A C T A P A L A E O N T O L O G I C A P O L O N I C A

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ON TWO NEW GENERA OF BRYOZOA CHEILOSTOMATA FROM THE TORTONIAN OF POLAND

Abstract. — Two new species of Bryozoa Cheilostomata, considered representatives of the two new genera, *Xaveropora* n.gen. and *Christinella* n.gen., are described from the clayey and sandy deposits of the Tortonian of Poland. *Xaveropora ojcowensis* n.sp. is marked by ovicells situated in front of the orifice; this type of an ovicell has been called by the author a prostomial ovicell. *Christinella pulchra* n.sp. is distinguished by its endozooecial ovicells which, with time, grow and completely cover the opesia.

INTRODUCTION

Investigating the Bryozoa from various localities of the Polish Tortonian, two new species: *Xaveropora ojcowensis* n.gen., n.sp. and *Christinella pulchra* n.gen., n.sp. were found. Both these forms considerably differ in the structure of their ovicells from the species and genera of the order Cheilostomata known thus far.

Xaveropora ojcowensis n.sp. was found in one place only, i.e. in the heterosteginal sands at Korzkiew, south of Ojców. In this locality, close behind the church, a layer of heterosteginal sand, full of well-preserved bryozoan skeletons, was uncovered during an excavation work. The best preserved specimens were selected from the samples washed. Among them, there were six specimens that could not be assigned to any known species and genera. Following a detailed investigation, they were found to be representatives of new species and genera. Now, the outcropping, from which these samples were taken, exists no more and, therefore, there is no hope of obtaining any further materials from this place.

The bryozoan assemblage, found there, is identical with another, excavated at Wielka Wieś, situated a few km. in a beeline west of Korzkiew. Shruby and encrusting forms predominate in the latter assemblage. The most important of them are: *Cellaria mutabilis, Calpensia cucullata, Hemieschara geminipora, Sertella cellulosa,* species of the family of Celleporidae, several encrusting forms, as well as small pele-

cypods and gastropods. This assemblage indicates a small depth of the marine basin, i.e. 30—80 m. and, therefore, the Miocene beds from Korzkiew correspond with the shallow-water, littoral sediments. It should be also stated that the representatives of the family Orbituliporidae, to which *Xaveropora* belongs, are uncommonly rare in the Miocene sediments not only in Poland, but also in other European countries.

Another form described is *Christinella pulchra* n.gen., n.sp. It comes from the heterosteginal sands from Racławice and Pałecznica (east of Miechów), as well as from the Miocene upper silts at Niechobrz. At the latter locality much more and better preserved specimens were obtained. Sixteen specimens were collected together which was quite a sufficient quantity for an accurate study of the structure of this new form. In the localities, mentioned above, an accompanying assemblage was also reviewed which allowed to state that the Racławice and Pałecznica samples are almost identical with those of the Korzkiew and Wielka Wieś assemblages. In all these places, *Christinella pulchra* n.sp. occurs in the heterosteginal sands which were probably deposited in the shallow, clear, littoral waters of the Miocene basin whose depths perhaps fluctuated between 30 and 80 m. At Niechobrz, there is a different sediment situation. The species under study was found there only in the upper part of the Miocene horizon, i.e. in upper silts, with underlying calcareous and sandy deposits, containing a rich lithotamnian flora. An abundance of Bryozoa has been found in the entire Miocene horizon at Niechobrz, but assemblages from particular layers differ from each other.

The question of changes, occurring in these assemblages, will not be dealt with in the present paper. It is enough to state that the assemblage and the sediment were subject to changes, following the changes in depth. At first, the Niechobrz basin was shallow and richly grown with red algae. Then, it gradually became deeper which was manifested by its faunal assemblage. In the upper part, there are grey silts in which *Christinella pulchra* n.sp. occurs and the bryozoan assemblage, accompanying it, consists of fragments of species which, in the form of solid shrubs with massive twigs, lived at a small depth (about 50 m.) in the littoral zone.

DESCRIPTION

Order **Cheilostomata** Busk, 1852
Suborder **Ascophora** Levinsen, 1909
Family **Orbituliporidae** Canu & Bassler, 1923
Genus *Xaveropora* n.gen.

Type species: Xaveropora ojcowensis n.sp.
Derivation of name: after the Polish name Ksawery.
Occurrence: Miocene (Lower Tortonian), *Heterostegina* sands.

Diagnosis. — Zoaria discoidal or flabellate, mounted on short stems. Zooecia hexagonal, deep, bilaterally disposed on a colony. Ovicells prostomial, large, globose. Avicularia and vibracularia absent.

Xaveropora ojcowensis n.sp.
(Plates: I, figs. 1-7; III, figs. 1-3)

Holotype: specimen in Plate III, fig. 1.
Type locality: Korzkiew near Ojców.
Derivation of name: ojcowensis — from the locality Ojców.

Material. — Six well-preserved specimens.
Dimensions (in mm.):

Normal zooecia	Lz = 0.20—0.25
	lz = 0.20—0.25
Zooecia with ovicells	Lz = 0.30—0.36
	lz = 0.20—0.25
Orifice diameter	0.12—0.25

Diagnosis. — Zoaria flabellate or discoidal, fastened to the substratum by means of the ancestroecium which forms a short, hollow stem. Other, normally developed zooecia, diverge radially from the ancestroecium. They are hexagonal in shape, with a large, round orifice in the middle. Zooecia with prostomial ovicells are shaped like elongated hexagons with a semicircular orifice in their upper part.

Description. — A zoarium of *Xaveropora ojcowensis* n.sp. has the shape of a fan or a round disc, mounted on a short, hollow stem, on which concentrical series of zooecia, formed by the lateral budding, are disposed on both sides of the colony. The upper surfaces of the zooecia are outlined like equilateral hexagons with large, round orifices in their centers. Zooecia are divided from each other by shallow but distinct furrows. The depth of zooecia is usually two times greater than their diameter. The first series of zooecia are non-ovicelled, the further ones have globose ovicells, situated on the anterior side of the orifice. Ovicelled zooecia are considerably larger than the non-ovicelled, are elongated and hexagonal or oval in shape. The orifice, due to the formation of the ovicell, is semicircular. On each colony, a few to a dozen or so series of zooecia are non-ovicelled and, therefore, have a capability of a vegetative reproduction; further series consist of zooecia of which almost all are ovicelled.

The development of the colony was as follows:

A larva, after anchoring itself to the substratum, transforms itself into the ancestrula, shaped like a hollow stem. From this first individual, new ones derive by the lateral budding. They are distributed in a very characteristic manner, i.e. in the form of two or three rows (Pl. I, figs. 6*b*, 7*b*). Further parts consist of a double layer of zooecia coalesced with their antiapertural sides, forming a bifoliate colony, flabellate or globose in shape (Pl. III, figs. 1—3). Looking on the zoaria from the ancestroecium,

a characteristic two-row and, sometimes, three-row system of zooecia can be observed. View from the top of zoarium (Pl. I, fig. 7c) the zooecia are situated alternately, forming a characteristic coalescence, zig-zag line. A zig-zag system of zooecia can be also observed in a longitudinal section (Pl. I, fig. 5) where the zooecia are coalesced with their antiapertural sides and shifted against each other.

The formation of ovicells in front of the orifice is characteristic of the species described. So far, the following six types of the ovicell structure have been recorded and described (Fig. 1): a) endozooecial, b) hyperstomial, c) endotoichal, d) peristomial, e) recumbent, and f) prostomial.

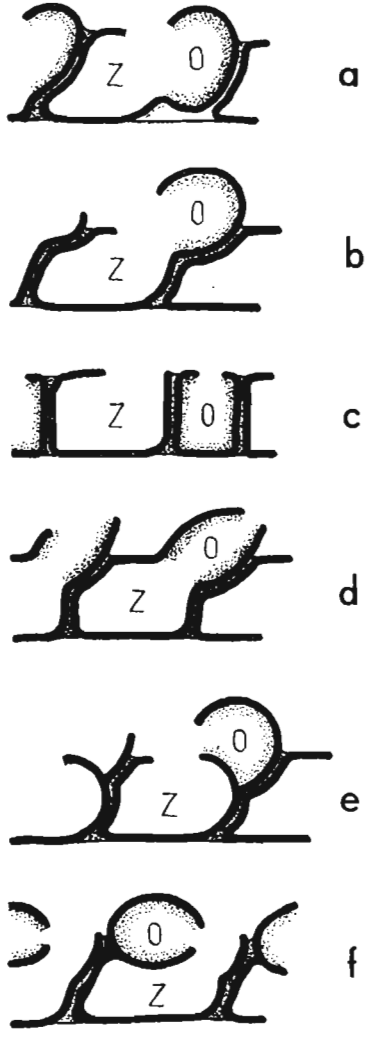

Fig. 1. — *Xaveropora ojcowensis* n.gen., n.sp.; various types of ovicells: *a* endozooecial, *b* hyperstomial, *c* endotoichal, *d* peristomial, *e* recumbent, *f* prostomial; *o* ovicell, *z* zooecium.

Among the known species of Bryozoa Cheilostomata, both fossil and Recent, no ovicells have been recorded in the anterior part of the orifice. The structure of ovicells was very accurately investigated in the sections, made through ovicelled zooecia, and in the specimens which had cracked or otherwise damaged ovicells. As a result, an indubitable anterior situation of ovicells was found in the species under study. The structure of ovicells is clearly outlined in the sections enclosed (Pl. III, figs. 2*b*, 5). In addition, therefore, to the previously known types of the ovicell formation, i.e. behind the zooecia, above the zooecia and in the enlarged peristome, in some species, ovicells were formed in front of the orifices. For this type of ovicells, the name "prostomial ovicells" is being introduced. Differences, occurring in the manner of the ovicell formation (Fig. 1) as compared with the prostomial ovicell are shown in the enclosed diagram.

Remarks. — Reuss (1867) described and figured (Pl. I, fig. 2) *Orbitulipora petiolus* Lonsd. The figured specimen is a fragment of a colony in which the ovicell is placed by this author in front of the orifice. The same phenomenon is found in *Xaveropora ojcowensis* n.gen.,n.sp. *Orbitulipora petiolus* Lonsd. considerably differs from *Xaveropora ojcowensis* in the shape of the colony, as well as in the development and distribution of zooecia. The ancestroecium is also differently built and, therefore, the species, mentioned above, despite of certain common characters, can be hardly compared with each other.

The different structure of some families of the order Cheilostomata drew the attention of Canu and Bassler who, in 1927, erected, within the order Cheilostomata, a new suborder, Hexapogona, to which they assigned the following families: Mamilloporidae Canu & Bassler, 1927, Orbituliporidae Canu & Bassler, 1923, and Conescharellinidae Levinsen, 1909. Although the suborder Hexapogona has been removed from Bassler's systematics of 1953, but all the same a specific character of the representatives of the three families, mentioned above, is quite clear.

Our species, belonging to the family Orbituliporidae, bears a resemblance, in the structure and distribution of zooecia, to the representatives of the genera *Orbitulipora* and *Stichoporina,* while the shape of the colony and the structure of the ancestroecium in these genera is different than that in the genus *Xaveropora,* described here.

Family **Flustridae** Smitt, 1867

Genus *Christinella* n.gen.

Type species: Christinella pulchra n.sp.

Derivation of name: Christinella — in honour of Prof. Krystyna Pożaryska, a well-known Polish micropalaeontologist.

Occurrence: Miocene (Lover Tortonian), *Heterostegina* sands.

Diagnosis. — Colony ramose, bifurcate, consisting of large, elliptic

zooecia, surrounded by marginal walls. Ovicells endozooecial. Avicularia situated in the posterior part of the colony and between zooecia; vibracularia small, occurring only in the posterior part of the colony.

Christinella pulchra n.sp.
(Plates: II, figs. 1-6; III, figs. 4-7)

Holotype: A specimen shown in Pl. III, fig. 4.
Type locality: Racławice near Miechów.
Derivation of name: pulchra — Lat. *pulchra* = beautiful.

Material. — Sixteen, well-preserved specimens.
Dimensions (in mm.):

Opesia	Lo = 0.18—0.20	Ovicell	Lo = 0.50—0.55
	lo = 0.48—0.52		lo = 0.24—0.28
Zooecium	Lz = 0.70—0.80	Orifice	0.15—0.18
	Lo = 0.18—0.20		

Diagnosis. — The same as for the genus.

Description. — Colonies stemlike, laterally flattened. Zooecia disposed on both sides of the colony. An anterior and dorsal sides can be distinguished in the colony. On the anterior side, zooecia are situated identical with those on the lateral sides, while the dorsal side of the colony is different in character (Pl. II, fig. 1*b*) since the sides of the zooecia, occurring in this part, are exposed, and the avicularia and vibracularia are attached on them. Zooecia are separated by shallow but distinct furrows. Marginal walls are narrow, low, smooth and pass onto the gymnocyst. In the specimens available, no initial parts of the colony are preserved and, therefore, we do not know what was the aspect of the ancetroecium in this species. It is clear from the very well-preserved colonies that the number of zooecia on lateral sides of the colony increases together with the growth of the colony: at first it is one, then two, three, four, five, etc., and they are always disposed in slanting rows which ascent towards the dorsal side of the colony.

This species is very interesting on account of its specific manner of multiplication. Similarly to the genus *Xaveropora* n.gen., a specific character of the ovicell development is recorded in it. This phenomenon has been investigated in the specimens available and shown in the drawings enclosed. In the first stage, there occur normally developed zooecia with large opesia, surrounded by a mural rim (Pl. II, figs. 2 *a-b*). In subsequent zooecia, large, elliptic ovicells, slightly flattened on their top and having a ring of small triangular apertures, appear on the top side (Pl. II, figs. 3 *a-b*). These ovicells are endozooecial in character but not typical since they ascend above the distal part of the opesium. With their development the ovicell increases and covers ever more distant parts of the opesium, after some time, only a small part of it is free of this cover. In some specimens, after some time, the opesium is completely covered by

the ovicell (Pl. II, figs. 5 *a-b*). In these specimens, therefore, an elliptic, convex vesicle — the ovicell — is observed on the mural rim. In other zooecia of the same colony, complete closing of the ovicell takes place following the formation of an additional vesicle on the zooecium proximal side on the mural rim. The latter vesicle, increasing, fuses with the ovicell (Pl. II, figs. 4 *a-b*). In these two ways, the opesium becomes completely covered by the ovicell. An interesting phenomenon also occurs in the further development, i.e. a formation of a secondary round orifice in the distal part of the ovicell (Pl. II, figs. 6 *a-b*). This phenomenon is probably related to the degeneration process of the zooid, occurring in connection with the opesium being covered by the ovicell and with the further process of the regeneration, owing to which a secondary orifice was built through which a regenerated individual could slip out.

The processes, mentioned above, which occur during the zooecium transformation, may be observed always in the same colony and, in fact, in various parts of it, both young and adult. Some phenomena and life processes which occurred are difficult to investigate in the fossil material. Nevertheless, in well-preserved specimens, the progress is clearly visible of the opesium being grown over by the ovicell both on the distal and proximal side. We can also investigate how did the formation of the secondary orifice come about.

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Kraków, April 1964

REFERENCES

BASSLER, R. S. 1953. Bryozoa. *In*: R. C. MOORE, Treatise on invertebrate paleontology. Part G. *Geol. Soc. Amer. Univ. Kansas Press*, 1—253, Lawrence.

CANU, F. & BASSLER, R. S. 1927. Classification of the cheilostomatous Bryozoa. — *Proc. U. S. Nation. Mus.*, 69, art. 14, 1—42, Washington.

REUSS, A. E. 1867. Über einige Bryozoen aus dem deutschen Unteroligocän. — *Sitz.-Ber. K. Akad. Wiss., Abt.* 1, 55, 1/5, 216—234, Wien.

JERZY MAŁECKI

O DWÓCH NOWYCH RODZAJACH MSZYWIOŁÓW CHEILOSTOMATA Z TORTONU POLSKI

Streszczenie

Wśród mszywiołów, wydobytych przez autora z tortońskich piasków heterosteginowych okolic Ojcowa i paru innych miejscowości, dwie formy zasługują na

szczególną uwagę. Są to gatunki nowe i na tyle różniące się od dotychczas opisanych, że trzeba było ustanowić dla nich nowe rodzaje. Są one opisane jako *Xaveropora ojcowensis* n.gen., n.sp. i *Christinella pulchra* n.gen., n.sp. Oba należą do podrzędu Ascophora, przy czym pierwszy zaliczony został do rodziny Orbituliporidae Canu & Bassler, a drugi do rodziny Flustridae Smitt.

Kolonia *Xaveropora ojcowensis* ma kształt wachlarzowaty lub tarczowaty i osadzona jest na krótkim, rurkowatym trzonku, który odpowiada ancestroecjum. Z tego trzonka, drogą pączkowania lateralnego, powstają zoecja ułożone naprzemianlegle w dwa lub trzy szeregi. Późniejsze zoecja ułożone są w dwie warstwy, zrośnięte z sobą stronami grzbietowymi. Bardzo specjalne jest położenie owicelli w stosunku do zoecjum, gdyż rozwija się ona w przedniej części apertury. Takiego stosunku dotychczas nie obserwowano i dla tego typu autor wprowadza nazwę owicelli prostomialnej. Podobnego typu, jak się zdaje, była owicella opisana w r. 1867 przez Reussa u *Orbitulipora petiolus* Lonsdale.

Christinella pulchra n.gen., n.sp. tworzy kolonię gałązkowatą, złożoną z dużych, eliptycznych zoecjów, otoczonych ścianami brzeżnymi i umieszczonych na obu stronach kolonii. Owicelle są typu endozoecjonalnego. Awikulary położone są na stronie tylnej kolonii oraz między zoecjami. Wibrakulary są małe i występują tylko na stronie tylnej kolonii. Rozwój owicelli jest bardzo swoisty. Na początku jest ona duża, eliptyczna, z wieńcem trójkątnych otworków. Jest ona umieszczona w części dystalnej zoecjum, które opatrzone jest dużym opesjum. W miarę rozwoju owicella zakrywa stopniowo całe opesjum. W dalszym stadium, w dystalnej części tak rozrośniętej owicelli, zjawia się niekiedy wtórna apertura w postaci okrągłego otworku. Związane to było zapewne z regeneracją zoida uwstecznionego częściowo na skutek zakrycia pierwotnej apertury przez nadmiernie rozrośniętą owicellę.

ЕРЖИ МАЛЭЦКИ

О ДВУХ НОВЫХ РОДАХ МШАНОК CHEILOSTOMATA ИЗ ТОРТОНА ПОЛЬШИ

Резюме

Среди мшанок, собранных автором из тортонских гетеростегиновых песков окрестностей Ойцова и некоторых иных местностей, две формы заслуживают на особое внимание. Это новые виды, настолько отличные от до сих пор описанных, что оказалось нужным установить для них новые роды. Они описаны как *Xaveropora ojcowensis* n. gen., n. sp. и *Christinella pulchra* n. gen., n. sp. Оба принадлежат к подотряду Ascophora, при чем первого из них причислено к се-

мейству Orbituliporidae Canu & Bassler, а второго — к семейству Flustridae Smitt.

Колония *Xaveropora ojcowensis* веерообразная или дисковидная и осажена на коротком, трубчатом стебле, который соответствует анцестрооэциум. Из него путем бокового почкования образуются зооэции, расположенные попеременно двумя или тремя рядами. Следующие зооэции располагаются в виде двух слоев, срастающихся между собой спинными сторонами. Особенное положение имеет овицелла по отношению к зооэции, так как образуется она в передней части апертуры. Таких соотношений до сих пор не наблюдалось и для такого типа автор вводит название овицеллы простомиальной. По имению автора, похожего типа была овицелла у *Orbitulipora petiolus* Lonsdale, описанная Ройссом (Reuss, 1867).

Christinella pulchra n. gen., n. sp. образует ветвистую колонию, построенную из крупных зооэций, окаймленных боковыми стенками и расположенных по обеих сторонах колонии. Авикулярии расположены на задней стороне колонии и между зооэциями. Вибракулярии малые и находятся только на задней стороне колонии.

Развитие овицеллы очень своеобразное. Вначале она большая, эллиптическая и вокруг имеет венец треугольных отверстий. Находится она в дистальной части зооэции, которая снабжена большим опэсиум. Овицелла по мере развития закрывает постепенно целое опэсиум. В дальнейшей стадии, в дистальной части так разросшейся овицеллы появляется иногда вторичная апертура в виде круглого отверстия. Вероятно связано это было с регенерацией зооида, который был сокращен вследствие прикрытия первоначальной апертуры слишком разросшейся овицеллой.

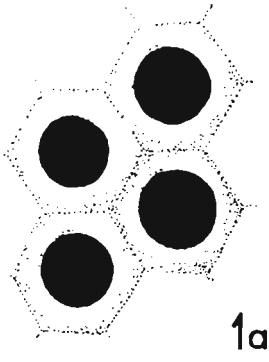
PLATES

(The specimens are housed in the Department of Palaeontology, School of the Mining and Metallurgy, Kraków, Mickiewicza 30)

Plate I

Xaveropora ojcowensis n.gen., n.sp.
(Korzkiew, Miocene, Lower Tortonian, *Heterostegina* sands)

Fig. 1. Normal zooecia: *a* top view, *b* longitudinal section; × 75.
Fig. 2. Zooecia with ovicells: *a* top view, *b* longitudinal section; × 75
Fig. 3. Transverse section of a colony fragment; × 50.
Fig. 4. Zooecium with an ovicell (the latter exposed to present its internal structure and its relation to the orifice); × 120.
Fig. 5. Longitudinal section through the colony; × 50.
Fig. 6. *a* A fragment of the lower part of a colony together with the ancestroecium; *b* bottom view of a colony; × 50.
Fig. 7. *a* A fragment of the lower part of a colony together with the ancestroecium having a three-row system of zooecia; *b* bottom view; *c* top view; × 50.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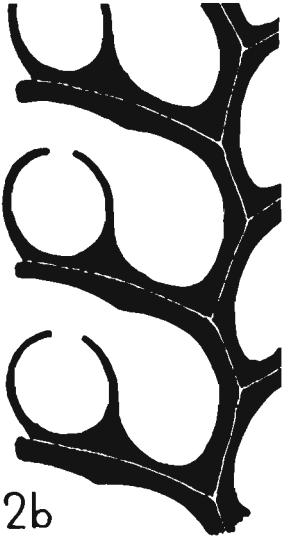
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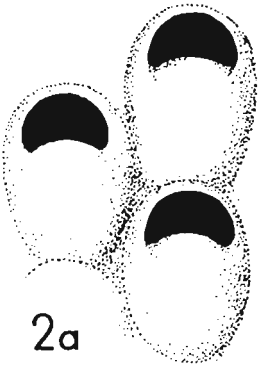
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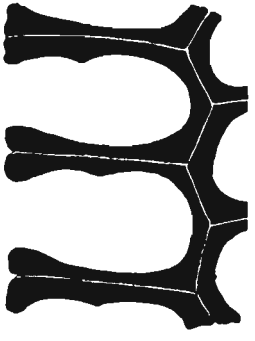
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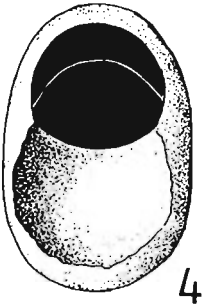
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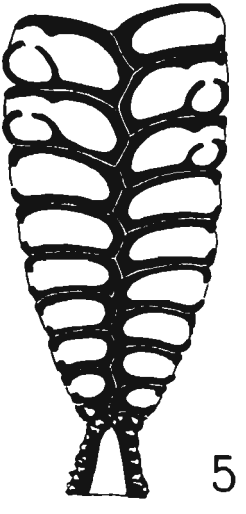
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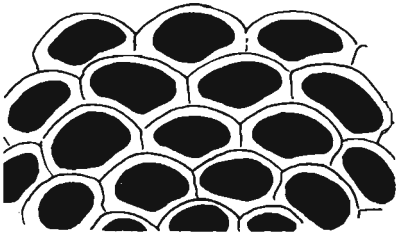
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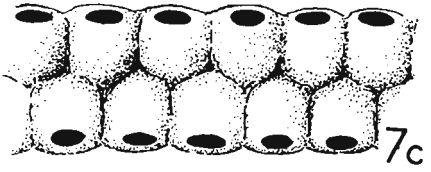
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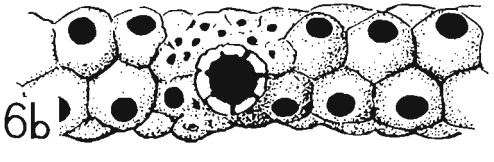
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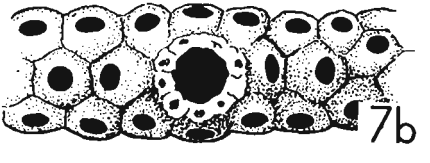
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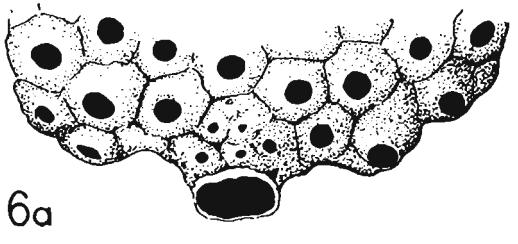
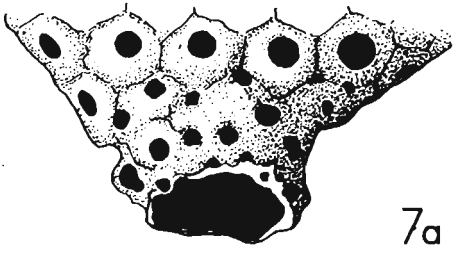

6a


7a

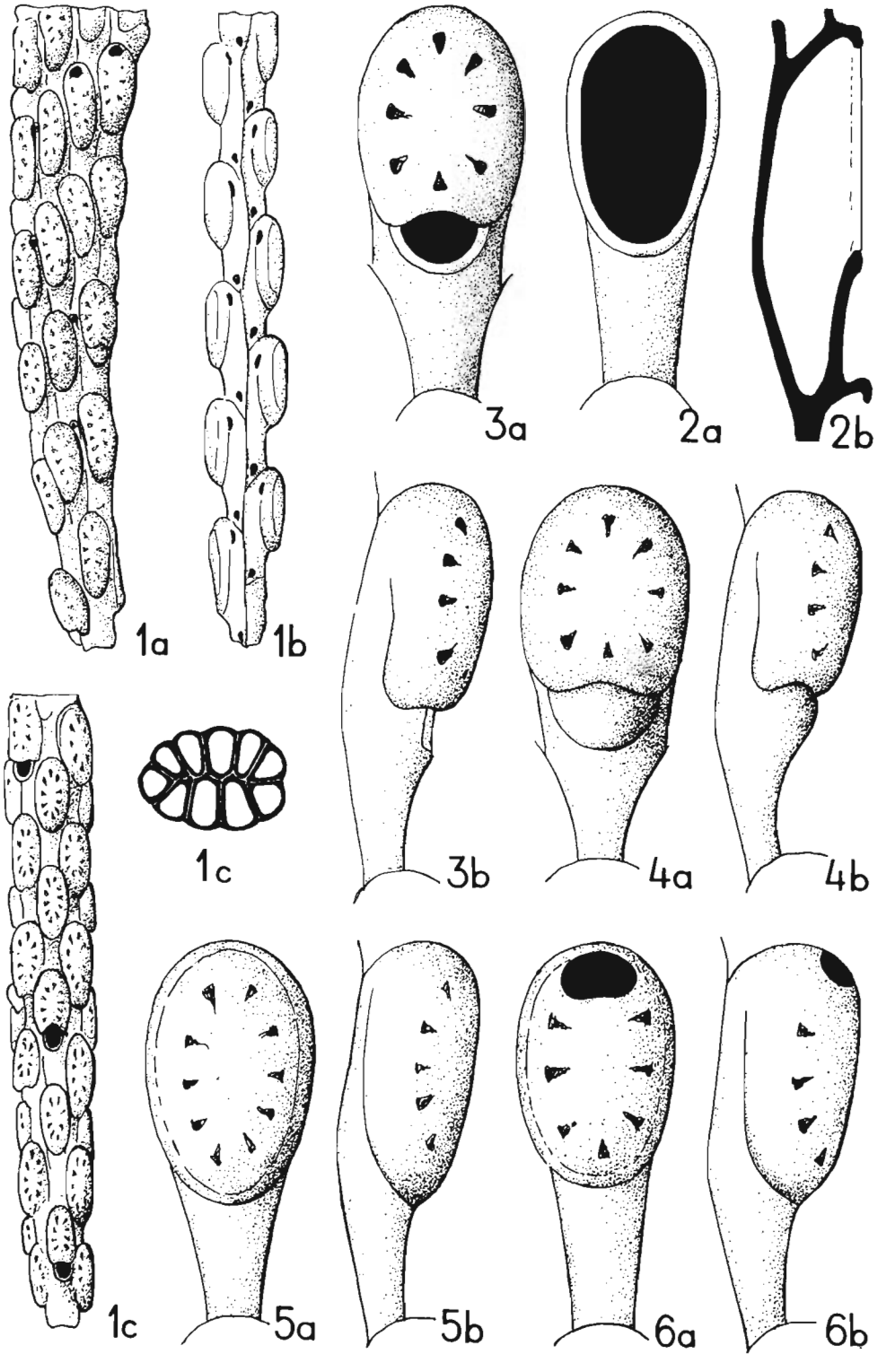

1a
1b
3a
2a
2b
1c
1c
3b
4a
4b
1c
5a
5b
6a
6b

Plate II

Christinella pulchra n.sp.

(Racławice, Miocene, Lower Tortonian, *Heterostegina* sands)

Fig. 1. A colony: *a* lateral view, *b* posterior view, *c* frontal view, *d* transverse section through the colony; × 15.
Fig. 2. Normal zooecium: *a* top view, *b* longitudinal section; × 50.
Fig. 3. Zooecium with an ovicell: *a* top view, *b* lateral view; × 50.
Fig. 4. *a* Zooecium with an ovicell closed on its proximal end, *b* lateral view; × 50.
Fig. 5. Zooecium with an ovicell completely closing the opesium: *a* frontal view, *b* lateral view; × 50.
Fig. 6. Zooecium with an ovicell and a secondary orifice: *a* top view, *b* lateral view; × 50.

Plate III

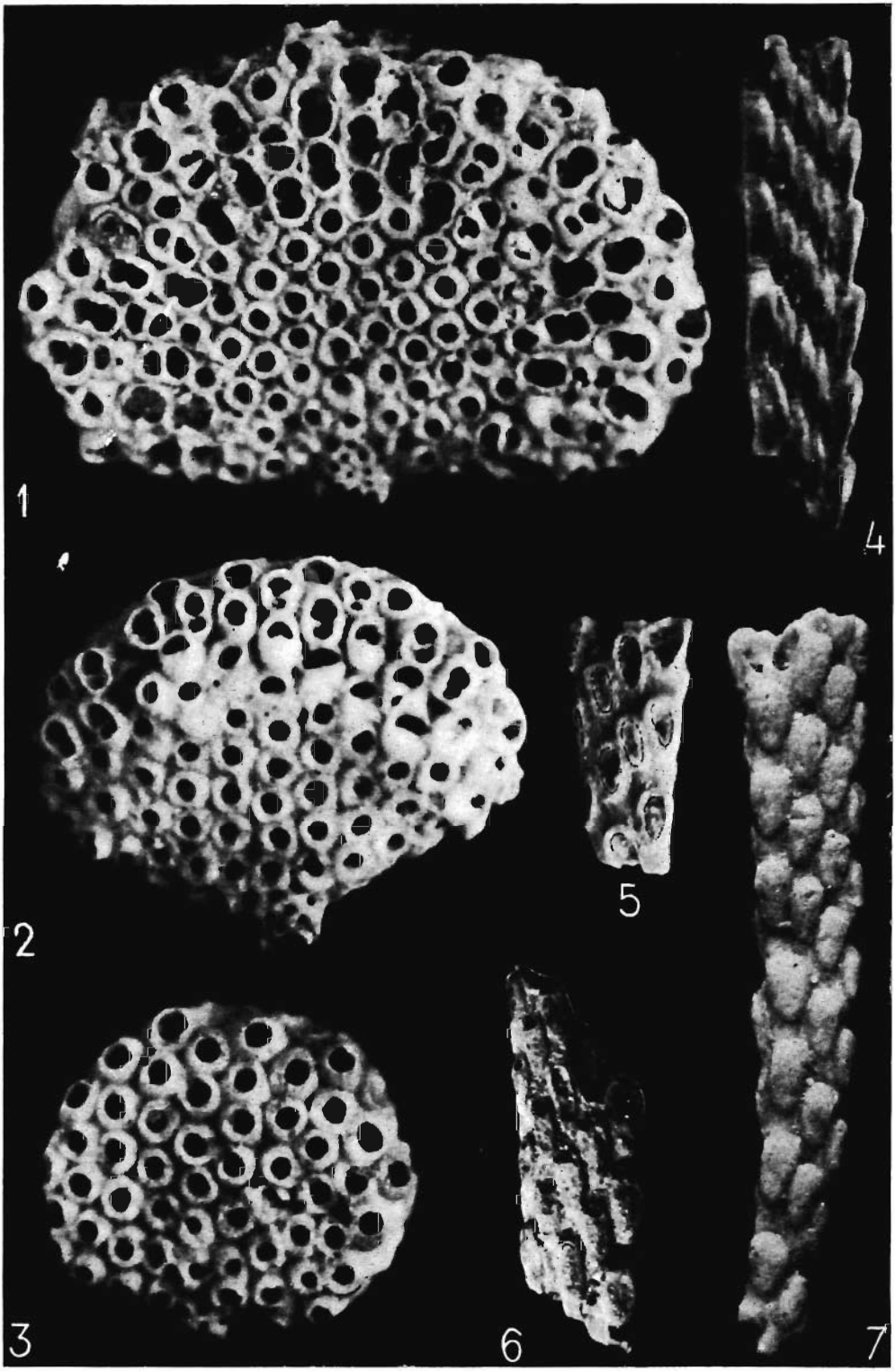
Xaveropora ojcowensis n.gen., n.sp.
(Korzkiew, Miocene, Lower Tortonian, *Heterostegina* sands)

Figs. 1–3. Various shapes of colonies.

Christinella pulchra n.sp.
(Racławice, Miocene, Lower Tortonian, *Heterostegina* sands)

Fig. 4. A colony shown from its inside.
Fig. 5. A fragment of a colony with normally developed zooecia.
Fig. 6. A colony with ovicells having secondary orifices.
Fig. 7. A colony with ovicells.

All specimens × 25.


1
4
2
5
3
6
7