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STRUCTURE AND ONTOGENY OF *KOZLOWSKIOCYSTIA POLONICA* (STASIŃSKA, 1958)

Abstract. — The genus *Kozlowskia* from the Couvinian of Grzegorzowice in the Holy Cross Mountains (Góry Świętokrzyskie), assigned to a new family Kozlowskiidae, was erected by the writer in 1958. Now, on the basis of a new material, supplementary observations have been made concerning the structure of wall and ontogenetic development. At the same time, since the name of *Kozlowskia* was preoccupied (Fredericks, 1933), new generic and family names have been introduced.

INTRODUCTION

In 1958, a representative of the order Auloporida from the Couvinian of Grzegorzowice in the Holy Cross Mountains (Góry Świętokrzyskie) was described by the present writer under the name of *Kozlowskia*. Since this genus displays several characters which do not occur in other families assigned to the order Auloporida Sokolov, a new family Kozlowskiidae was erected to include it. In the shape of corallites and incrusting colonies, it is related to the representatives of the family Auloporidae Milne-Edwards & Haime, from which it differs, however, in the presence of a vesicular tissue. Such a tissue is also known in the representatives of the family Aulocystidae Sokolov, but there it is formed of vesicular tabulae.

After the examination of a new material from the same locality, supplementary observations were made concerning the structure of wall and ontogenetic development traced in corallites developed by budding. At the same time, since the name of *Kozlowskia* was already earlier used to designate a brachiopod (Fredericks, 1933), the genus has been renamed *Kozlowskiocystia*.

The colonies here described are housed at the Palaeozoological Institute of the Polish Academy of Sciences (abbreviated as Z. Pal.). The drawings were prepared by Mrs. K. Budzyńska, photographs by Miss M. Czarnocka and thin sections by Mrs. M. Nowińska (all from the Institute mentioned above).

DESCRIPTION

Subclass **Tabulata**
Order **Auloporida** Sokolov, 1962
Family **Kozlowskiocystidae** nom. nov.
pro **Kozlowskiidae** Stasińska, 1958

Revised diagnosis. — Colonies small, closely adhering to the substratum by the entire basal part. Incrusting corallites form branching, non-anastomozing colonies. Calyces slightly raised over the substratum and widely open. Epitheca thick, composed of radially disposed fibers, with growth wrinkles on its surface. Inner wall thin, built of wavily arranged fibers. A layer of vesicular tissue occurs between epitheca and inner wall. Septal spines and pores lacking. Tabulae horizontal, unequal, incomplete or vesicular. Reproduction by intracalicinal budding within the dissepimentarium.

Genus *Kozlowskiocystia* nom. nov. pro *Kozlowskia* Stasińska, 1958

Type species: *Kozlowskia polonica* Stasińska, 1958.

Derivation of the name: *Kozlowskiocystia* — in honour of Professor Roman Kozłowski; Gr. *kystis* — on account of the occurrence of a vesicular tissue.

Diagnosis of the genus is identical with that of the type species.

Kozlowskiocystia polonica Stasińska, 1958
((Pls. I, II; Text-figs. 1-3)

1958. *Kozlowskia polonica* Stasińska; A. Stasińska, Tabulata..., pp. 221—222, Pl. 33, Figs. 1—3.

Revised diagnosis. — Colonies incrusting and forming branches consisting of corallites multiplying by intracalicinal budding within dissepimentarium. Corallites conical, elongate, with a distal part slightly raised over the substratum. The length of corallites amounts to 11 mm and the largest diameter to 4.3×2.5 mm. Epitheca thick, inner wall thin. A vesicular tissue, forming a wide cuff on the basal side attached to the substratum, occurs between epitheca and inner wall. The largest thickness of the vesicular layer amounts to 1 mm. Septal spines and pores lacking. Tabula few, unequal, incomplete or vesicular, occurring in the proximal part of corallite. Budding intracalicinal, within the vesicular tissue. One or two corallites are thus formed.

Material. — Twenty-two colonies, 15 thin sections.

Description. — Colonies incrusting skeletons of foreign organisms, branching by budding one or two corallites (Pl. I, Figs. 1, 2*a*) which do not anastomoze with each other, but here and there are grouped in tuffs (Pl. I, Fig. 1). They are conical and adhere to the substratum over their entire length as far as the point of formation of a new corallite. Distal part slightly raised over the substratum in the place in which the young corallite detaches itself from the parent individual. Corallites usually reach 8—9 mm in length, less frequently 11 mm. In transverse section corallites are at first round and then gradually become flatter and oval. Their largest diameters reach 4.3×2.5 mm. Epitheca thick, reaching 0.7 mm, built of thick, radially arranged fibers (Pl. II, Fig. 3). Outer surface of epitheca covered with growth wrinkles which are thickened every 2—3 mm (Pl. I, Fig. 2*b*). Thicker growth wrinkles were probably developed in the places in which the growth of the corallite was interrupted. Inner wall thin (Pl. II, Fig. 1), reaching only 0.03 mm in thickness and composed of thick, wavily arranged fibers (Pl. II, Fig. 2 *a-b*). Such an arrangement of fibers results in the folding of the inner surface of wall, folds being short and in some places forming mere nodes (Pl. II, Fig. 3). A vesicular tissue (Pl. II, Fig. 1), forming a sort of a cuff, the widest in the corallite's attachment place, occurs between epitheca and inner wall. This layer is at most 1 mm or, less frequently, 1.1 mm thick. Vesicles, varying in size, are mostly large with a diameter reaching 0.6 mm.

Tabulae occur in the basal, proximal part of corallite. They are horizontal, slightly concave, incomplete or vesicular. Since they occupy only 1/4 of the length of corallite we may conclude that the polyp was elongated (7—9 mm) and occupied considerable part of calyx.

Septal spines and pores lacking.

Ontogenetic development. — The ontogenetic development was investigated on the corallites which were formed by budding. The following four stages were distinguished: 1) the appearance of basal plate, 2) the formation of inner wall, 3) the appearance of epitheca and tabulae, 4) the formation of dissepimentarium between epitheca and inner wall.

Stage 1 is characterized by the formation of basal plate shaped like a lens 0.2×0.15 mm in diameters. Basal plate is developed near inner wall (Fig. *1a*). At the moment of the appearance of a young individual, the parent corallite is oval in transverse section, 1.7×1.5 mm in diameter and about 4 mm long.

Inner wall is formed in stage 2 when the young corallite is shaped like a flattened tube with a lenticulate transverse section.

In the initial phases of stages 1 and 2, when the bud was small, it did not exert any influence on the internal morphology of the parent

corallite. However, the bud grew rapidly and soon it occupy nearly a half of the space, previously occupied by the vesicles of the parent individual. Reaching a height of 0.3 mm the young bud was still flattened, lenticulate

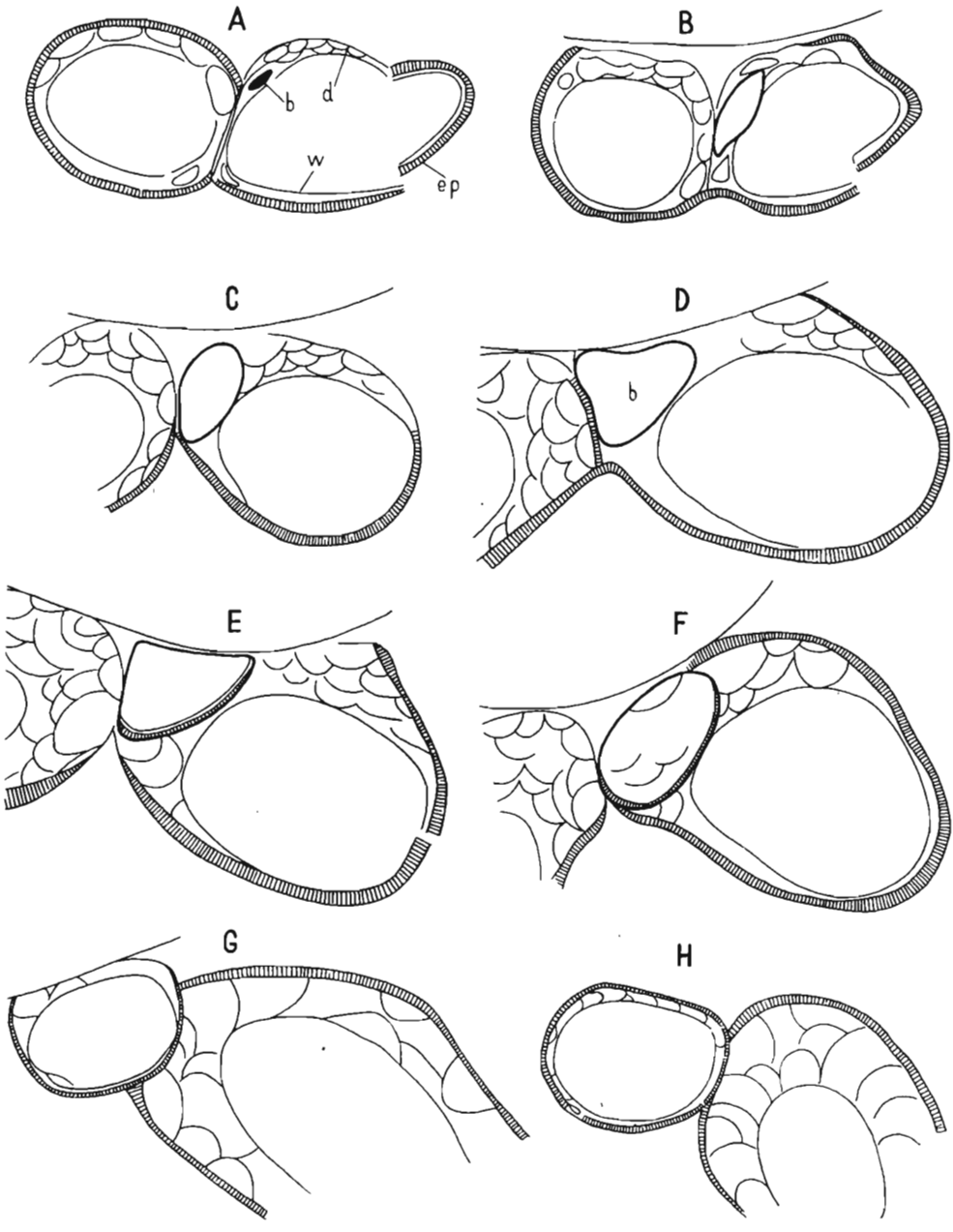

Fig. 1. — *Kozlowskiocystia polonica* (Stasińska): *A-H* serial transverse sections through a budding corallite; *A* appearance of a basal plate, *B-D* formation of inner wall, *A-F* appearance of epitheca, *G-H* appearance of dissepimentarium; *ep* epitheca, *w* inner wall, *b* bud, *d* dissepiments (Z. Pal. T. II-501/22); ×30.

in transverse section and 0.4×0.2 mm in diameters. During that period, its thin wall had its convexity directed to the inner cavity of the parent corallite (Fig. 1b). After a rapid growth up to 0.6 mm, the young corallite

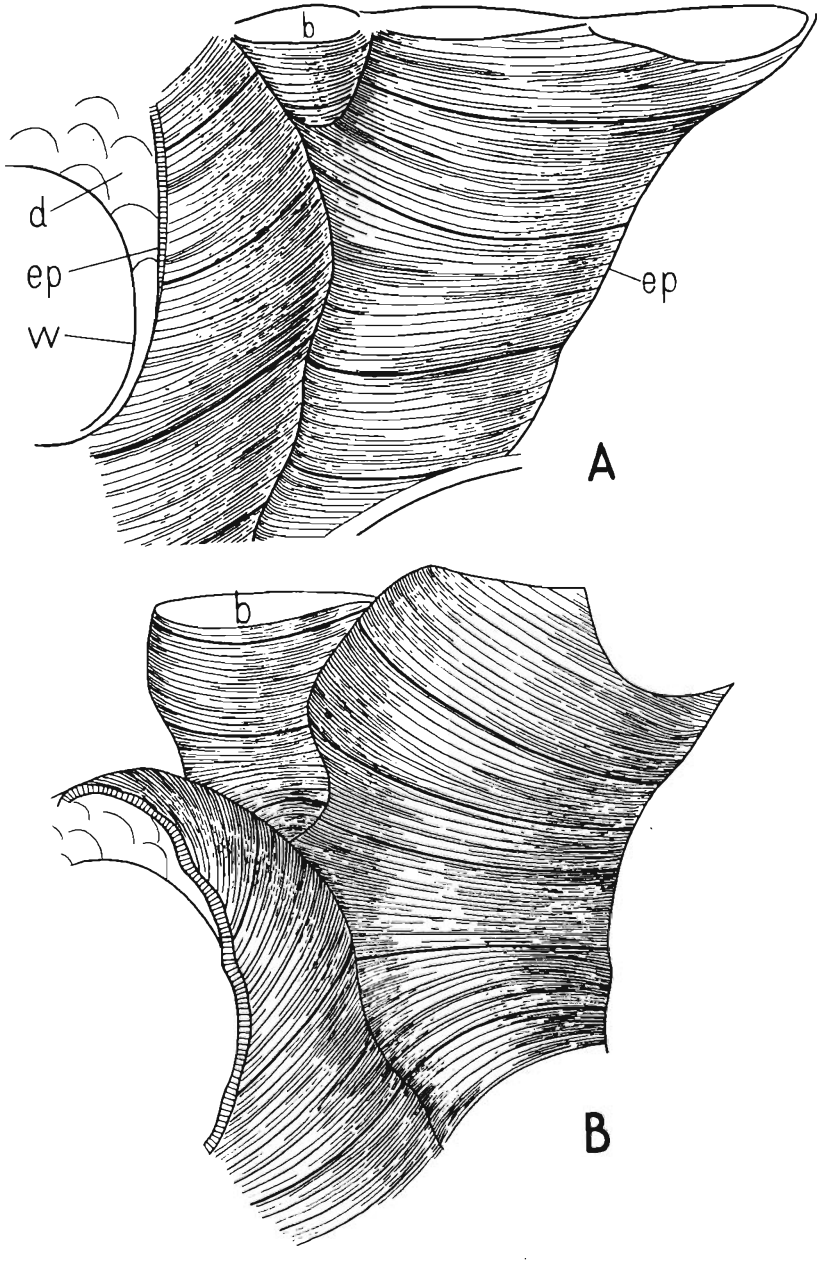

Fig. 2. — *Kozlowskiocystia polonica* (Stasińska): *A-B* young corallite visible on the surface of a parent individual, *ep* epitheca, *w* inner wall, *b* bud, *d* dissepiments (Z. Pal. II-501/23); ×30.

became oval in transverse section and reached 1×0.4 mm in diameters. Its thin wall was slightly convex towards the inner cavity of the calyx of the parent corallite. In this stage, the new individual became visible, in the form of a slight protuberance, also on the outer side. The shape of its transverse section gradually passes from oval to triangular (Fig. 1*d*) and its diameters reach 1.0×0.7 mm.

Stage 3 was characterized by the formation of epitheca which appeared on the surface of the new corallite contained still inside the vesicular tissue of the parent corallite (Fig. 1*e*). During its further growth, the young corallite was still irregular in transverse outline and started to emerge gradually from the vesicular zone. Little by little, its transverse section once again became oval. After reaching 0.9 mm in height, it was clearly visible on the surface of the parent corallite in the form of a small pocket 0.3 mm high (Figs. 1*f*, 2*a*). Beginning with this stage, in which tabulae already appeared, the young individual rapidly got out of the parent corallite.

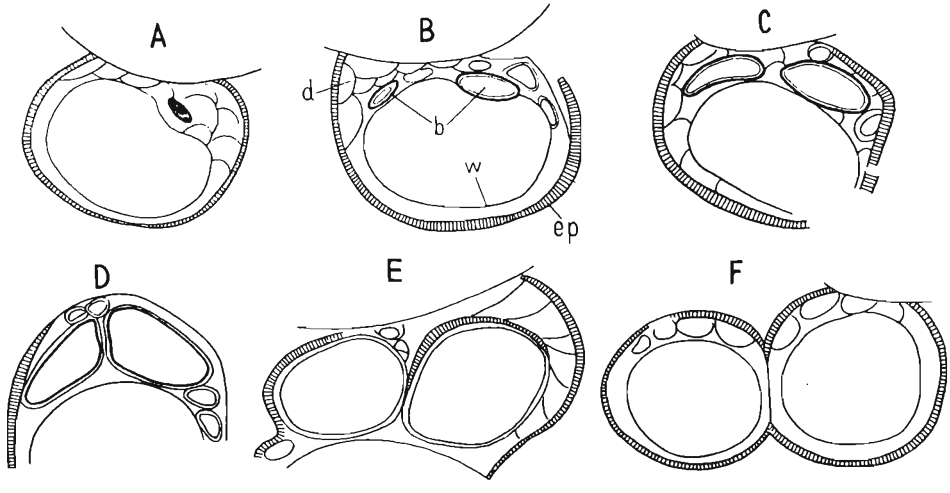

Fig. 3. — *Kozlowskiocystia polonica* (Stasińska): *A-F* serial transverse sections through a budding corallite in the case of the formation of two young individuals, *ep* epitheca, *w* inner wall, *b* bud, *d* dissepiments (Z. Pal. T. II-501/22) ×30.

The inner wall and epitheca separated from each other in stage 4, in which the vesicular tissue appeared between them. The young corallite, already about 2.3 mm high, was not yet completely separated from the parent individual. Its part thrust outside was a tube 0.6 mm high and 1 mm in diameter. After reaching a height of 2.5 mm, the young corallite rapidly separated from its parent and grew as an independent individual whose transverse section became round (Fig. 1 *g-h*). After getting out of the young corallite, the parent individual slightly rised but only to

the height, which was necessary for the development of a next new corallite.

In the case of the formation of two buds, they did not appear simultaneously but successively (Fig. 3 *a-h*). Their development was the same as that of a single bud. For a certain time, descendant corallites having epithecae, still grew near each other separated by a thin wall. Afterwards, they rapidly separated from each other and grew at a small angle in opposite directions.

Remarks. — A similar type of budding occurs in the suborder Amphiastraeida Alloiteau, 1952 (Hexacoralla) and is known under the name of "pocket budding" or "Taschenknospung" (Ogilvie, 1897; Alloiteau, 1957; Roniewicz, 1966). The pocket type, intracalicinal, marginal budding is unknown in the representatives of other Hexacoralla. In the case of the pocket type budding, buds are contained in a small pocket formed by the doubling of the wall.

No similar manner of marginal budding which, independently of septa, would be related to dissepimentarium, has ever been described in the Rugosa corals.

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BUDOWA I ONTOGENEZA *KOZLOWSKIOCYSTIA POLONICA* (STASIŃSKA, 1958)

Streszczenie

W 1958 r. został ustanowiony przez autorkę rodzaj *Kozlowskia* z kuwinu Grzegorzowic w Górach Świętokrzyskich. Dla tego rodzaju wprowadzono (1958) nową rodzinę Kozlowskiidae. Obecnie, na podstawie nowego materiału, dokonano uzupełniających obserwacji, dotyczących budowy ściany i rozwoju ontogenetycznego. Jednocześnie została zmieniona nazwa rodzajowa, ponieważ nazwa *Kozlowskia* była już wprowadzona wcześniej (Fredericks, 1933).

Rozwój ontogenetyczny prześledzono na koralitach, powstałych przez pączkowanie wewnątrzkielichowe w obrębie dissepimentarium, przy czym powstają jeden lub dwa korality. Wyróżniono 4 fazy rozwoju ontogenetycznego: 1) pojawienie się blaszki podstawowej, 2) powstanie ściany wewnętrznej, 3) pojawienie się epiteki i denek, 4) powstanie dissepimentarium pomiędzy epiteką i ścianą wewnętrzną. W przypadku powstania dwóch pączków, pojawiają się one kolejno, a nie jednocześnie. Rozwój ich przebiega tak samo, jak w przypadku powstania jednego pączka.

АННА СТАСИНЬСКА

СТРУКТУРА И ОНТОГЕНЕЗ *KOZLOWSKIOCYSTIA POLONICA* (STASIŃSKA, 1958)

Резюме

В 1958 г. автором был установлен новый род табулят *Kozlowskia* из кувинского яруса местности Гжегожовице в Свентокшиских Горах. На новых материалах автор провел ряд дополнительных наблюдений, касающихся, в частности, структуры стенки и онтогенеза. Одновременно первичное родовое название *Kozlowskia* автор заменяет названием *Kozlowskiocystia*, так как предыдущее было преоккупировано (Fredericks, 1933).

Онтогенетическое развитие автор проследил на кораллитах, возникших путем внутричашечного почкования в диссепиментариум. Так возникают один или два кораллита. Автор выделяет 4 стадии развития: 1) образование базальной пластинки, 2) образование внутренней стенки, 3) образование эпитеки и табул, 4) образование диссепиментариума между эпитекой и внутренней стенкой. В случае образования двух почек, они появляются поочередно и развиваются также, как и в случае одной почки.

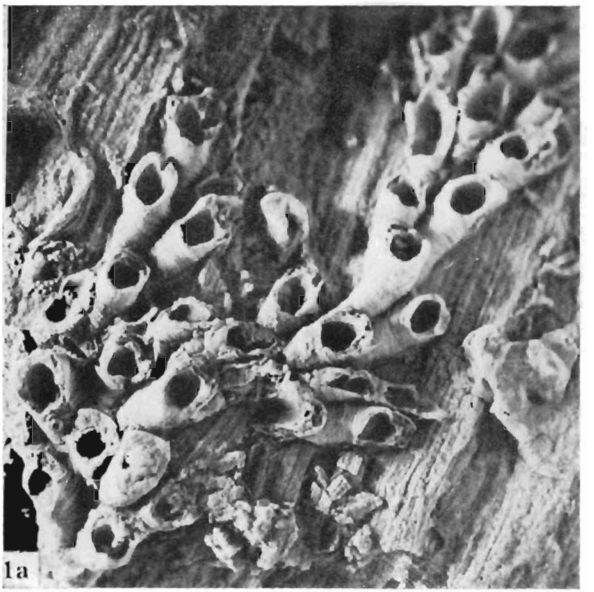
PLATES

Plate I

Kozlowskiocystia polonica (Stasińska)
Grzegorzowice, Couvinian

Fig. 1. *a* Fragmentary colony with individuals grouped in bunches, ×3.2; *b* an inner surface of the wall with the folds and cusps visible, ×25 (Z. Pal. T. II-502).

Fig. 2. *a-b* Holotype, a colony incrusting a bryozoan's skeleton; *a* ×55, *b* ×10 (T. II-501).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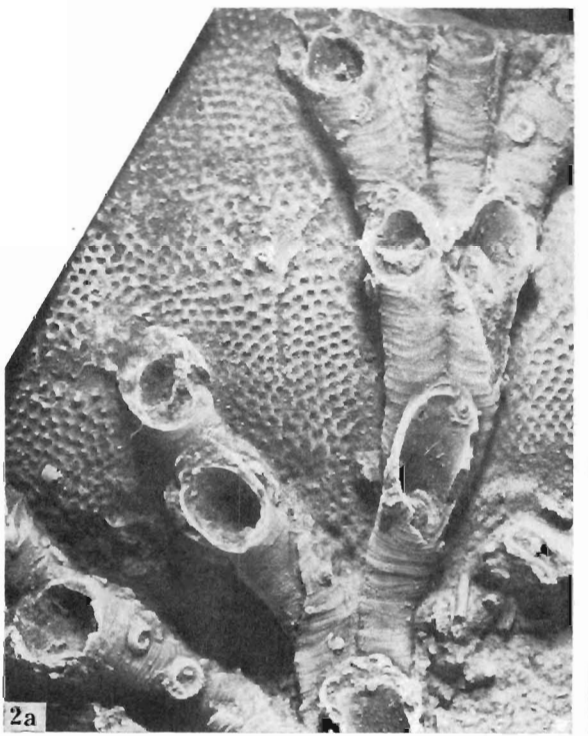
2b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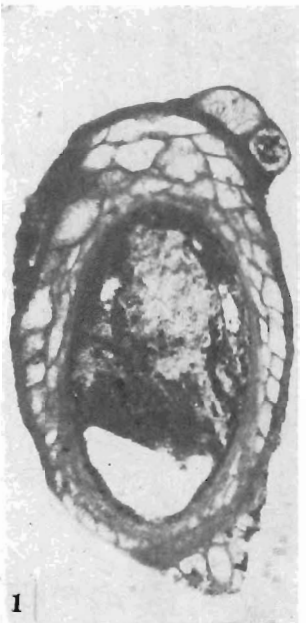
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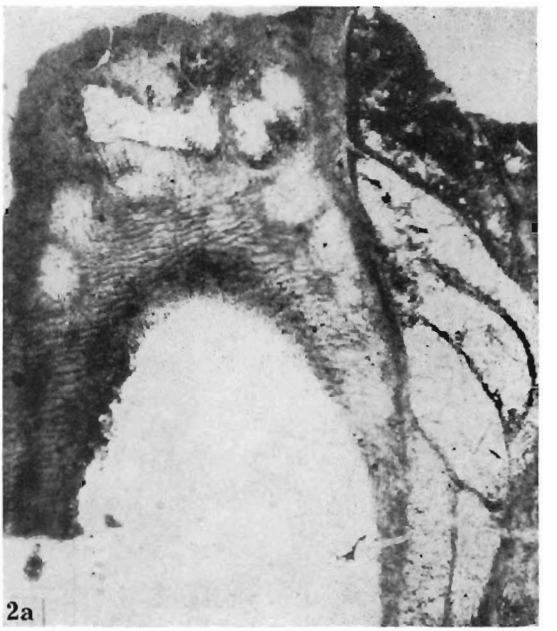
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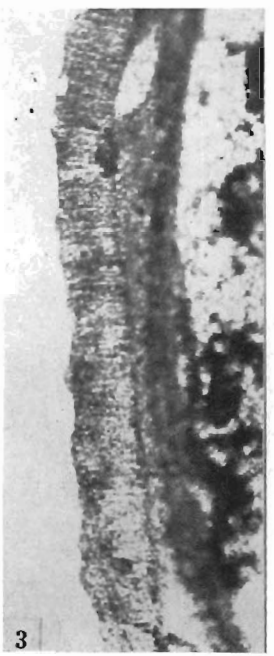
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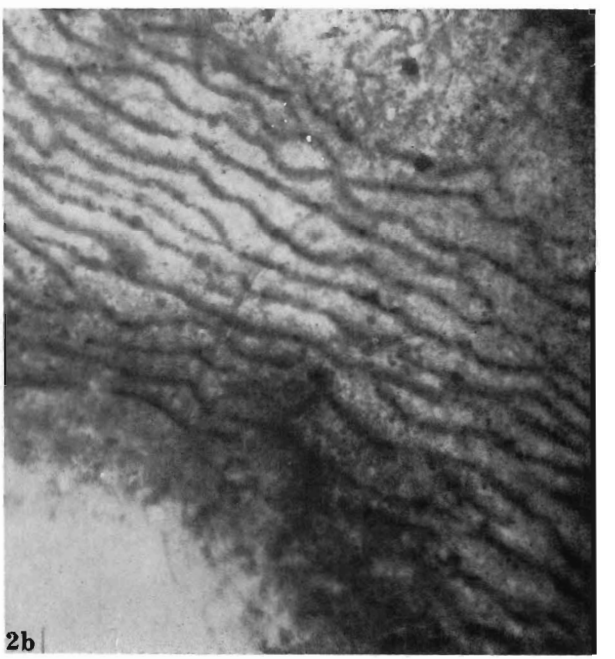
2b

Plate II

Kozlowskiocystia polonica (Stasińska)
Grzegorzowice, Couvinian

Fig. 1. A transverse section through a corallite with the vesicular tissue visible (Z. Pal. T. II-368); ×12.5.
Fig. 2. *a-b* Inner wall with the fibers visible (T. II-370); *a* ×33, *b* ×80.
Fig. 3. An epitheca composed of radially arranged fibers (T. II-369); ×60.