

KRZYSZTOFA USNARSKA-TALERZAK

MORPHOLOGY AND POSTEMBRYONIC DEVELOPMENT
OF *COENOTHYRIS VULGARIS* (SCHLOTHEIM) BRACHIOPODA
MIDDLE TRIASSIC

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Shell morphology and postembryonic development of brachidium in *Coenothyris vulgaris* (Schlotheim) have been studied on specimens from the Middle Triassic *Terebratula* Beds of Opole Silesia, Poland. Reconstruction of brachidium in precentronellid, centronellid, mutacionellid and terebratulid ontogenetic stages are presented

Key words: Brachiopoda, Dielasmatidae, morphology, ontogeny, Triassic, *Terebratula* Beds, Poland.

Krzysztofa Usnarska-Talerzak, Zakład Paleozoologii, Instytut Zoologiczny, Uniwersytet Wrocławski, ul. Stenkiwicza 21, 50-335 Wrocław, Poland. Received: February 1986.

INTRODUCTION

The paper presents new palaeontological data on development of *Coenothyris vulgaris* (Schlotheim). The material for studies comes from Opole Silesia (the west part of Upper Silesia), from several outcrops of the *Terebratula* Beds (Lower Muschelkalk): Góra Św. Anny, Dziewkowice and two quarries in Strzelce Opolskie (fig. 1). These are outcrops described in the geological literature on the region.

The fauna of the Lower Muschelkalk from the region in question has been described briefly in general geological and stratigraphical papers (Assmann 1944, Kłapciński 1959, Kotlicki 1974, Zawidzka 1975 and others); lists of brachiopods and their short characteristics are given by Assmann (1915, 1937), Gürich (1925), Schmidt (1928) and Kirchner (1934); Brüggel (1977) has described a new brachiopod genus. Dżułyński and Kubicz (1975), and Bodziach (1985) have given an interpretation of sedimentary conditions of brachiopod accumulation of the *Terebratula* Beds.

In the *Terebratula* Beds the author has collected 1883 specimens be-

longing to eight brachiopod species. The collection includes *Coenothyris vulgaris* (Schlotheim) (over 90%), as well as, *Tetractinella trigonella* (Schlotheim), *Decurtella decurtata* (Girard), *Aulacothyroides* sp., *Angustothyris angustaeformis* (Boeckh), *Hirsutella hirsuta* (Alberti), *Punctospirella fragilis* (Schlotheim) and *Aulacothyris* cf. *angusta* (Schlotheim). *Angustothyris angustaeformis* and *Aulacothyroides* sp. have been found in this area for the first time. The collection includes both single valves and complete shells.

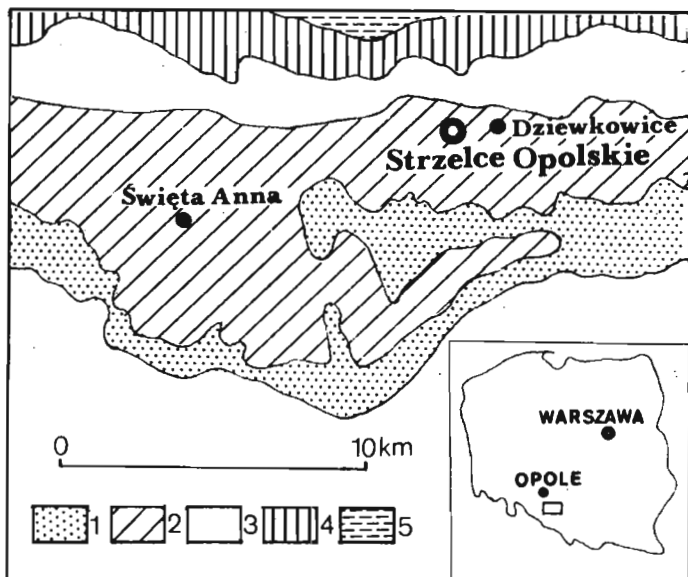


Fig. 1. Location map of the examined brachiopod sites at the Opole Silesia; insert shows location of the area under consideration. 1 Bunter Sandstone, 2 lower part of the Lower Muschelkalk, 3 upper part of the Lower Muschelkalk, 4 Middle Muschelkalk, 5 Upper Muschelkalk (after Zawidzka 1975, simplified).

The material is housed at the Paleozoology Department of the Institute of Zoology at the Wrocław University (abbreviated ZPALWr.).

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MATERIAL AND METHODS

In Strzelce Opolskie and Góra Św. Anny brachiopods have been found in fresh limestones, and in Dziewkowice — in weathered marly limestones. The most interesting material comes from Dziewkowice. It contains both juvenile and adult stages of *C. vulgaris*, *A. angustaeformis* and *Aulacothyroides* sp., and especially abounds in specimens at the earliest developmental stages.

Coenothyris vulgaris shells are from 0.8 to 36.4 mm in length and represent successive developmental stages. The other species are represented by scarce shells and it is impossible to examine their complete development. Measurements of the selected specimens are presented in table 1.

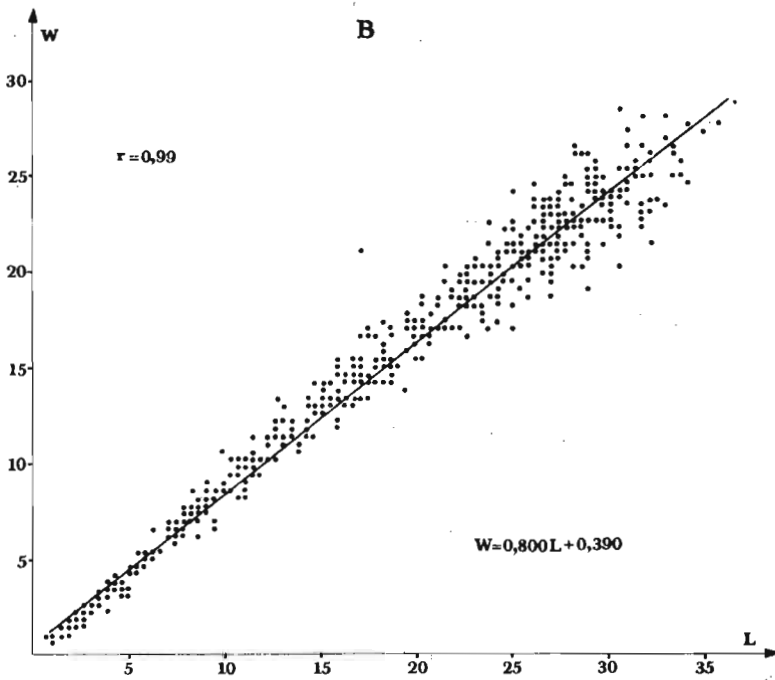
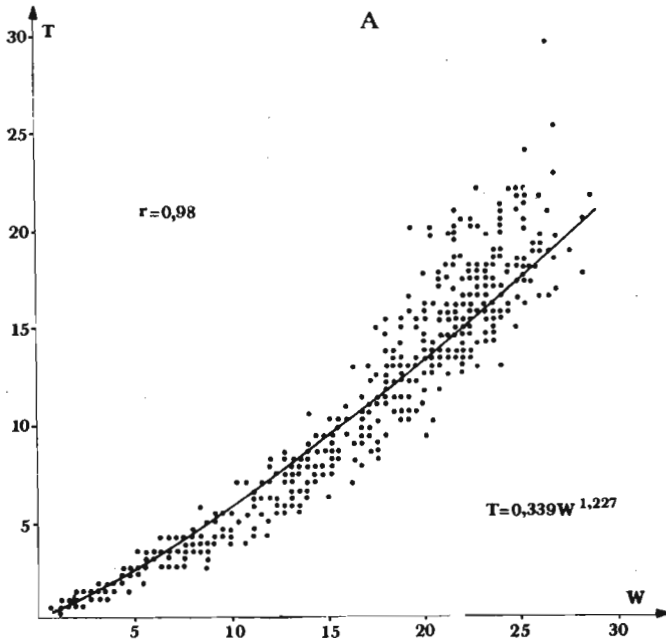
Table 1
Measurements of the selected shells of *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice

Species	Specimen No.	Length mm	Width mm	Thickness mm
<i>Coenothyris vulgaris</i>	ZPALWr. Br (28/I)672	1.0	0.8	0.3
	490	9.0	8.4	4.5
	437	15.5	13.3	5.7
	226	27.0	21.8	16.3
	46	36.4	29.0	21.0

The material of *C. vulgaris* comprises 1761 shells: 13.5% are shorter than 0.7 mm, 16.1% are 13.5—15.0 mm long, 33.4% are 16.1—22.5 mm long, and 37% are 22.5—36.4 mm long.

Shells make about 80 percent of the material. The majority of them have their primary shell layer destroyed, some shells are deformed or crashed. Juveniles are well-preserved. Some shells are assymetrical, especially at their anterior and side margins. Deformations may be also found in umbonal regions of pedicle valves and in hinge regions. Larger than 10 mm shells of *C. vulgaris* have their brachidia broken, especially in the anterior part.

The internal structure of the shell has been examined by the Muir-Wood (1934) method. Three hundred specimens of *C. vulgaris*, have been sectioned. On the basis of peels made of series of sections have been made reconstructions of brachidium at diverse stages of postembryonic shell development. Shells have been measured according to Williams' and Rowell's diagram (1965: H58, fig. 59).



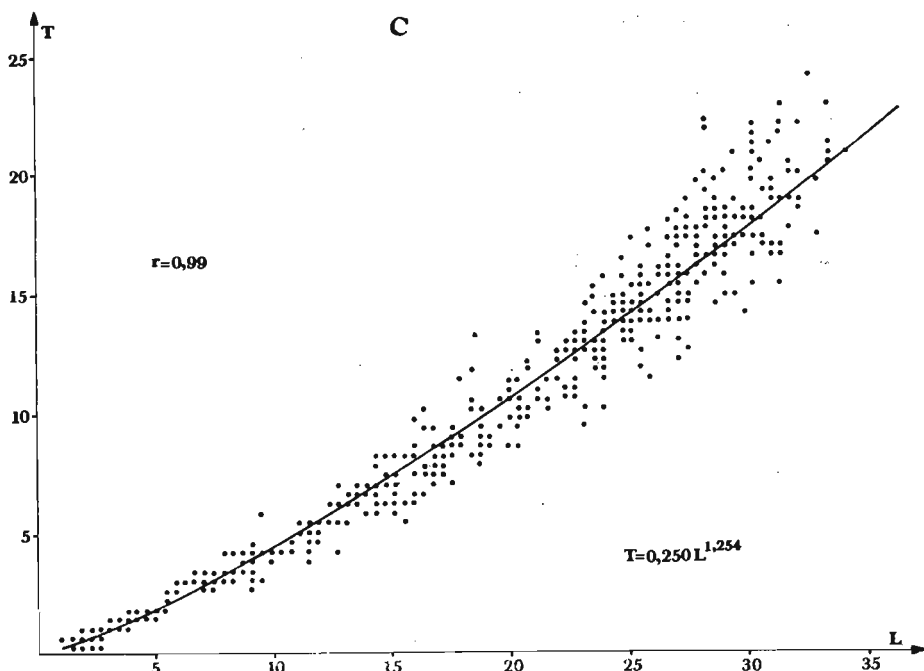


Fig. 2. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; A—C graphs of a function of regression of the following connections: (a) W and L, (b) T and L, (c) T and W; r — correlation coefficient.

MORPHOLOGY OF *COENOTHYRIS VULGARIS* (SCHLOTHEIM)

Shape. — Shell outline in adult *C. vulgaris* is very variable (Koschinsky 1878, Kirchner 1934, Müller 1950, Speciale 1967, Nowakowski 1972). Similarly in juveniles, the shell outline and proportions vary conspicuously, especially in these which have loops in the precentronellid and centronellid stages (see below). Their proportions change considerably even at slight changes of dimensions. The thickness is especially variable, e.g. specimens 1.5 mm long may be from 0.1 to 1.2 mm thick. Width and thickness indices are not significantly different for the specimens from the examined localities (table 2). Particularly similar are indices of specimens from Dziewkowice and Strzelce Opolskie (1 and 2). Specimens from Góra Św. Anny, characterized by width index of 86.1 and thickness index of 48.5, are slightly wider and less thick than those from the other localities.

The characteristic connections between the measurable features (length, width, thickness) are presented in fig. 2.

The coefficients of correlation for length and width ($r = 0.99$), width and thickness ($r = 0.98$) as well as length and thickness ($r = 0.99$) indicate high dependence between all these parameters. The dependence between width and length is linear. The regression coefficient is 0.800 and indicates

the negative isometric dependence (the value of width increase is 0.800 of length increase). The connections between thickness, length and width are of different nature. The thickness increases with the increase of length and width.

Table 2
Coenothyris vulgaris (Schlotheim), *Terebratula* Beds: indices of width and thickness of the shell.

Site	Number of specimens	Width index		Thickness index	
		variability range	mean	variability range	mean
Góra Św. Anny	200	48.7—101.2	86.1	33.5—83.0	48.5
Strzelce Opolskie (1)	600	49.7—95.3	81.1	42.5—95.8	54.7
Strzelce Opolskie (2)	350	50.3—99.1	80.8	41.1—92.3	56.2
Dziewkowice	611	47.5—99.8	82.3	6.7—83.1 ¹⁾	55.5

¹⁾ The presence of very small specimens (0.1—0.5 mm thick) causes the great variability range of the index.

Pedicle foramen. — The youngest specimens (shorter than 2 mm) have delthyrium open, big, triangular. Deltidial plates appear at 2 mm length. The successive growth stages of deltidial plates are displayed by specimens 2.0—9.0 mm long. Shells 9.0—12.0 mm long have these plates completely fused. In specimens over 12.0 mm the deltidial plates join to form a single structure; a suture may be visible occasionally. The pedicle foramen is present even in very old individuals, the pedicle have been functioning for all their lives. Juvenile *C. vulgaris* with pedicle foramen are presented in fig. 31.

Dental plates. — Individuals vary as to their dental plate width and length as well as the angle of inclination of the plates to the wall of pedicle valve. Sometimes the two plates are unequally developed and differ in length. They may also be differently inclined to the symmetry plane of the pedicle valve. The inception of dental plates in ontogeny is variable as well (table 3). Dental plates have been found to appear in specimens 7.0—22.4 mm long, and to be present in all individuals over this length. Specimens 8.0—9.0 mm long, as well as those over 15 mm, may have initial dental plates developed in the form of short processes on the

teeth. However, in many specimens of this category dental plates may be not developed at all.

Cardinal part and brachidium. — The variability of cardinal part concerns the shape of hinge plates surface (slightly concave to flat), depth of the septalium (shallow in most specimens), as well as length and width of hinge and septalial plates. Due to this variability, individuals at similar growth stages may have cardinalium either relatively narrow and elongated, or rather wide, quite massive. Cardinal part may occasionally be asymmetrical. In several cases one half of cardinalium is distinctively narrower and shorter than the other. In other specimens one half of the cardinalium is overgrown and, in comparison with the normally developed one, its hinge and septalial plates are differently oriented in relation to the brachial valve.

The height and thickness of septum are also variable. The septum may bifurcate and may be supported by two props which are visible at the level of the posterior margin of septalial plates. Sometimes septum is not situated on the symmetry plane of brachial valve.

Table 3

The inception of dental plates in *Coenothyris vulgaris* (Schlotheim), Dziewkowice, *Terebratula* Beds

Length of specimens	Number of specimens examined	Number of specimens with plates
0.8—6.9	89	0
7.0—22.4	7.0—14.9	26
	15.0—22.4	33
22.5—36.0	70	70
	300 in total	

In adults, brachidium is never preserved completely²⁾. Here, one observes variability in the structure of crura and descending branches, especially of their inclination to the symmetry plane of brachial valve. Crural processes are well-developed. Just behind the crural processes the descending branches of the loop twist. On the side of brachial valve their surface is covered by sparse fine spines.

Remarks on morphological variability. — The variability range of *C. vulgaris* in the localities examined corresponds with that given by other

²⁾ Brachidia are broken, especially in the anterior part. The reason is most probably, a weaker mineralisation of this part of the loop.

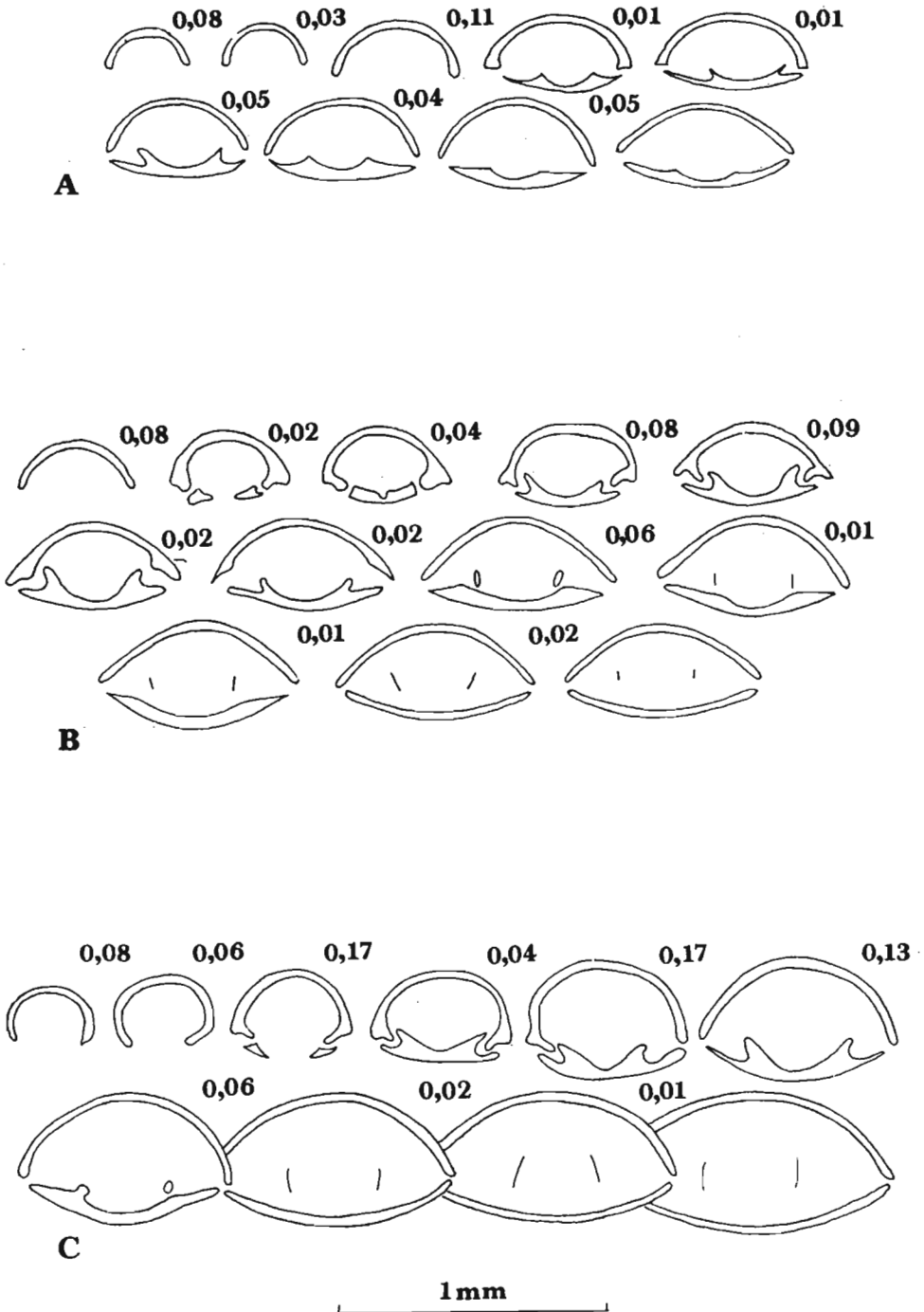


Fig. 3. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; series of transverse sections of specimens: A—0.8 mm long and 0.7 mm wide, ZPALWr. Br/28/1/96, B—1.1 mm long and 1.0 mm wide ZPALWr. Br/28/1/67, C—1.5 mm long and 1.2 mm wide, ZPALWr. Br/28/1/89.

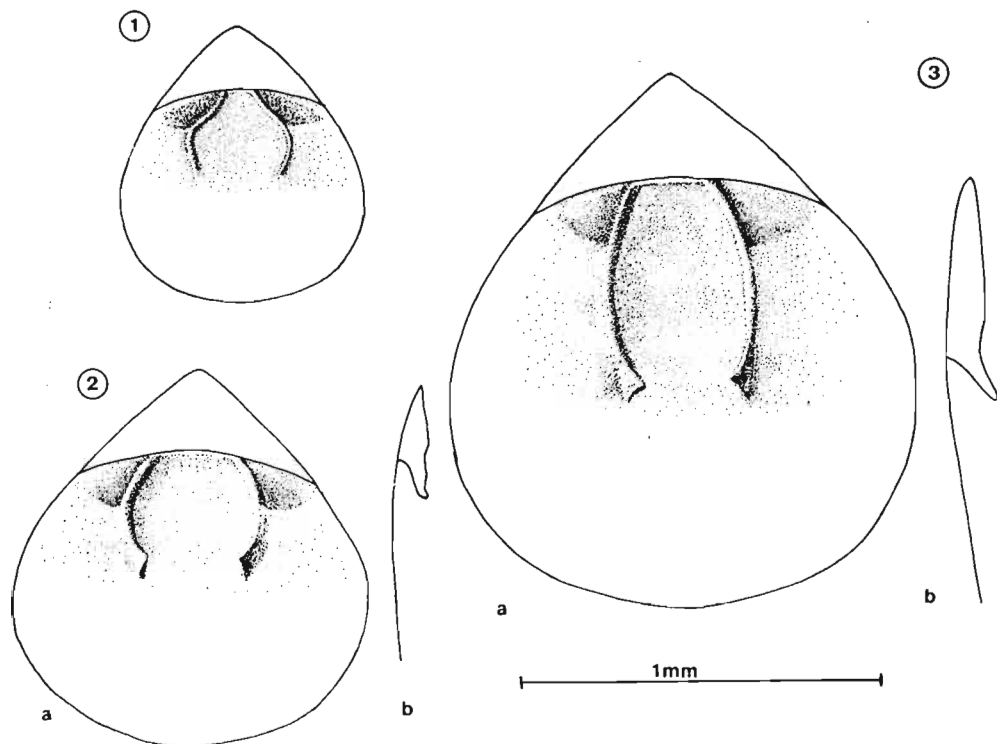


Fig. 4. *Coenothyris vulgaris* (Schlotheim), precentronelliform stage, reconstructions of brachial valve interior of the specimens from fig. 3; a—adventral view, b—side view.

authors. Specimens from Góra Św. Anny in their mean indices of width (86.1) and thickness (48.5) are closest to forms described by Speciale (1967) from Lombardy (respectively—90.0 and 50.0). Mean width indices of specimens from Strzelce Opolskie and Dziewkowice (table 2) are similar to those from the Lower Muschelkalk of Würzburg vicinity, Bavaria (Kirchner 1934: 80.0—83.0). The mean index of thickness for Bavarian specimens is lower (47.0 with the variability range 40.0—59.0) than that of the Silesian specimens from the localities in question (table 2).

Asymmetrically developed shells suggest great concentration of individuals in the area, and direct contact between the shells limiting their symmetrical growth. Some *C. vulgaris* have deformations caused by contact with bivalves from the genus *Enantiostreon*. According to some authors, asymmetry in fossil and recent brachiopods might be caused by unfavourable influence of the environment (Ager and Riggs 1964, Ager 1965, Assgaard 1968, Mc Cammon 1970). Small shells with gerontic features found in Dziewkowice suggest unfavourable conditions in an over-populated locality causing metabolic changes and inhibiting shell

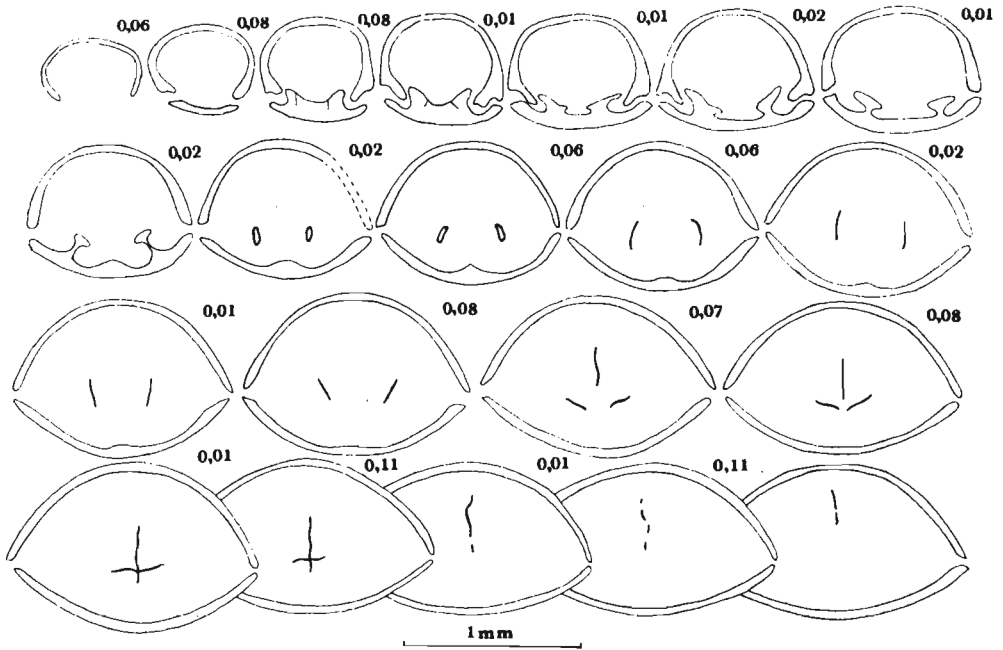


Fig. 5. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 1.7 mm long and 1.4 mm wide; ZPALWr. Br/28/I/100.

growth. Such forms could have also developed due to abiotic factors, e.g. changes of temperature (Cloud 1948, Zezina 1976).

The present study has proved that, contrary to the opinions of some authors (Schloenbach 1869, Bittner 1890, Muir-Wood 1965), dental plates are a characteristic feature of adult *C. vulgaris*. Significance and functions of dental plates in brachiopods have been analysed by many authors (Makridin 1964, Dągys 1974 and others). Dental plates, persisting in late stages, made the umbo of older individuals stronger and added weight to the posterior part of the shell (compare Grant 1965, Rudwick 1970, Richardson and Watson 1975).

ONTOGENY OF BRACHIDIUM OF COENOTHYRIS VULGARIS

Growth stages. — The development of cardinal part and the brachidium may be divided into the following stages (table 4):

I. The precentronelliform stage, observed in 15 specimens 0.8—1.5 mm long:

Two thickenings start at the hinge margin of brachial valve. They are here considered as the initial growth stage of crura and descending branches of loop. In the smallest of these specimens, 0.8 mm long, the

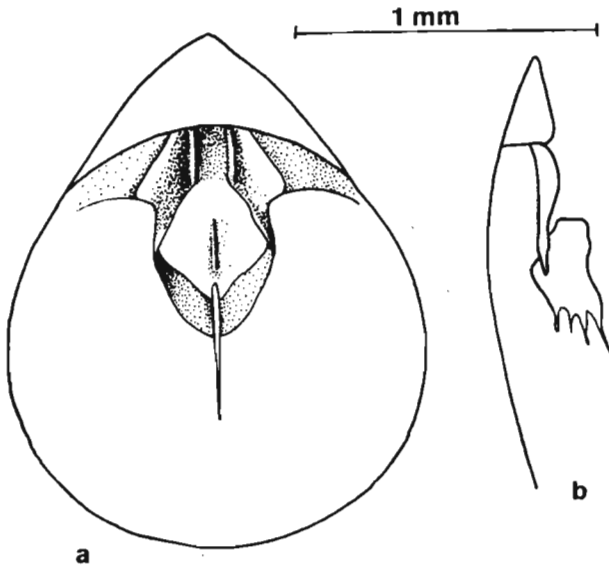


Fig. 6. *Coenothyris vulgaris* (Schlotheim), centronelli-form stage, a reconstruction of brachidium of the specimen from fig. 5. Explanation see fig. 4.

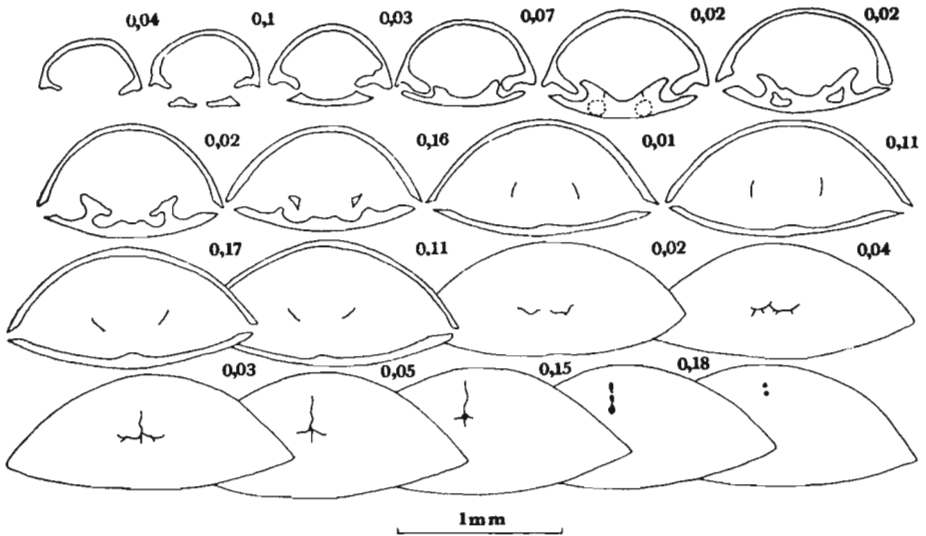


Fig. 7. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 2.3 mm long and 1.9 mm wide; ZPALWr. Br/28/I/102.

thickenings are developed along the whole length of the valve (fig. 3a, 4a). In a little larger specimens (1.1—1.5 mm long) the thickenings form processes distinctly turned towards the middle of the valve (fig. 3b, c and 4b, c). This suggests the initial stage of the joining of descending branches. Cardinal part is not developed at this stage.

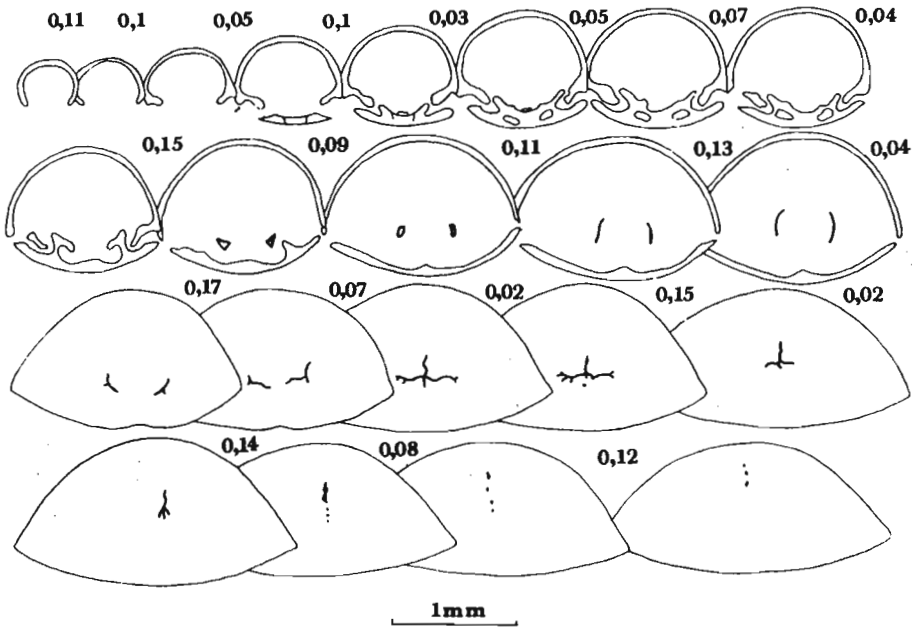


Fig. 8. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of the specimen 3.0 mm long and 2.0 mm wide; ZPALWr. Br/28/I/105.

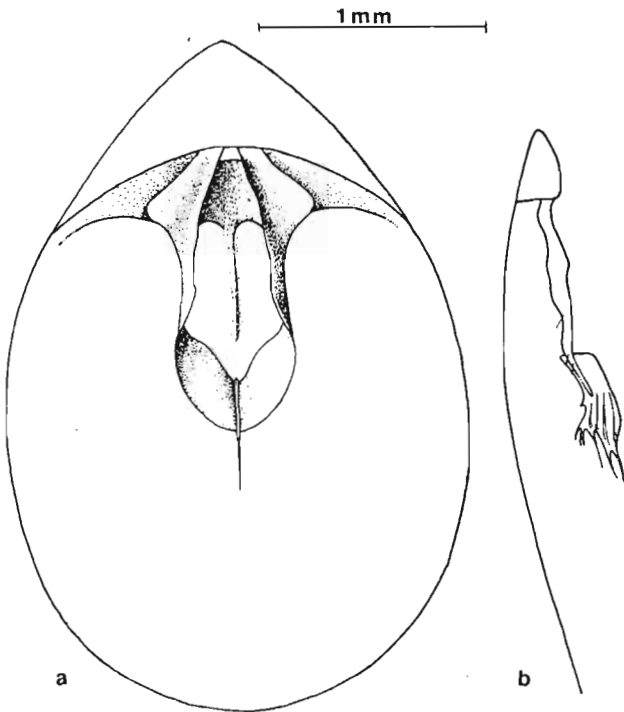


Fig. 9. *Coenothyris vulgaris* (Schlotheim), centronelli-form stage, a reconstruction of brachidium of the specimen from fig. 8. Explanation see fig. 4.

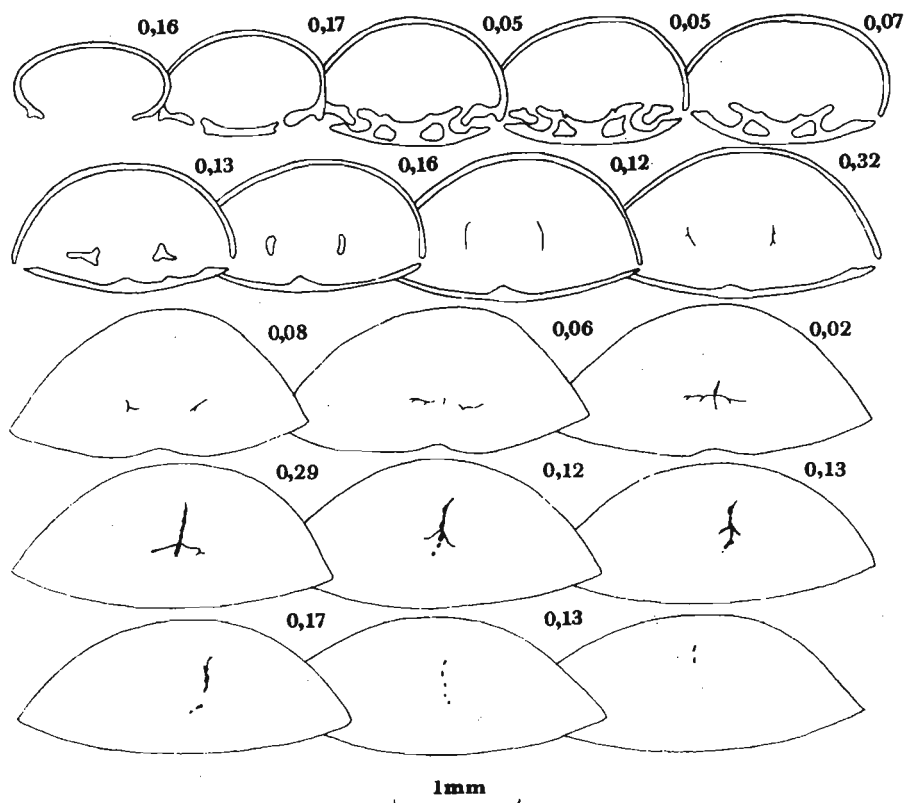


Fig. 10. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowiec; a series of transverse sections of specimen 3.5 mm long and 3.1 mm wide; ZPALWr. Br/28/I/106.

II. The centronelliform stage — 30 specimens 1.7—5.3 mm long — shows gradual forming of cardinal region and centronellid loop:

Specimens 1.7—2.0 mm long have clearly marked hinge plates (figs. 5, 6). Septum is not yet developed. In the middle part of brachial valve, at some distance from the hinge margin appears a thickening separating the adductor muscle scars (fig. 6a).

In specimens 2.3—4.2 mm long (figs. 8, 9) septal plates, crural bases and cardinal process appear (the latter appears first in a specimen 3 mm long) as well as a short septum. Septal plates and septum form a very shallow septalium (fig. 7). The smallest specimens which have been found to have septalium with relatively high septum, typical of *C. vulgaris*, are 4.5 mm long.

Brachidium at centronelliform stage consists of descending branches, joined at the anterior part (echmidium), and a vertical plate (figs. 5—13).

At this stage the loop exhibits great variability of the shape of vertical plate, its spines and ribs; anterior part of echmidium as well as width of

descending branches are variable (fig. 14c, d). In specimens with undeveloped cardinal region the descending branches of loop twist but have no crural processes. These elements become well visible in specimens longer than 2.3 mm. The descending branches may join at a sharp angle or gently pass into one another along a gentle curve to form echmidium (fig. 14a, b). Moreover, in specimens longer than 3.2 mm, the anterior part of the loop develops a ventral bending at the point where the branches join the vertical plate (fig. 11). This element is better visible at the next stage of development. Below the crural processes the descending branches are covered by more or less numerous spines of unequal length.

Vertical plate is covered by ribs which, on transverse sections, may be seen as thickenings on both sides of the plate (figs. 9b, 10). The thickenings continue into spines of unequal length. They are always longer on the

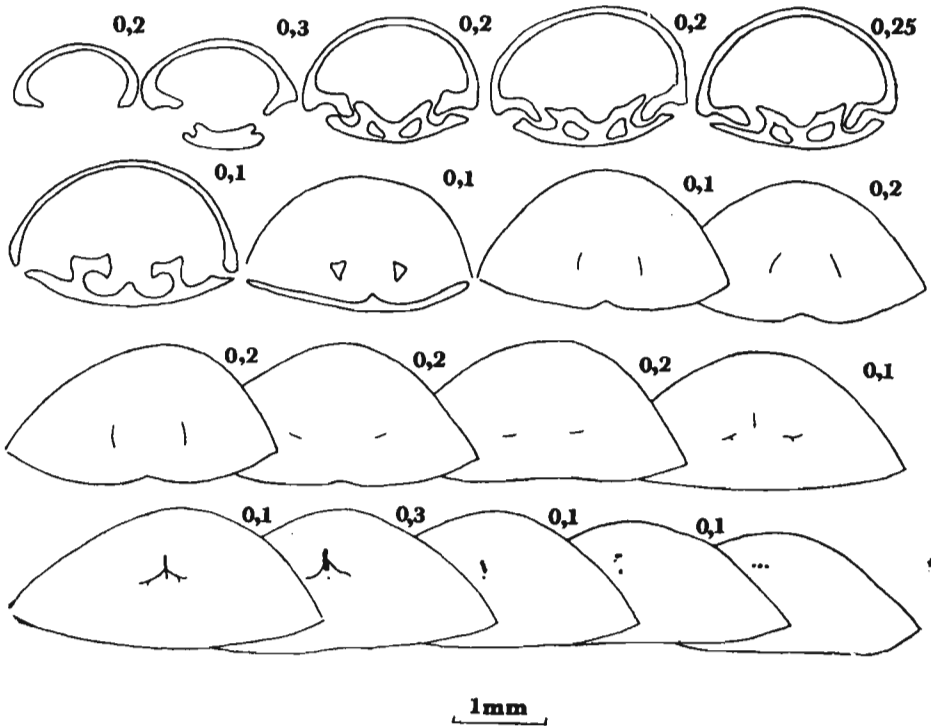


Fig. 11. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 4.5 mm long and 3.5 mm wide; ZPALWr. Br/28/I/160.

adventral side of the plate. The vertical plate varies in relative dimensions as the brachidium develops. First, it is relatively large, strong adventrally (fig. 6b), later reduced, especially in the addorsal part (fig. 13b). This reduction may be first observed in specimens 4.5 mm long. Similarly,

Table 4
Coenothyris vulgaris Schlotheim, Dziewkowice, *Terebratula* Beds: the order of appearance of shell interior elements

Length of the specimens measured (mm)	Brachidium			Cardinalium				Umbo		growth stage
	descending branches	vertical plate reduction * — weak ** — strong	ascending branches	transverse band	plates		septum	crural bases	dental plates	
					hinge	septal				
0.8—1.5	+				+					precentronelliform
1.7—2.0	+	+			+					centronelliform
2.3—3.6	+	+			+	+	+			
3.9—5.3	+	+			+	+	+			mutacionelliform
5.5—6.0	+	+					+	+		dielasmoidform
6.2—6.9	+		+	+	+	+	+	+		terebratuliform
7.0—9.5	+		+	+	+	+	+	+	+	

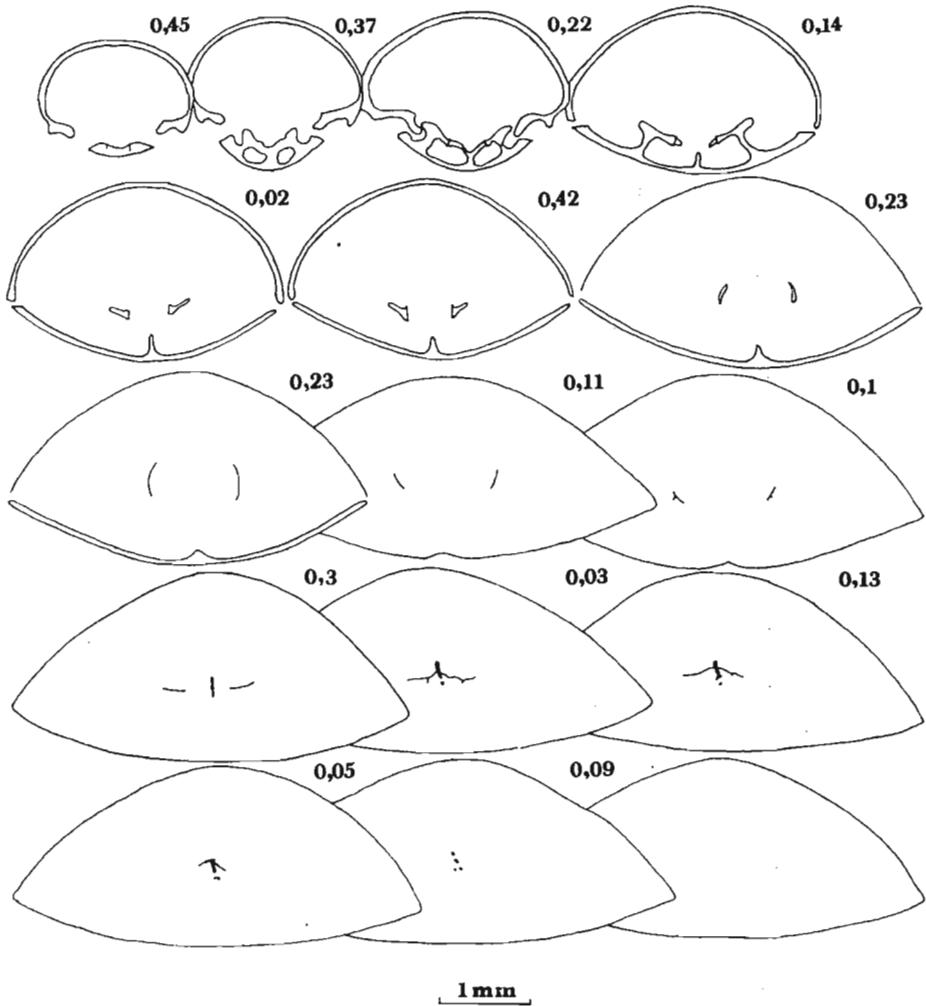


Fig. 12. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimens 5.3 mm long and 4.4 mm wide; ZPALWr. Br/28/I/115.

spines of the plate become shorter and its ribs less distinct (see anterior part of the loop in specimens 5.3 mm long, on figs. 12 and 13).

The length of the brachidium is slightly more than half-length of the brachial valve.

III. The mutacionelliform stage — 7 specimens 5.5—6.0 mm long:

No important changes in the cardinal region. In the anterior part of brachidium the echmidium splits, the descending branches divide and a triangular, gradually increasing incision is formed (figs. 15—20). At the same time the vertical plate rapidly reduces. At this stage the adventral bending of echmidium becomes clearly marked (figs. 18a, 20a).

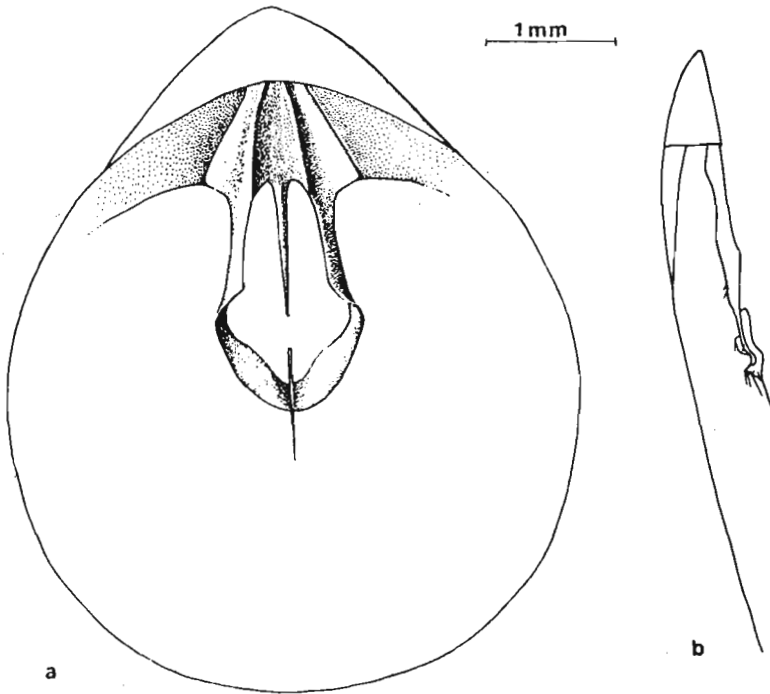


Fig. 13. *Coenothyris vulgaris* (Schlotheim), centronelliform stage, a reconstruction of brachidium of the specimen from fig. 12. Explanation see fig. 4.

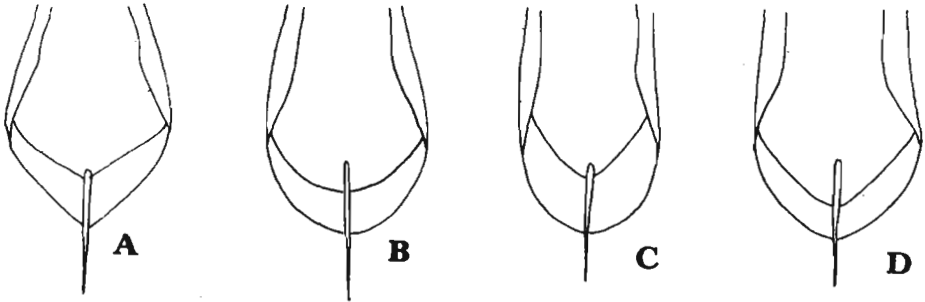


Fig. 14. A development variability of the anterior part of loop at the centronelliform stage in *Coenothyris vulgaris* (Schlotheim).

Relative length of brachidium shows a tendency to decrease and attains half length, or less of the brachial valve.

IV. The dielasmoidform (terebratuliform) stage — 12 specimens 6.2—9.5 mm long:

At this stage the vertical plate disappears. The descending branches separate completely and there appear short, ascending branches which

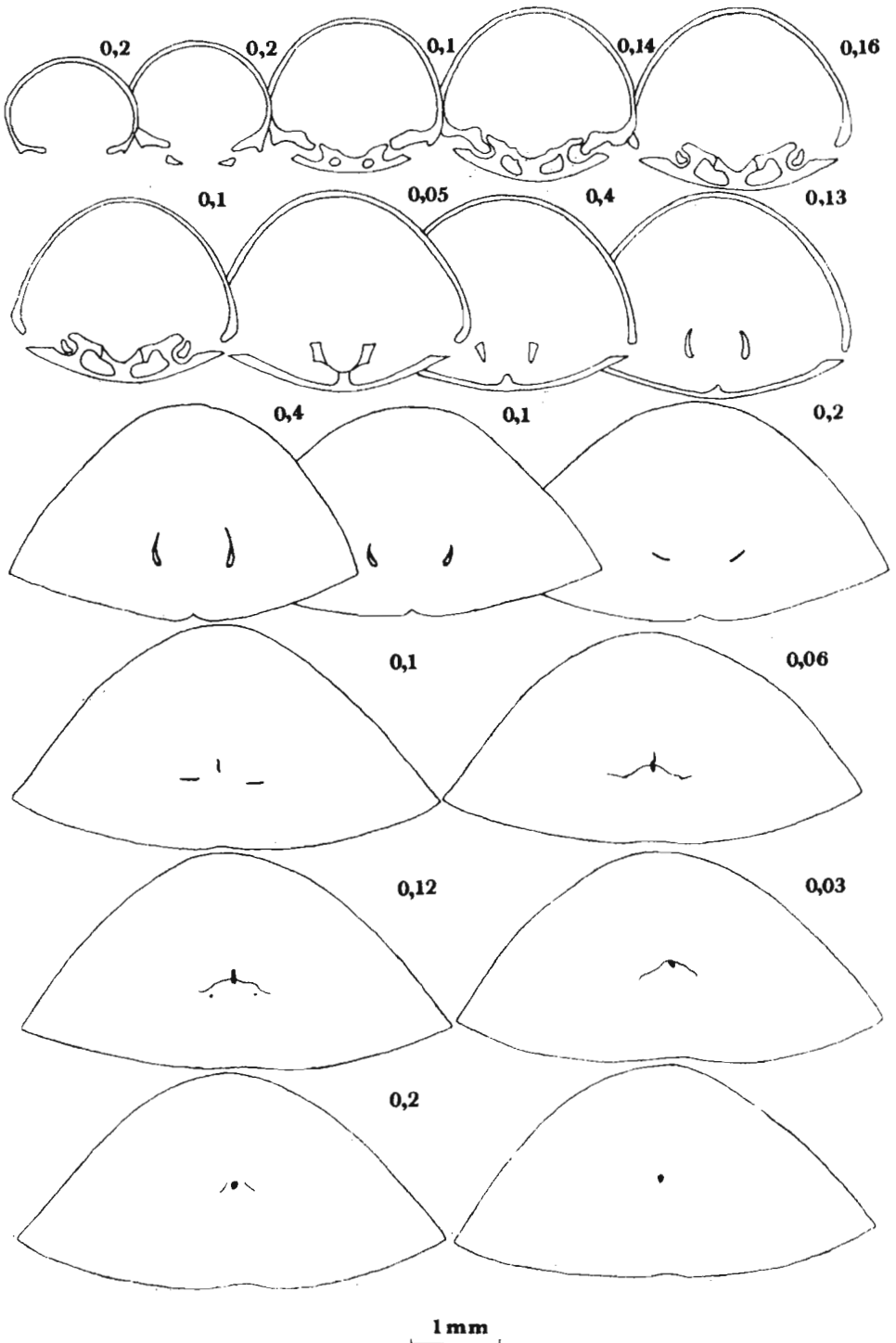


Fig. 15. *Coenothyris vulgaris* (Schlotheim) *Terebratula* Beds, Dziewkowiec; a series of transverse sections of specimen 5.5 mm long and 4.8 mm wide, ZPALWr. Br/28/I/112.

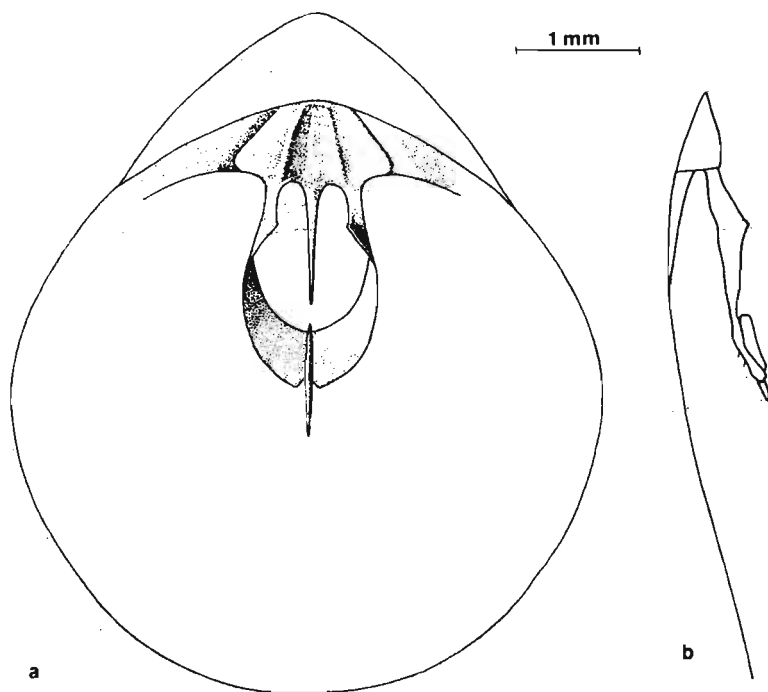


Fig. 16. *Coenothyris vulgaris* (Schlotheim), mutacionelliform stage, a reconstruction of brachidium of the specimen from fig. 15. Explanations see fig. 4.

are connected by a transverse band, formed of the ventrally bent parts of echmidium (figs. 21, 22). The descending branches gradually bend towards the pedicle valve and the brachial margin of transverse band starts to incline towards the brachial valve (figs. 23, 24). The largest specimen (9.5 mm) with the loop preserved (figs. 25, 26) shows that the width of the band doubles in relation to its width in smaller specimens (7.0—7.5 mm long). None of the 193 sectioned specimens, which might have exhibited further growth stages (10.0—36.0 mm), had a completely preserved loop.

The length of the brachidium is less than half length of the brachial valve.

Remarks. — The study of the postembryonic development of *C. vulgaris* against the few available data on other Dielasmatacea, leads to the following conclusions (see also Usnarska-Talerzak 1975):

1) Dielasmatidae (represented by *Coenothyris* and genera with similar size of adult shell: *Dielasma* — see Stehli 1965, *Rhaetina* — see Dagis 1963 and *Fletcherithyris* — see Stehli 1965 and Dagis 1972) have similar early and medium developmental stages. *C. vulgaris* varies from the other ones in

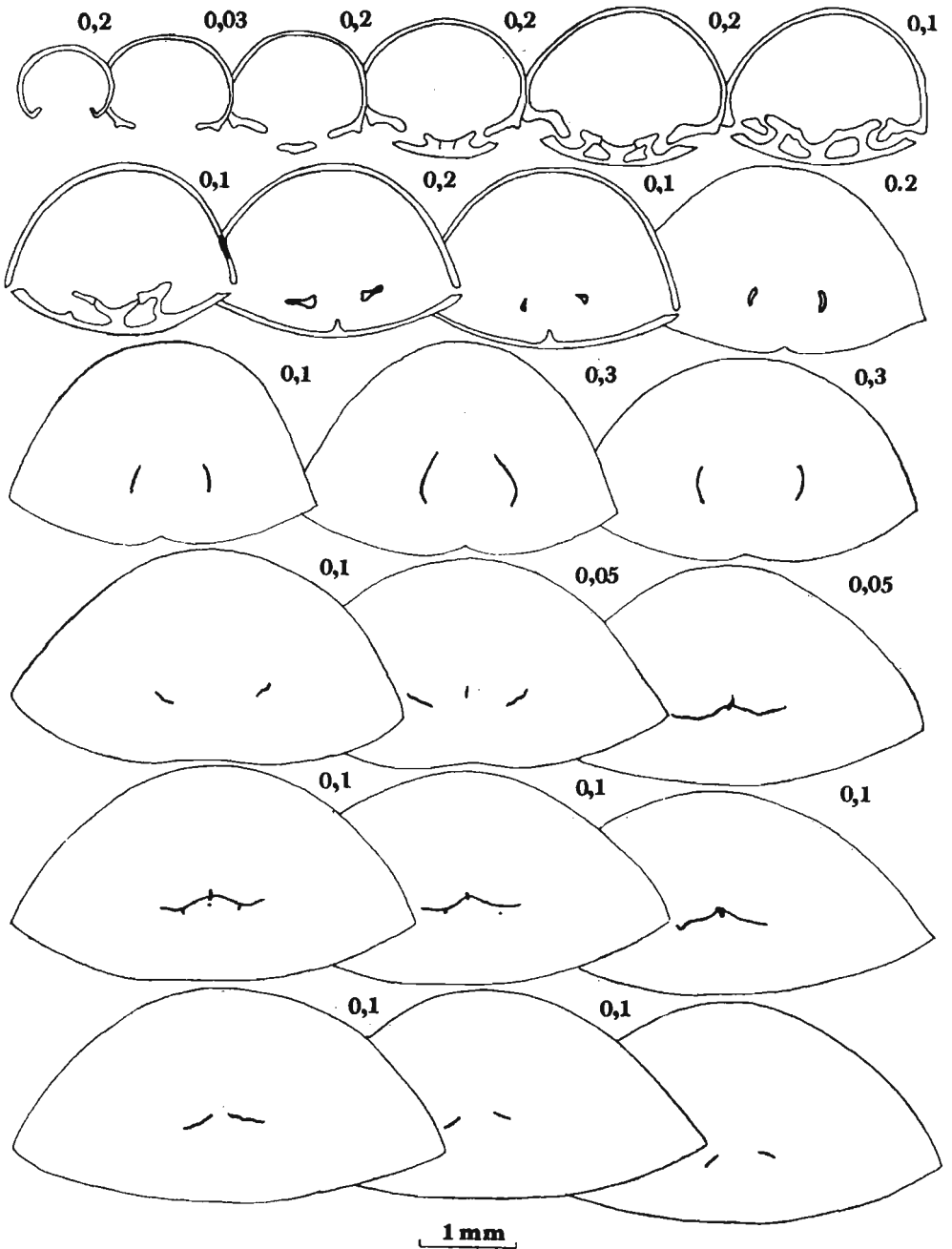


Fig. 17. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 5.8 mm long and 4.9 mm wide, ZPALWr. Br/28/I/113.

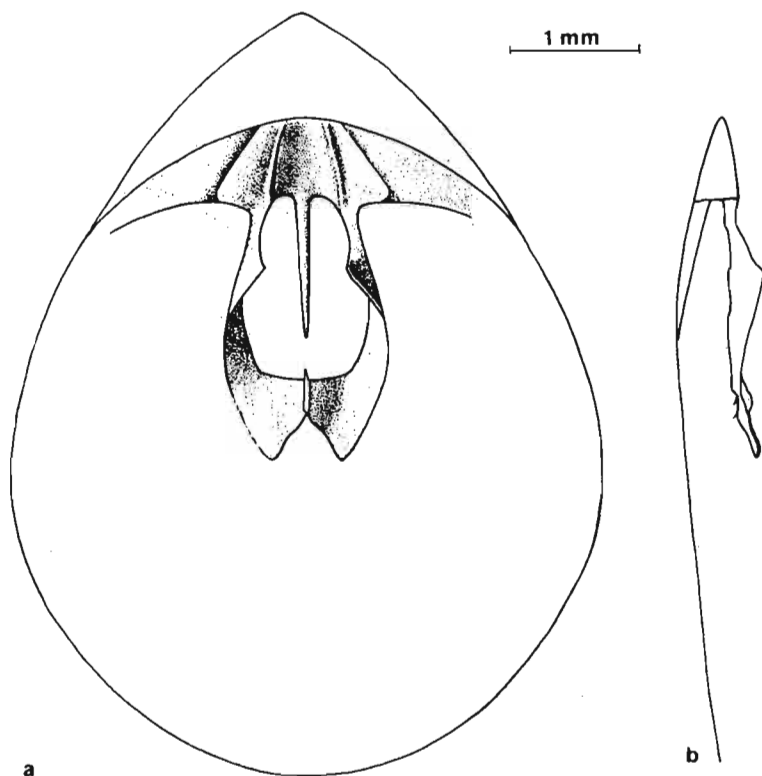


Fig. 18. *Coenothyris vulgaris* (Schlotheim); a reconstruction of brachidium of the specimen from fig. 17. Explanations see fig. 4.

relatively early (at length of 6.0—7.0 mm) developed loop close to the adult one (in *D. elongata* at 7.7 mm, in *R. elliptica* at 11.5 mm). The genera may differ in the length of individual developmental stages, e.g. the terebratulid loop appears in *C. vulgaris* and *F. margaritovi* at similar shell lengths, but in the latter genus the mutacionelliform stage lasts much longer than the centronelliform one (respective specimens 3.0—6.0 mm long), just the opposite than in *C. vulgaris* (respectively — 5.5—6.0 mm and 1.7—5.3 mm). Also in *D. elongata* the centronelliform stage (specimen 5.7 mm long) and mutacionelliform one (specimens up to 7.3 mm long) must have lasted longer than in *C. vulgaris*.

The coefficient of the development advance (Elliot 1952) of *C. vulgaris* is 0,26 and indicates rapid changes of the loop and lophophore.

2) Angustothyridae (*A. angustaeformis* — see Dagis 1972, Popiel-Barczyk and Senkowiczowa 1983, and the present paper — fig. 27 a—c) show general resemblance to dielasmatis only at the earliest stages of brachidium development (precentronelliform and centronelliform). Differences

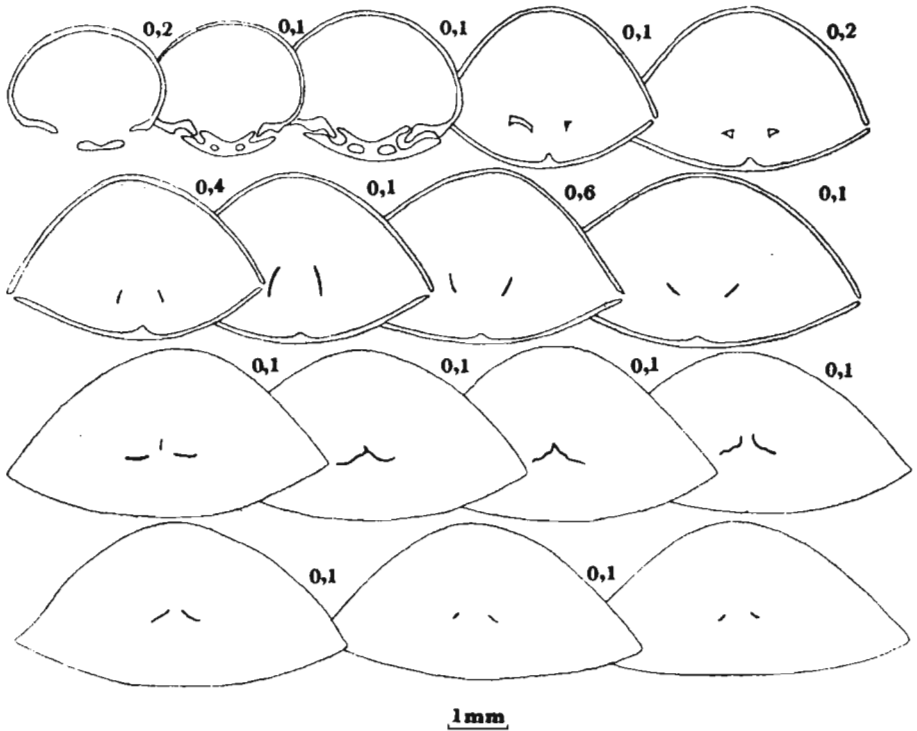


Fig. 19. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 6.0 mm long and 5.7 mm wide, ZPALWr. Br/28/I/134.

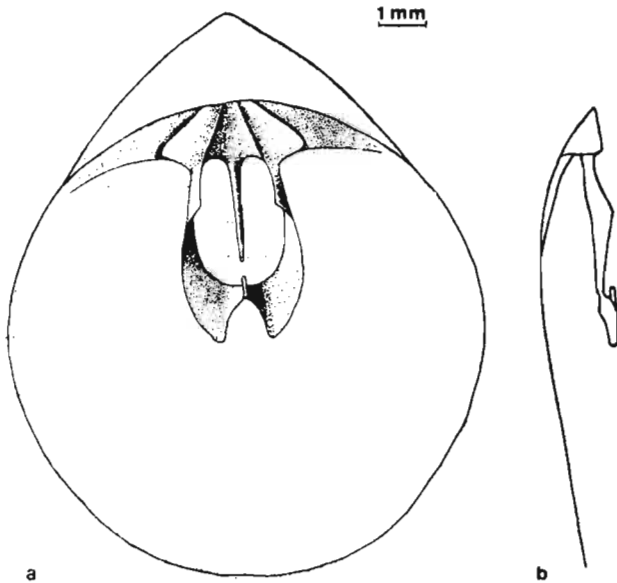


Fig. 20. *Coenothyris vulgaris* (Schlotheim), mutacionelli-form stage, a reconstruction of brachidium of the specimen from fig. 19. Explanations see fig. 4.

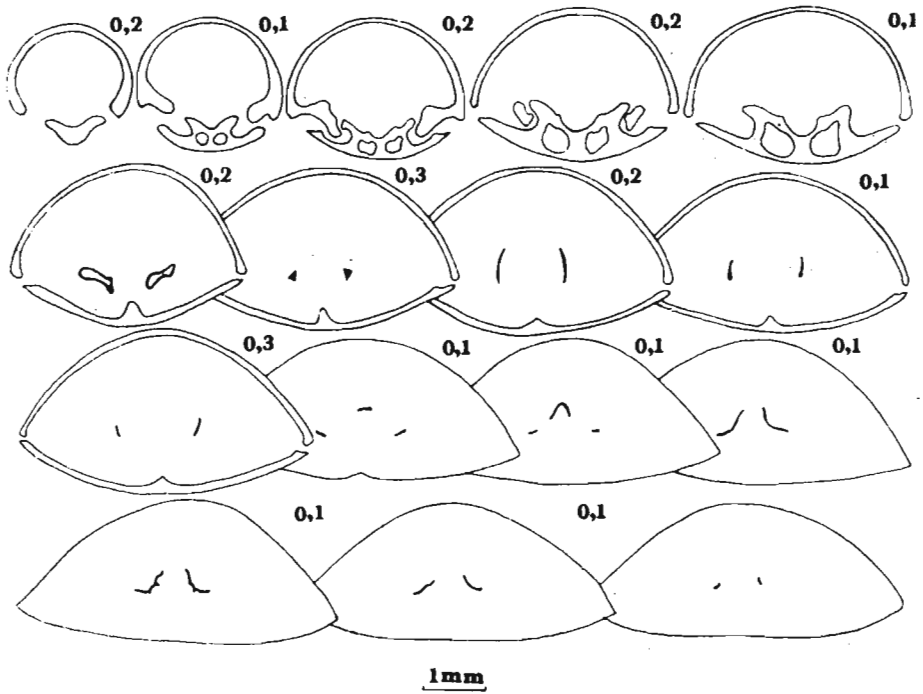


Fig. 21. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 6.3 mm long and 5.4 mm wide, ZPALWr. Br/28/I/175.

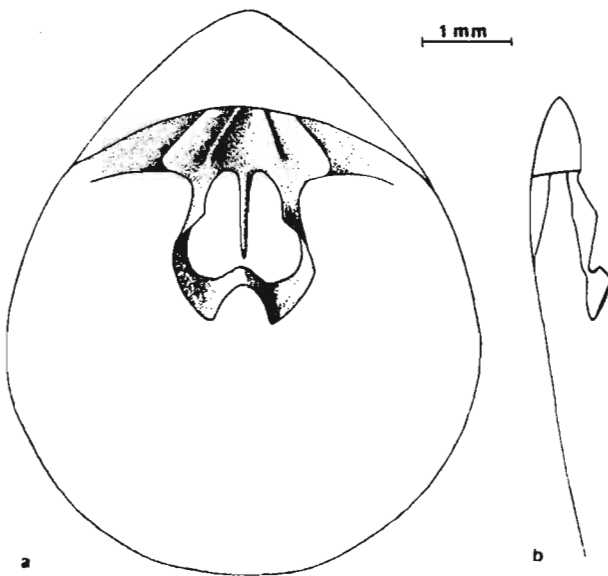


Fig. 22. *Coenothyris vulgaris* (Schlotheim), dielasmoid-form stage, a reconstruction of brachidium of the specimen from fig. 21. Explanation see fig. 4.

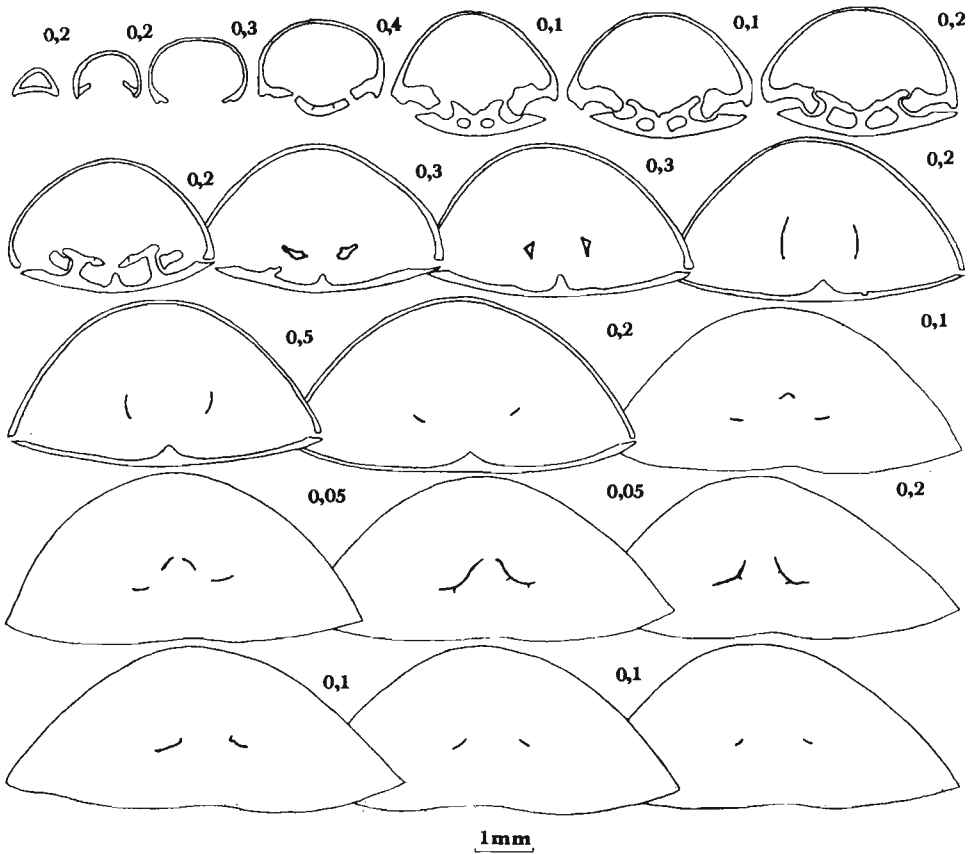


Fig. 23. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 7.4 mm long and 7.3 mm wide, ZPALWr. Br/28/I/165.

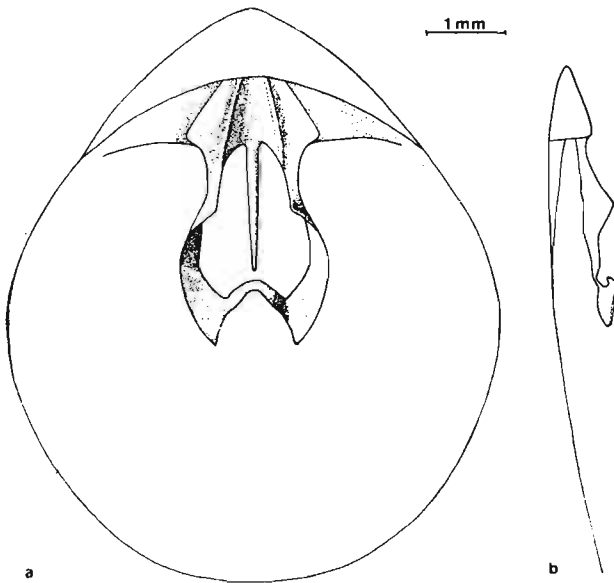


Fig. 24. *Coenothyris vulgaris* (Schlotheim), dielasmoid-form stage, a reconstruction of brachidium of a nearly adult shape—the specimen from fig. 23. Explanations see fig. 4.

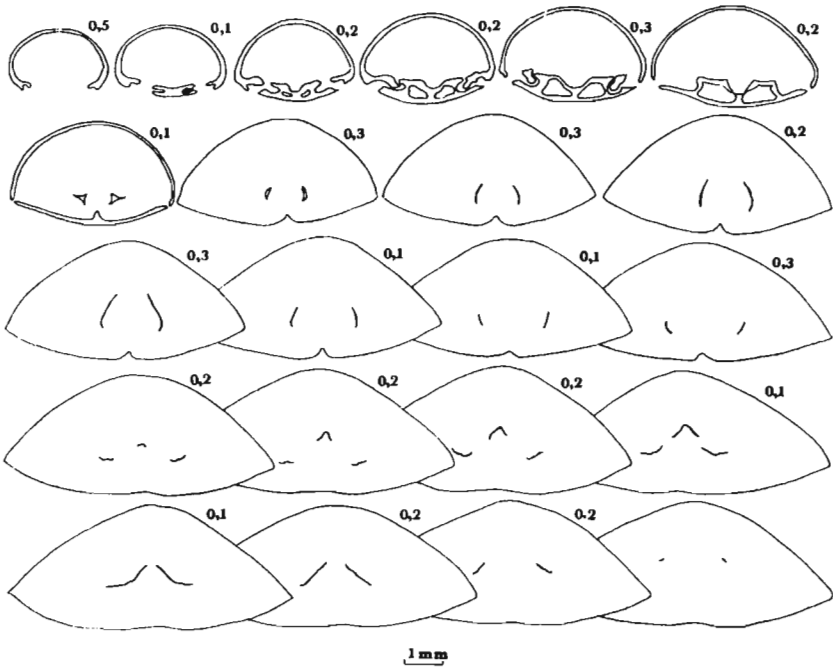


Fig. 25. *Coenothyris vulgaris* (Schlotheim), *Terebratula* Beds, Dziewkowice; a series of transverse sections of specimen 9.5 mm long and 8.5 mm wide, ZPALWr. Br/28/I/235.

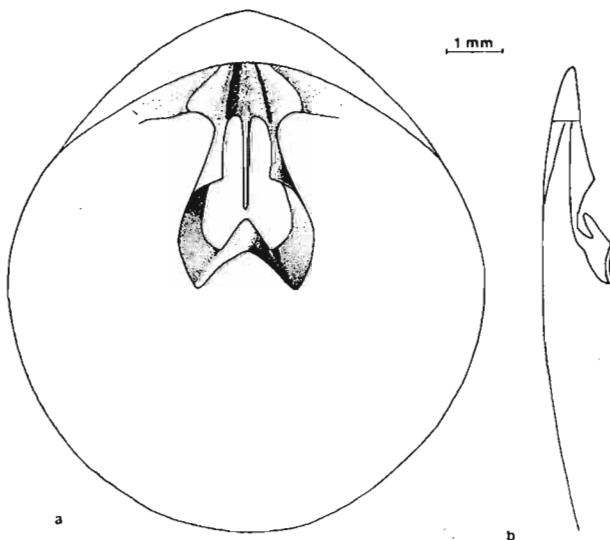


Fig. 26. *Coenothyris vulgaris* (Schlotheim), dielasmoid-form stage, a reconstruction of an adult shape of brachidium of the specimen from fig. 25. Explanations see fig. 4.

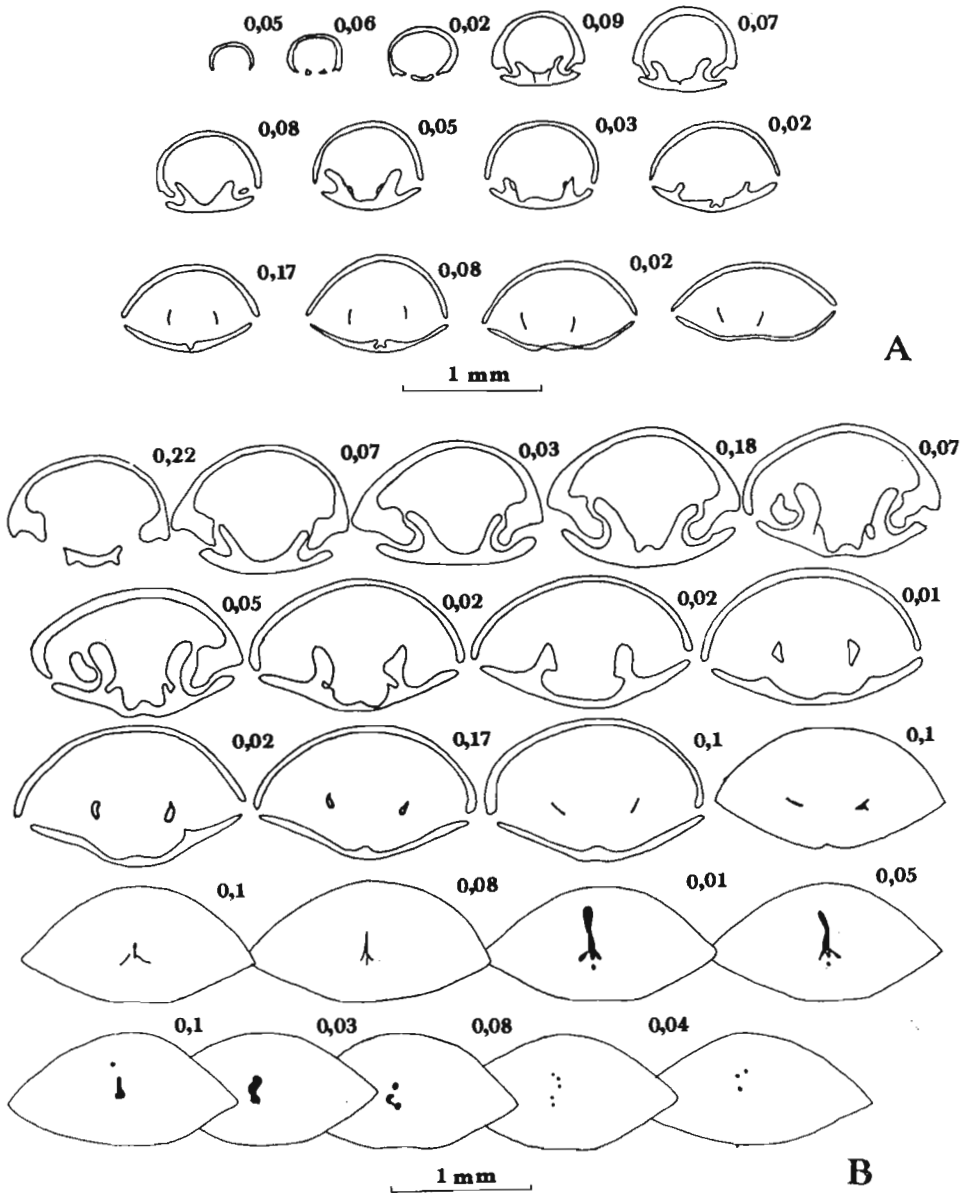
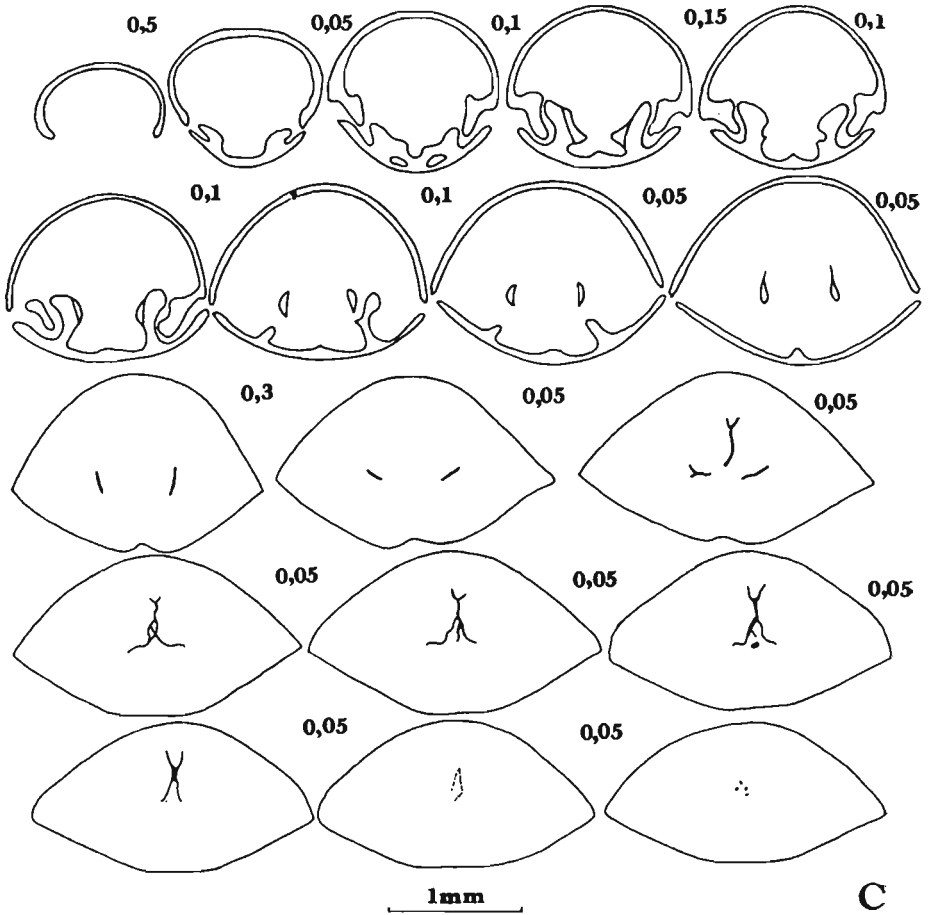


Fig. 27. *Angustothyris angustaeformis* (Boeckis), *Terebratula* Beds, Dziewkowice; series of transverse sections of specimens: A—1.5 mm long and 1.2 mm wide, ZPALWr. Br/28/IV/1, B—2.5 mm long and 1.7 mm wide, ZPALWr. Br/28/IV/3, C—3.5 mm long and 3.5 mm wide, ZPALWr. Br/28/IV/4.



(Fig. 27: continued, explanation on the preceding page)

in the cardinalium structure can be seen as early as the precentronelliform stage (in *A. angustaeformis* — present high crests at dental grooves — fig. 27a).

3) Aulacothyroideidae (represented by *Aulacothyroides sudzuchensis* — see Dagus 1972, and *Aulacothyroides* sp. — the present paper, figs. 28—30), in general, develop similarly to dielasmatids in the early and medium stages (centronelliform, mutacionelliform). The main difference between the families at these stages is faster tempo at which skeletal structures appear in aulacotyroids.

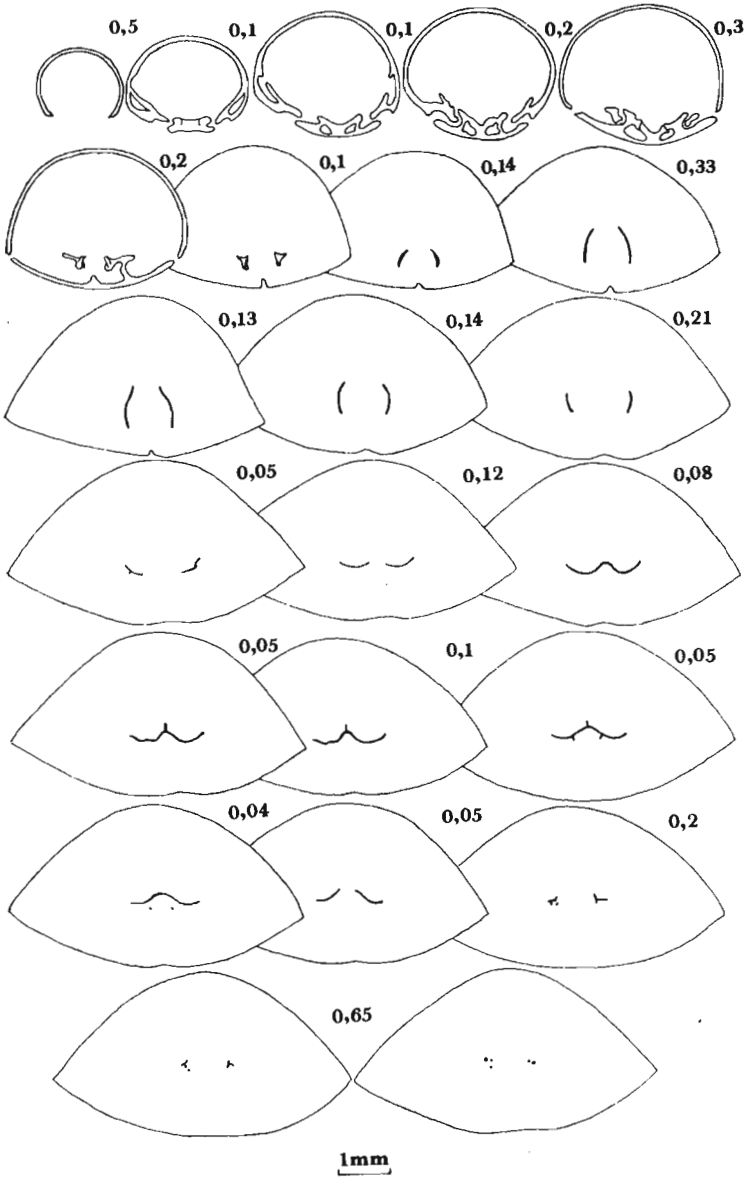


Fig. 28. *Aulacothyroides* sp., *Terebratula* Beds, Dziewkowice, a series of transverse sections of specimen 6.5 mm long and 5.6 mm wide, ZPALWr. Br/28/V/405. Reconstruction of the brachidium on fig. 30.

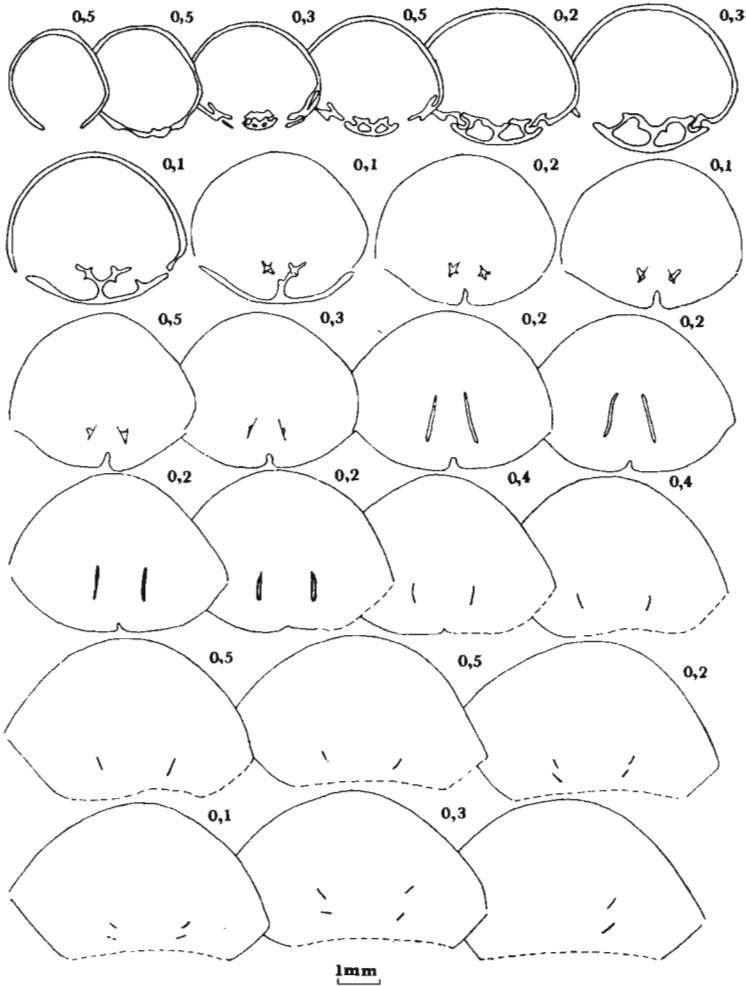


Fig. 29. *Aulacothyroides* sp., *Terebratula* Beds, Dziewkowice, a series of transverse sections of specimen 19.5 mm long and 17.8 mm wide, ZPALWr. Br/28/V/411.

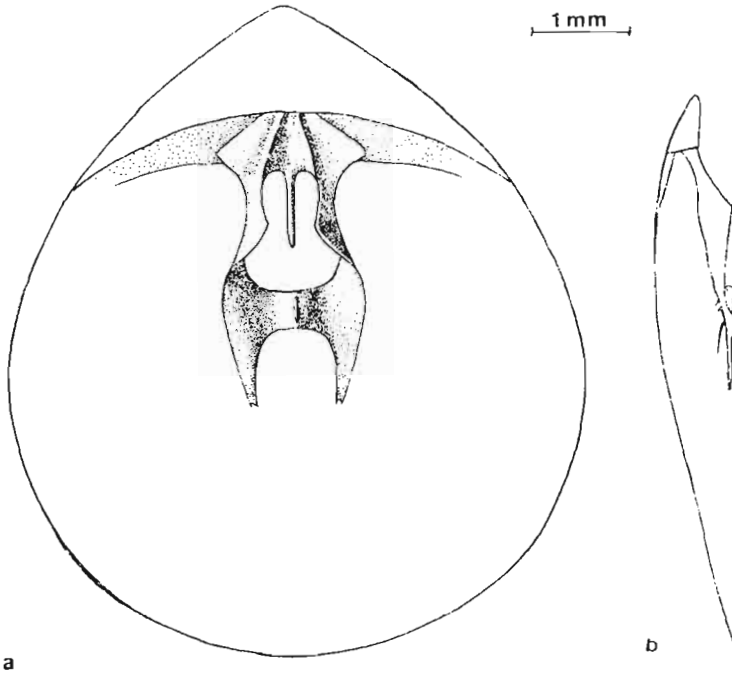
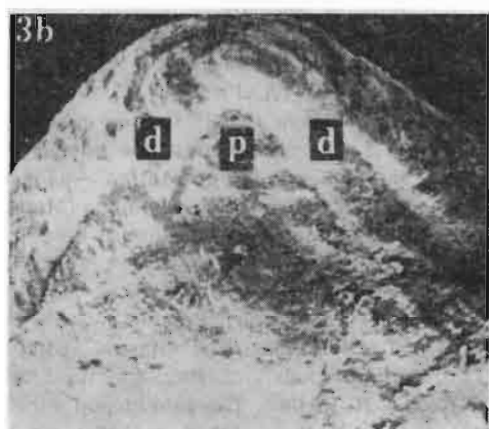


Fig. 30. *Aulacothyroides* sp., a reconstruction of brachidium of the specimen from fig. 28. Explanation see fig. 4.

Fig. 31. *Coenothyris vulgaris* (Schlotheim), Middle Triassic, *Terebratula* Beds, Dziewkowice

1. Specimen ZPALWr. Br/28/V/537, SEM, $\times 98$. 2. Specimen ZPALWr. Br/28/670, SEM \times ca. 59. 3. Specimen ZPALWr. Br/28/V/692, SEM, a \times ca. 20, b \times 56; p pedicle opening, d deltidial plates. 4. Specimen ZPALWr. Br/28/V/516, \times ca. 4. 5. Specimen ZPALWr. Br/28/V/498, \times ca. 3. 6. Specimen ZPALWr. Br/28/V/487, \times ca. 2.6. All in brachial valve view

All in brachial valve view



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MORFOLOGIA I POSTEMBRIONALNY ROZWÓJ *COENOTHYRIS VULGARIS*
(SCHLOTHEIM) (BRACHIOPODA, TRIAS ŚRODKOWY)

Streszczenie

Przedmiotem pracy są badania nad *Coenothyris vulgaris* (Schlotheim) oparte na materiale z warstw terebratulowych (dolny wapień muszlowy) z czterech stanowisk Śląska Opolskiego (fig. 1).

Do badań wnętrza muszli zastosowano metodę szlifów seryjnych i rekonstrukcji. Zeszlifowano 300 okazów *C. vulgaris*. Charakteryzując zmienność budowy zewnętrznej *C. vulgaris* obliczono wskaźniki procentowe szerokości i grubości (tabela 2) oraz badano związki zależności między tymi wielkościami a długością (fig. 2).

Bogata kolekcja muszli *C. vulgaris* reprezentuje różne stadia rozwojowe (długość okazów waha się od 0,8 do 36,4 mm). Liczne juwenilne okazy tego gatunku umożliwiły przebadanie rozwoju brachidium w tym również stadiów bardzo wczesnych. Wyróżniono następujące stadia rozwoju brachidium: stadium precentronellowe (fig. 3—4), stadium centronellowe (fig. 5—14), stadium mutacjonellowe (fig. 15—20) i stadium terebratulowe (fig. 21—26).

Zbadanie licznych zeszlifowanych muszli *C. vulgaris* pozwoliło również prześledzić pojawianie się płytek zębowych (tabela 3). Badania te wykazały, że płytki zębowe są cechą charakterystyczną dla tego gatunku, ale pojawiają się w późniejszych stadiach rozwojowych (w badanym zbiorze wszystkie okazy dorosłe, powyżej 22,5 mm długości muszli miały płytki zębowe). Kolejność pojawiania się wewnętrznych elementów szkieletowych u *C. vulgaris* przedstawia tabela 4.

Porównanie rozwoju brachidium u *C. vulgaris* i u przedstawicieli Dielasmatidae wykazuje różnice w tempie pojawiania się poszczególnych elementów szkieletowych i czasie trwania kolejnych stadiów rozwojowych. Współczynnik zaawansowania rozwoju u *C. vulgaris* wynosi 0,26 i wskazuje na szybkie modyfikacje pętli i loforu.

Rozwój wnętrza muszli *C. vulgaris* w porównaniu z przedstawicielami Angustothyridae i Aulacothyroideidae wykazuje podobieństwo tylko we wczesnych stadiach (por. figs. 27—30).