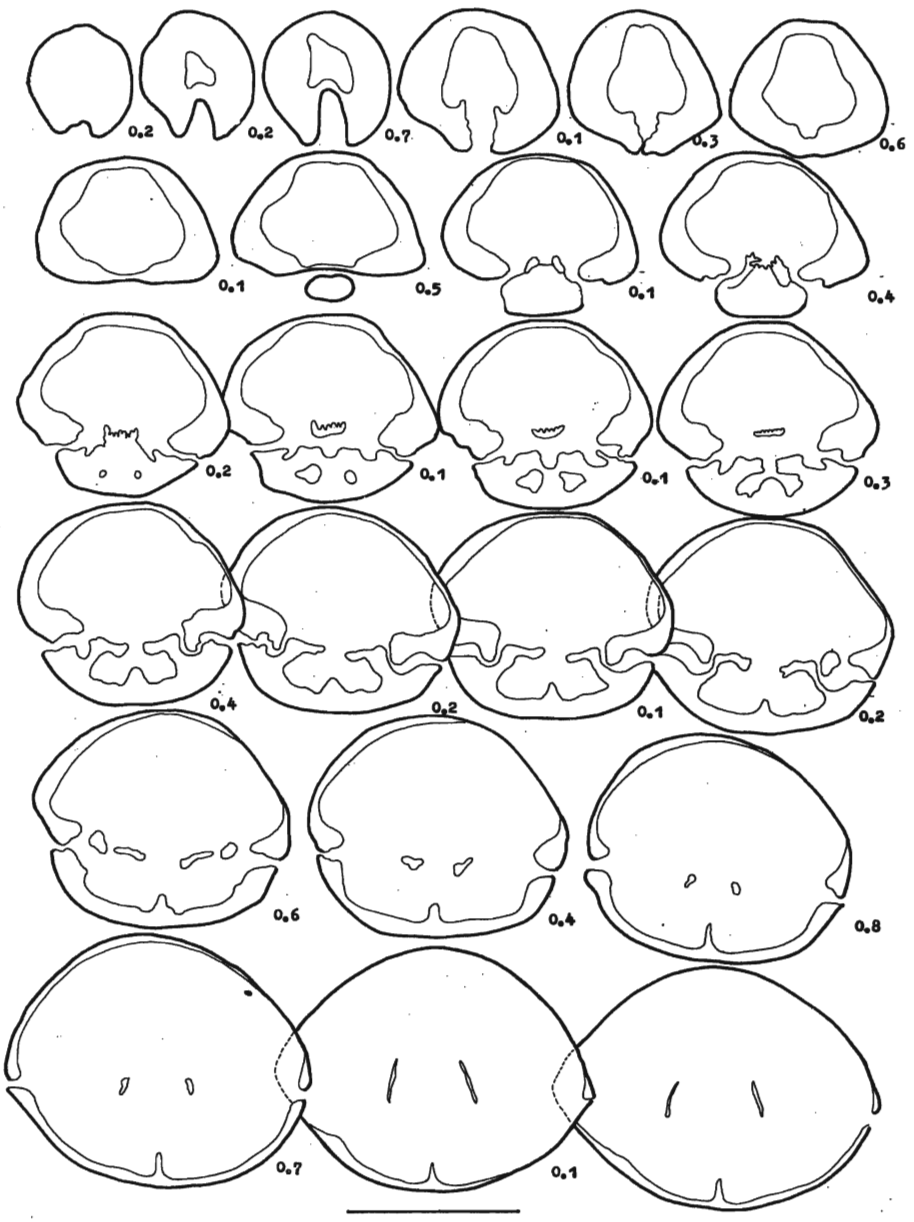

Fig. 6. Serial transverse sections of *Coenothyris vulgaris* (SCHLOTHEIM) from Skrzelczyce (IG 1362 II 109b; L = 22.7, W = 21.6, T = 12.8 mm), figured in Pl. 1, Fig. 2a–c

LERZAK (1988, Figs 18, 22 and 24) for *Coenothyris vulgaris* (SCHLOTHEIM) from the Lower Muschelkalk of Upper Silesia, although the dimensions of shell of the studied specimens approve such a possibility.

The dorsal septum, massive in the posterior part, becomes thinner in sections anteriorly, and in some sectioned specimens it attains 1/4 or even 1/3 of the valve length. In specimens of ovally-triangular outline the septum seems to be lower and supports definitely deeper septalium (Text-fig. 7).

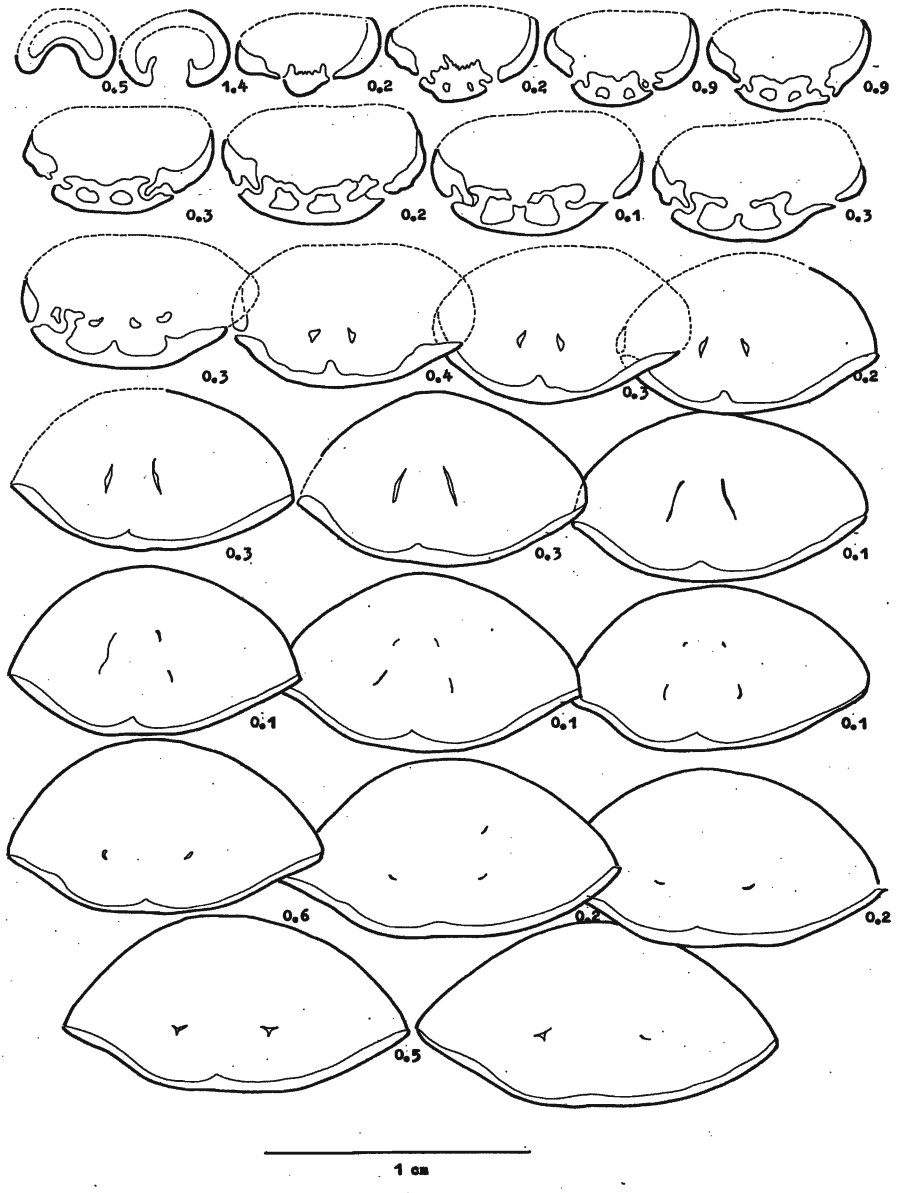

Fig. 7. Serial transverse sections of *Coenothyris vulgaris* (SCHLOTHEIM) from Piekoszów (IG 1362 II 106; L = 15.7, W = 13.8, T = 6.3 mm), figured in Pl. 3, Fig. 2a

The data on the shell microstructure pertain only to the structure of secondary layer (Pl. 3, Fig. 3 and Pl. 4, Fig. 4). The fibres of that layer, as observable in preparates tangent to the valve surfaces, show different thickenss in various parts of both valves, *e.g.* from 11.7 to 13.2 μm in a specimen from Bliżyn and from 14.7 to 17.6 μm in a specimen from Stare Chęciny. Punctae diameter is about 13.0 μm in the specimen from Bliżyn and from 7.3 to 8.8 μm in the specimen from Stare Chęciny. Punctae are irregularly arranged and the distances between them vary from *e.g.* 51.5 up to 61.7 μm in the specimen from Bliżyn and from 50.0 up to 51.4 μm in the specimen from Stare Chęciny.

OCCURRENCE: Lower Muschelkalk of Upper Silesia (ASSMANN 1915, 1937; NOWAKOWSKI 1972; MAŁKOWSKI 1975; USNARSKA-TALERZAK 1981, 1988), Lower and Upper Muschelkalk of the Holy Cross Mts (SENKOWICZOWA & KOTAŃSKI 1979) and of the Polish Lowland (SENKOWICZOWA 1985); Muschelkalk of Germany (SCHMIDT 1907, 1928; KIRCHNER 1934), Anisian of Italy (SPECIALE 1967) and BULGARIA (DAGIS 1974).

Coenothyris cycloides (ZENKER, 1836)

(Text-figs 8–10; Pl. 2, Figs 1–11; Pl. 4, Fig. 1; Pl. 5, Figs 1–3)

1928. *T. (Coenothyris) cycloides* ZENKER sp.; M. SCHMIDT, p. 141, Fig. 285.
1934. *Coenothyris cycloides* ZENKER; H. KIRCHNER, p. 126, Text-fig. 11, Pl. 2, Fig. 20.

MATERIAL: 4 specimens from Bliżyn, 1 from Jarugi, 3 from Piekoszów, 11 from Polichno, 4 from Stare Chęciny, 8 from Wola Morawicka, 9 from Lizawy, 6 from Drugnia Kościelna.
Sectioned specimens: 2 from Bliżyn, 1 from Jarugi, 3 from Piekoszów, 1 from Polichno, 1 from Lizawy, 3 from Wola Morawicka, 4 from Drugnia Kościelna.

DIMENSIONS: Shell dimensions of 10 specimens from various localities are given in Table 2.

Table 2

No.	No.cat. 1962 II	L	W	T	W/L	T/L	hinge angle	Locality	Documentation
1	103	10.7	10.0	5.5	0.92	0.42	-	Piekoszów	ser.sec.
2	112	11.1	10.5	5.3	0.94	0.46	126	Wola Morawicka	Pl.2,Fig.5
3	113	12.1	11.2	5.8	0.92	0.47	126	Lizawy	Pl.2,Fig.6a
4	91	12.4	11.0	5.2	0.88	0.41	118	Polichno	Text-fig.9 Pl.2,Fig.7
5	102	12.5	12.3	5.6	0.98	0.52	116	Stare Chęciny	Pl.5,Fig.1a
6	102a	14.3	13.7	5.8	0.97	0.40	120	Stare Chęciny	Pl.4,Fig.1
7	92	14.6	14.2	6.2	0.97	0.42	126	Polichno	Pl.2,Fig.8
8	111	15.5	14.8	7.4	0.95	0.47	126	Bliżyn	Pl.2,Fig.1a
9	104a	16.2	14.2	8.0	0.87	0.49	126	Piekoszów	Pl.2,Fig.10
10	22	35.5	33.6	13.7	0.94	0.36	126	Jarugi	Pl.2,Fig.9

REMARKS: Rounded shell outline, broad hinge angle, relatively low and weakly bent umbo of the pedicle valve, smaller convexity of the brachial valve and the rectimarginate anterior commissure differ *Coenothyris cycloides* (ZENKER) from the preceding species, *C. vulgaris* (SCHLOTHEIM). Weak convexity of the brachial valve is characteristic of the specimens from Bliżyn, Wola Morawicka and Polichno (*see* Pl. 2, Figs 2, 5 and 8). These external characters correspond with those of the specimens placed in the synonymy. The studied specimens show larger shell dimensions exceeding those of the German specimens, *i.e.* 11 mm (KIRCHNER 1934) or 14 mm (SCHMIDT 1928). The smallest specimens come from Piekoszów, Polichno and Stare Chęciny, whilst the largest are from Jarugi. Some specimens attain even 20 mm in their shell length and

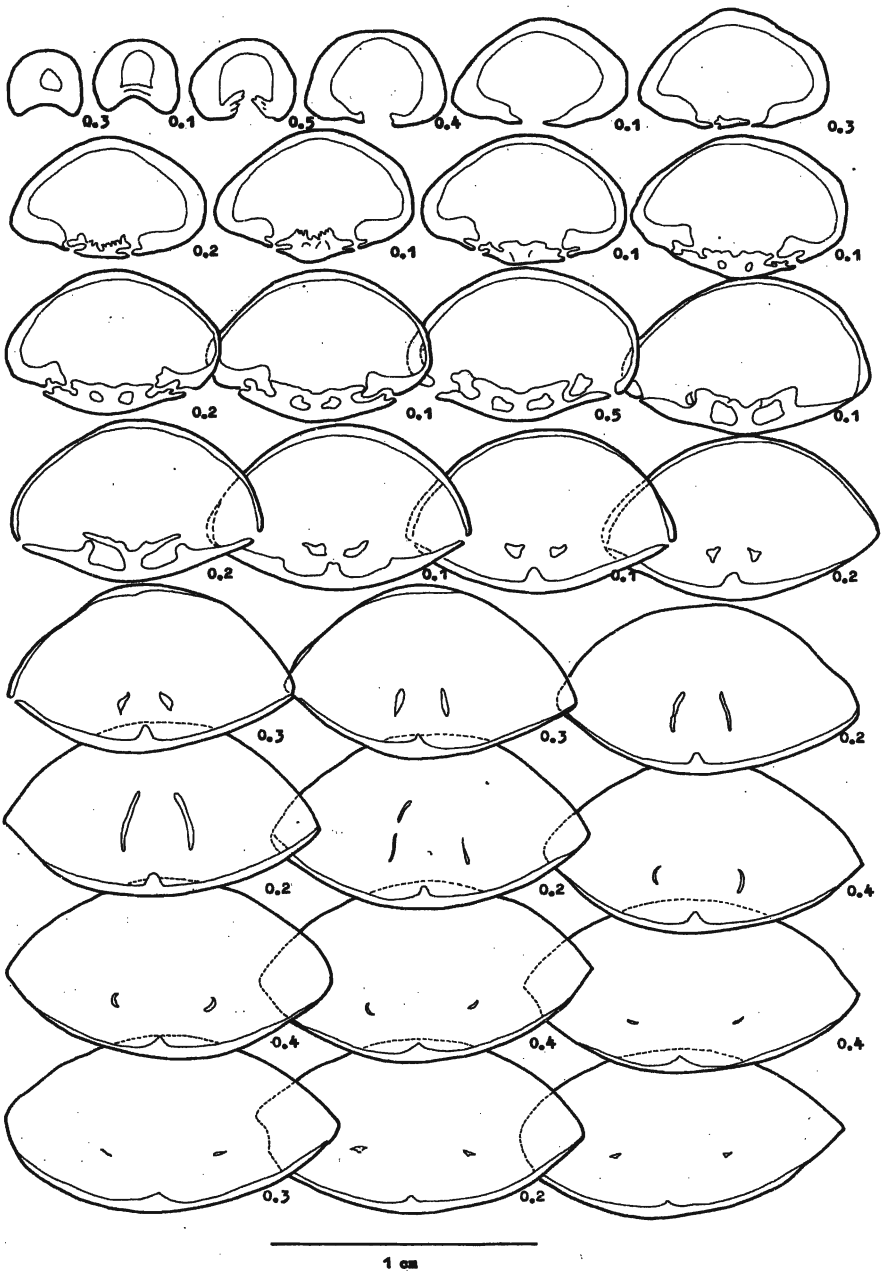

Fig. 8. Serial transverse sections of *Coenotyhris cycloides* (ZENKER) from Piekoszów (IG 1362 II 103; L = 14.7, W = 13.3, T = 7.0 mm); specimen similar to that figured in Pl. 2, Fig. 10a–c

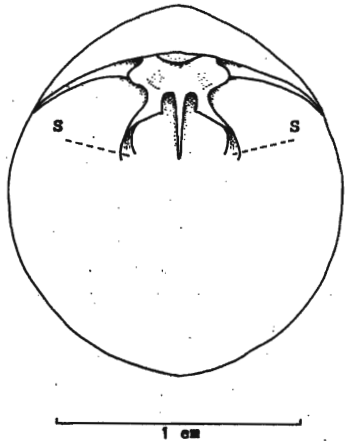

Fig. 8a
Coenothyris cycloides (ZENKER)
Interior of the brachial valve reconstructed from serial transverse sections presented in Text-fig. 8; S – spines

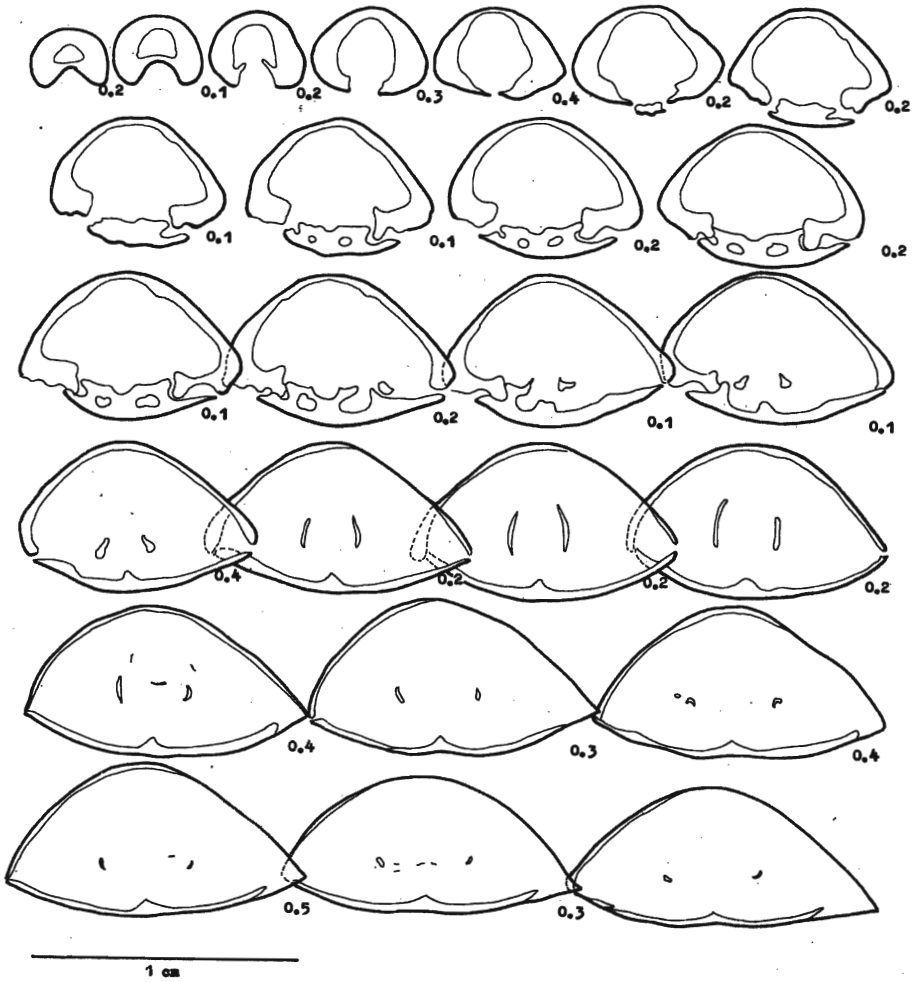

Fig. 9. Serial transverse sections of *Coenothyris cycloides* (ZENKER) from Polichno (IG 1362 II 91; L = 12.4, W = 11.0, T = 5.2 mm), figured in Pl. 2, Fig. 7a–c

sporadically up to 35 mm. The large, round specimens (*see* Pl. 2, Figs 4, 9 and 11) resemble in their shell outline the specimens of *Coenothyris vulgaris* (SCHLOTHEIM) illustrated by SCHMIDT (1928, Fig. 284e, f) and by SPECIALE (1967, Pl. 79, Fig. 7 and Pl. 80, Fig. 3).

The interior of the sectioned specimens (Text-figs 8–10) does not differ from that schematically illustrated in *Coenothyris cycloides* (ZENKER) from the vicinity of Würzburg presented by KIRCHNER (1934, Text-fig. 11a–e). Earlier illustrations of the shell interior in *Terebratula* (*Coenothyris*) *vulgaris* (SCHLOTHEIM) var. *cycloides* given by BITTNER (1980, p. 5, lower part of unnumbered Text-fig.) were not taken into consideration because they display the presence of traces of dental plates in the pedicle valve.

In the sectioned specimens observable was the large part of the posterior shell margin together with crura and crural processes and a part of the descending branches of the loop. The reconstruction (Text-fig. 8a) shows points of bending of the descending branches of the loop and some of the sections show distinct "spine elements" at place where the descending branches broaden near the disappearing anterior end of the septum. None of the sectioned specimens shows traces of dental plates.

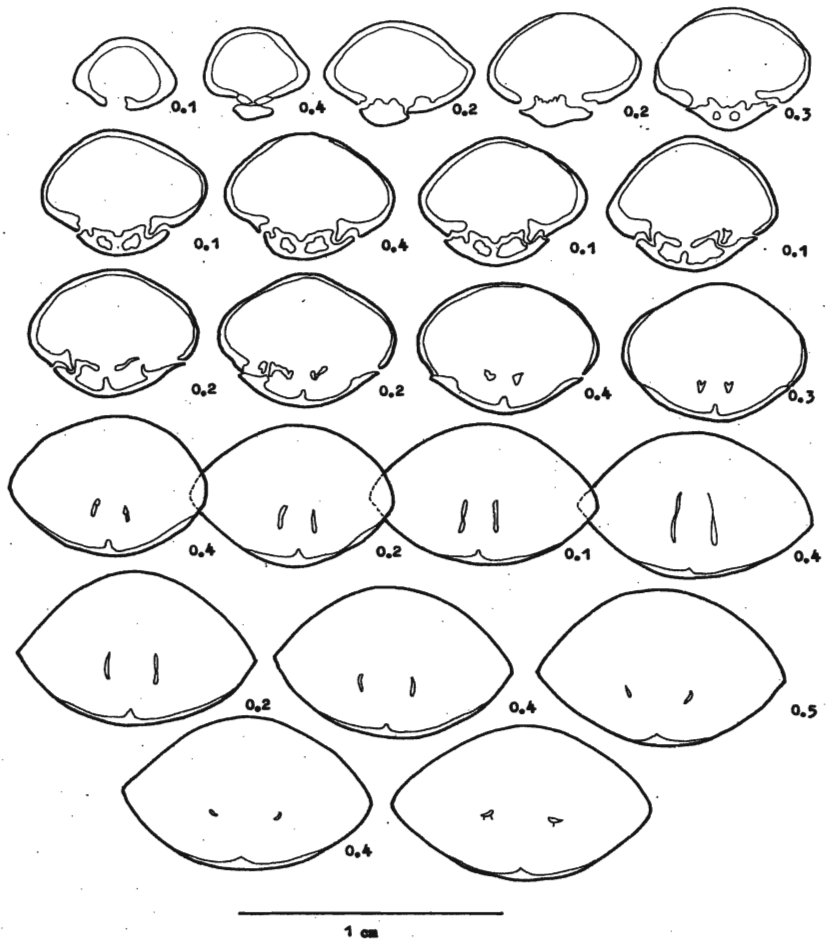

Fig. 10. Serial transverse sections of *Coenothyris cycloides* (ZENKER) from Lizawy (IG 1362 II 110; L = 11.7, W = 10.2, T = 5.7 mm); specimen similar to that figured in Pl. 2, Fig. 6a

The character and pattern of fibres in the secondary layer (Pl. 4, Fig. 1 and Pl. 5, Figs 2–3) are similar to those in *C. vulgaris* (SCHLOTHEIM). Fibre thickness in the specimen from Polichno is approximately 14.0 μm, and in the specimen from Jarugi it ranges from 15.0 up to 20.0 μm. Punctae diameter in the specimen from Polichno ranges from 8.8 up to 10.2 μm, and in the specimen from Jarugi 9.2–10.7 μm. Punctae spacing is 36.0–70.5 μm and 33.8–73.0 μm respectively.

OCCURRENCE: Upper Muschelkalk of the Holy Cross Mts; Upper Muschelkalk of Eastern (SCHMIDT 1928) and Western Germany (KIRCHNER 1934).

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The photos of the specimens were taken both in the Museum of the Earth and in the Geological Survey of Poland. The *SEM* micrographs of the shell microstructure were done in the *SEM* Laboratory of the Institute of Geochemistry, Mineralogy and Petrography of the University of Warsaw.

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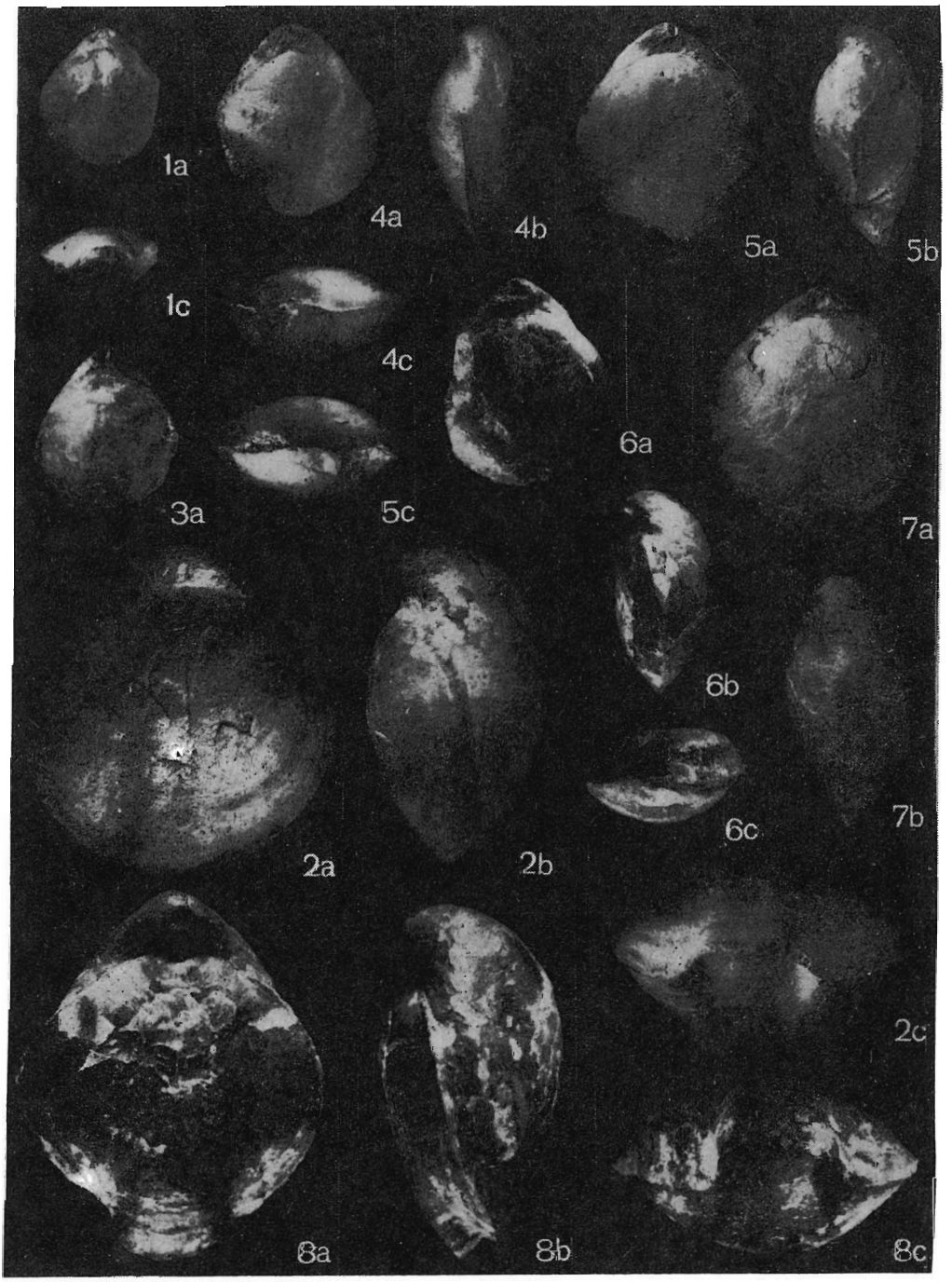
E. POPIEL-BARCZYK i H. SENKOWICZOWA

PRZEDSTAWICIELE RODZAJU *Coenothyris* DOUVILLÉ, 1879, Z ŁAWICY TEREBRATULOWEJ GÓRNEGO WAPIENIA MUSZLOWEGO GÓR ŚWIĘTOKRZYSKICH

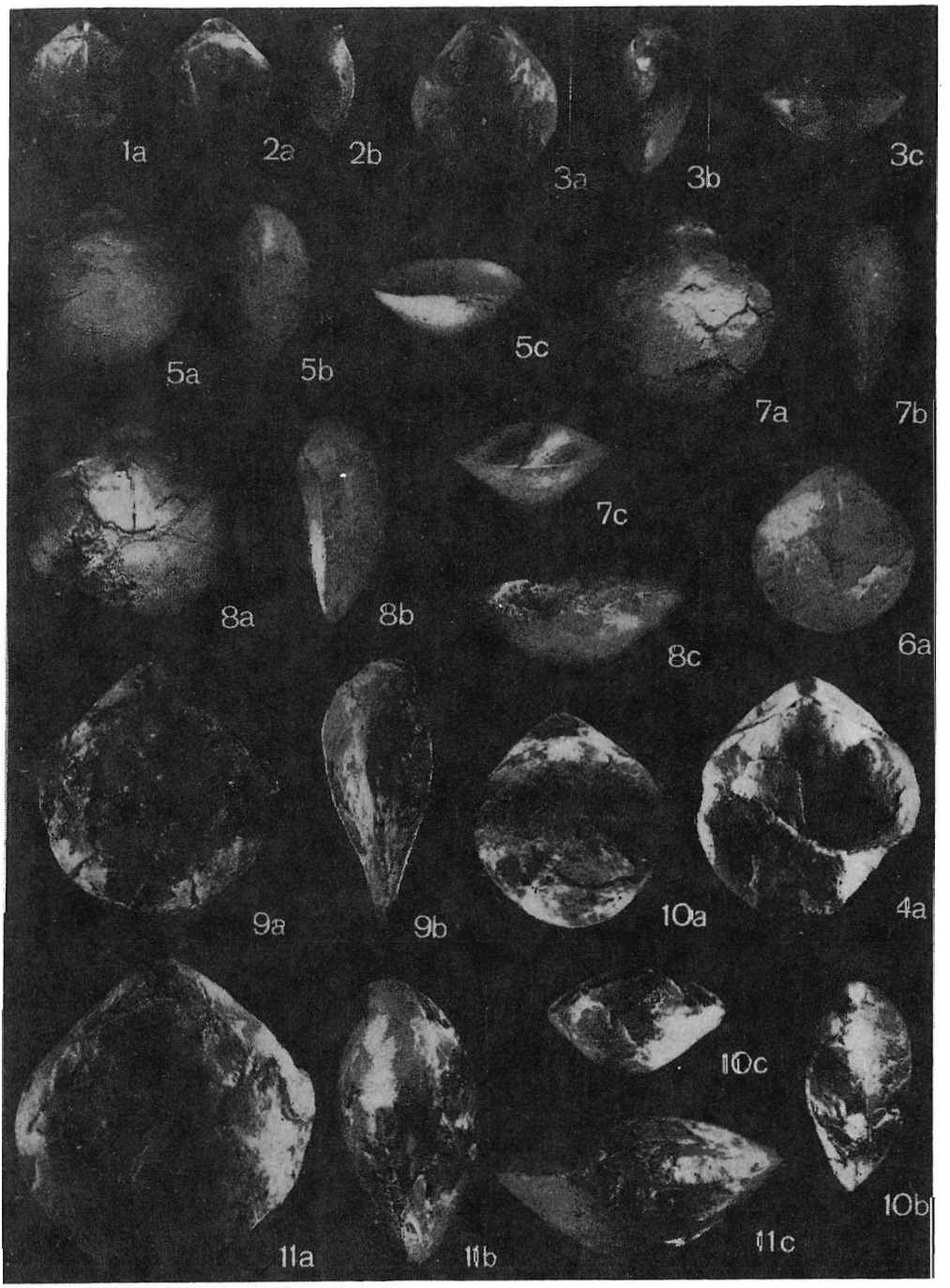
(Streszczenie)

W pracy przedstawiono wyniki badań nad morfologią dwóch gatunków ramienionogów rodzaju *Coenothyris* DOUVILLÉ, 1879, a mianowicie *C. vulgaris* (SCHLOTHEIM) i *C. cycloides* (ZENKER) występujących masowo w ławicy terebratulowej górnego wapienia muszlowego na obrzeżeniu Gór Świętokrzyskich (*patrz* fig. 1—2 oraz pl. 1—5). Badania morfologii wewnętrznej muszli obu gatunków przeprowadzono metodą szlifów seryjnych (*patrz* fig. 3—10); przedmiotem badań była też mikrostruktura muszli. Stwierdzono dużą zmienność morfologii zewnętrznej kosmopolitycznego gatunku *C. vulgaris* (SCHLOTHEIM) oraz potwierdzono zasadność uznania form okrągłych, znanych także z górnego wapienia muszlowego Niemiec (SCHMIDT 1928, KIRCHNER 1934) za odrębny gatunek *C. cycloides* (ZENKER). Ten ostatni gatunek przeważa w odsłonięciach ławicy terebratulowej na południowo-zachodnim obrzeżeniu Gór Świętokrzyskich. Wszystkie badane (szlifowane) okazy obu gatunków z tej ławicy nie mają płytek zębowych, zgodnie z diagnozą rodzaju *Coenothyris* podaną przez autora rodzaju (DOUVILLÉ 1879) oraz przez MUIR-WOOD (1965). Nowe spostrzeżenia o morfologii wewnętrznej muszli badanych gatunków, a zwłaszcza *C. vulgaris* (SCHLOTHEIM), odniesiono do dotychczasowych wyników badań tego gatunku z dolnego wapienia muszlowego Górnego Śląska (NOWAKOWSKI 1972; USNARSKA-TALERZAK 1981, 1983, 1985, 1988).



Coenothyris vulgaris (SCHLOTHEIM)

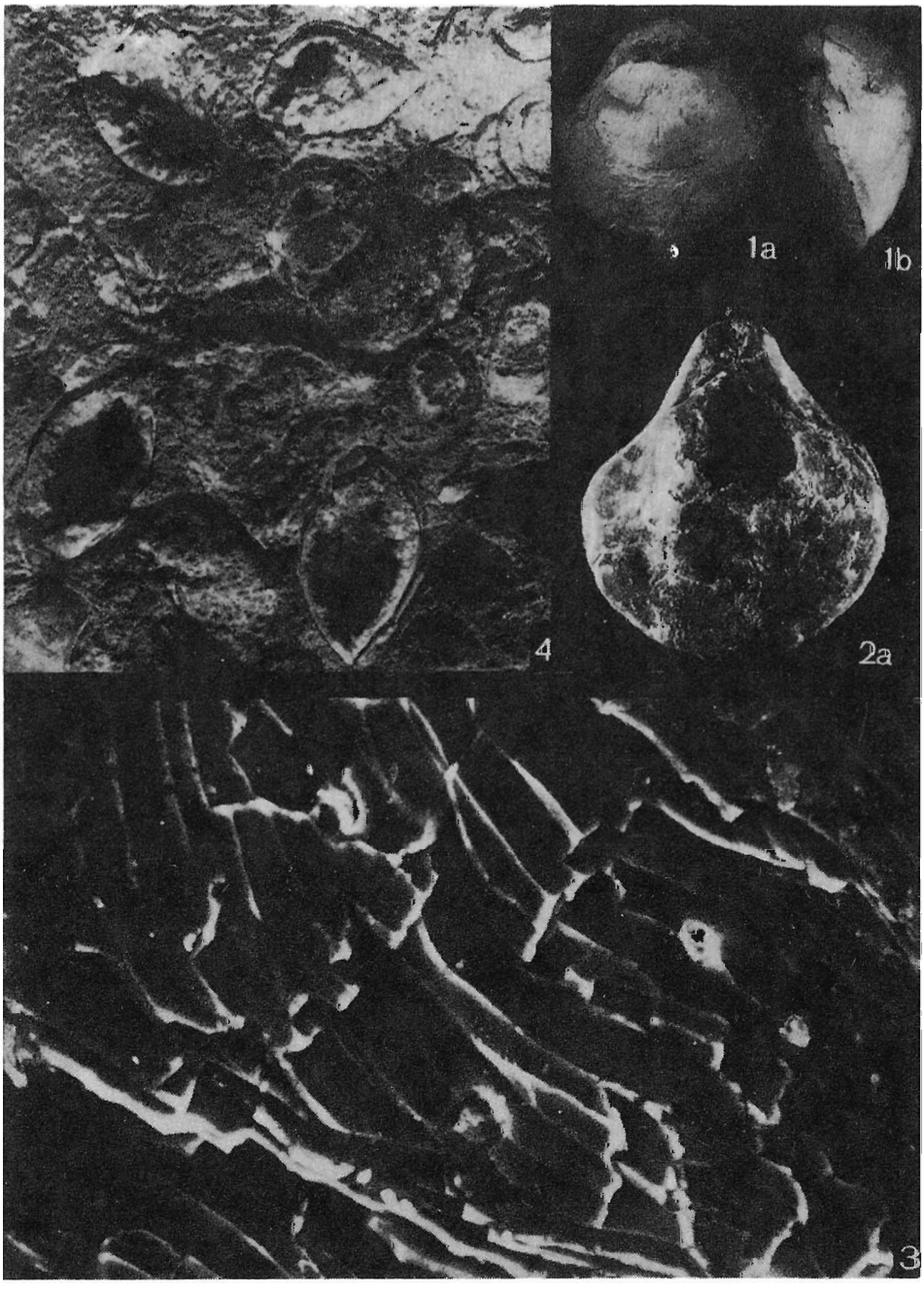
1-2 – Specimens from Skrzelczyce (1 – IG 1362 II 109a, nat. size; 2 – IG 1362 II 109b, × 2); **3** – Specimen from Jarugi (IG 1362 II 107, nat. size); **4-5** and **7** – Specimens from Stare Chęciny (IG 1362 II 94, IG 1362 II 95, IG 1362 II 93; all × 2); **6** – Specimen from Piekoszów (IG 1362 II 105, × 2); **8** – Specimen from Bliżyn (IG 1362 II 108, × 2)
In all figures: a – brachial, b – lateral, c – anterior views



Coenothyris cycloides (ZENKER)

1-2 – Specimens from Bliżyn (IG 1362 II 111, IG 1362 II 20; nat. size); **3-4** – Specimens from Drugnia Kościelna (IG 1362 II 100, IG 1362 II 101; both × 2); **5** – Specimen from Wola Morawicka (IG 1362 II 112, × 2); **6** – Specimen from Lizawy (IG 1362 II 113, × 2); **7-8** – Specimens from Polichno (IG 1362 II 91, IG 1362 II 92; both × 2); **9** – Specimen from Jarugi (IG 1362 II 22, nat. size); **10-11** – Specimens from Piekoszów (IG 1362 II 104a, IG 1362 II 104b; both × 2)

In all figures: a – brachial, b – lateral, c – anterior views

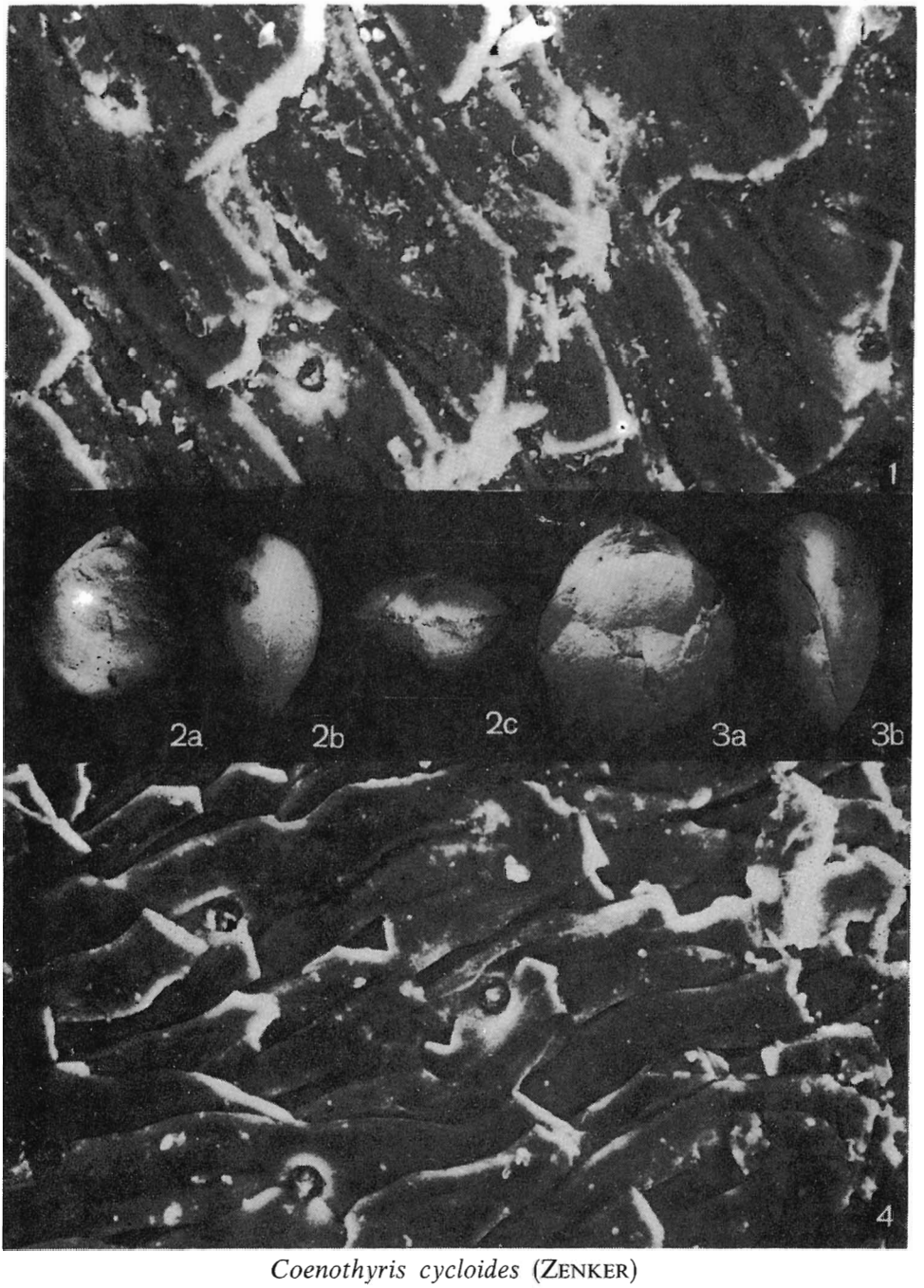


Coenothyris vulgaris (SCHLOTHEIM)

1 – Specimen from Stare Chęciny (IG 1362 II 97, × 2); **2** – Specimen from Piekoszów (IG 1362 II 106, × 3)

3 – Specimen from Bliżyn (IG 1362 II 108a); *SEM* micrograph (× 680), section tangential to the pedicle-valve surface showing fibres of secondary layer

4 – Fragment of the layer replete with the coenothyrid specimens from Stare Chęciny (MZ VIII Pp 55), × 2



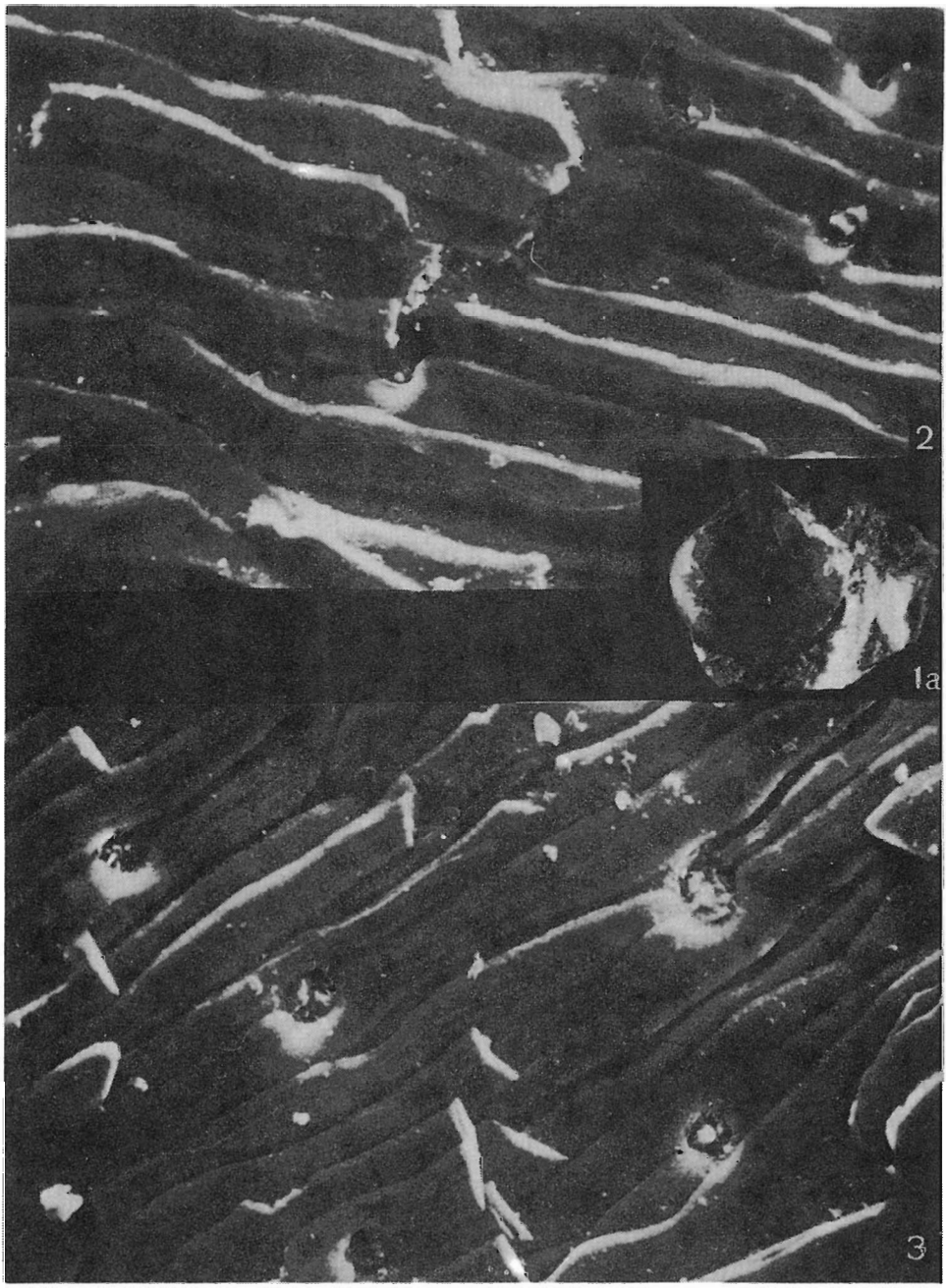
Coenothyris cycloides (ZENKER)

1 – Specimen from Stare Chęciny (IG 1362 II 102a), *SEM* micrograph (× 750), section tangential to the pedicle-valve surface showing fibres of secondary layer and punctae

Coenothyris vulgaris (SCHLOTHEIM)

2 – Specimen from Polichno (IG 1362 II 90, × 2); **3** – Specimen from Stare Chęciny (IG 1362 II 99, × 2)

4 – Specimen from Stare Chęciny (IG 1362 II 98), *SEM* micrograph (× 680), section tangential to the brachial-valve surface (middle part near septum) showing fibres of secondary layer and punctae



Coenothyris cycloides (ZENKER)

1 – Specimen from Stare Chęciny (IG 1362 II 102, × 2)

2 – Specimen from Polichno (IG 1362 II 92), *SEM* micrograph (× 680), section tangential to the pedicle-valve surface showing fibres of secondary layer and punctae

3 – Specimen from Jarugi (IG 1362 II 22), *SEM* micrograph (× 650), section tangential to the pedicle-valve surface showing fibres of secondary layer and punctae