Sbor. geol. věd	Paleontologie 29	Pages 145—189	12 figs.	— tab.	12 pls.	Praha 1988 ISSN 0036-5297

Acruliammina, Bdelloidina and Axicolumella n. gen. (Foraminifera) from the Cretaceous transgressive sediments of the Bohemian Massif

Acruliammina, Bdelloidina a Axicolumella n. gen. (Foraminifera) z transgresních sedimentů křídy Českého masívu

JITKA HERCOGOVÁ[1]

Received December 28, 1984

HERCOGOVÁ J. (1988): Acruliammina, Bdelloidina and Axicolumella n. gen. (Foraminifera) from the Cretaceous transgressive sediments of the Bohemian Massif. – Sbor. geol. Věd, Paleont., 29, *145–189*. Praha.

Abstract: From the shallow-water transgressive sediments belonging predominantly to the Lower Turonian four species from the family *Lituolidae* were studied. The species exhibit large, macroscopically visible arenaceous tests, more or less attached to the substrate: *Acruliammina longa* (TAPPAN) originally described from the Lower Cretaceous, *Acruliammina nekvasilovae* n. sp. from the Cenomanian to the Lower Turonian of the Bohemian Cretaceous Basin, *Bdelloidina cribrosa* (REUSS) and *Axicolumella cylindrica* (PERNER) emend. HERCOGOVÁ. The new genus *Axicolumella* was determined mainly on the basis of the internal structure of the test; the revision of the species was based on the study of Perner's autotypes in the National Museum in Prague and on new topotypes from Perner's locality Kamajka. Ecologic relations were examined, too. Stratigraphic classification of the samples from 11 localities of the so called surf facies was based mainly on the composition of foraminiferal associations. In addition, a new species, *Dictyopsella fragilis*, was described from the Lower Turonian organodetritic limestones.

[1] *Ústřední ústav geologický, Malostranské nám.* 19, 118 21 *Praha* 1

Introduction

Foraminifers described in this paper were studied at the instigation of dr. O. Nekvasilová from the Institute of Geology and Geotechnique of the Czechoslovak Academy of Sciences, Prague. Dr. Nekvasilová kindly lent me all her material gathered during many years of brachiopod sampling from exposures and quarries of the Bohemian Massif Cretaceous. I wish to express my gratitude not only for the foraminifers but also for the data on lithological and sedimentary development of individual localities.

Foraminifers studied come from localities of prevailingly Lower Turonian age.

The following review provides a short lithological characteristic of the type of the substrate where the attached specimens were found or of the types of sediments, which yielded tests secondarily disengaged from the substrate and a short survey of fossils (foraminifers mainly) whose occurrence served as the basis for stratigraphical classification of the locality.

Prague - West District:

Tuchoměřice, quarry Kněživka:

1. an abraded wall of lydite monadnock;
2. marlstone with *Vaginulina robusta* (CHAPMAN) and *Gavelinella belorussica* (AKIMEC) — Lower Turonian.

Černovičky, an abandoned quarry near the church of St. Vavřinec:

1. lydite block (maximum size cca 1.5 m) near the entrance of the quarry;
2. lydite pebbles from conglomerate;
3. conglomeratic cement, calcareous claystone to organodetritic limestone with *Cibicides lepidus* PLOTNIKOVA, *Dictyopsella fragilis* n. sp. and *Patellina subcretacea* CUSHMAN & ALEXANDER, known in the Bohemian Massif from the Lower Turonian; there were also found *Cibicides* aff. *apprima* VOLOSHINA, *Spiroplectammina goodlandana* LALICKER and *Spiroplectammina laevis* (ROEMER) unknown from the Bohemian Cretaceous Basin. Free portions of *Bdelloidina cribrosa* (REUSS) were quite sporadic here. The Lower Turonian.

Středokluky. An abraded lydite block (approx. 1.25 × 0.75 m) with the attached *Bdelloidina cribrosa* (REUSS) specimens remained as the last available residue of the Cretaceous transgressive sediments from an abandoned little quarry, today filled with the dump.

Kladno District:

Vrapice: glauconitic claystones with the free ends and secondarily disengaged short tests of *Bdelloidina cribrosa* (REUSS) only.

Kolín District:

Skalka near Velim (Němeček quarry):

1. abraded gneiss wall of the eroded channel of the Cretaceous substratum (muscovite-biotite migmatite with garnet, locally with rare lenses of amphibolite and erlane);
2. filling of the deeper parts of the erosional channel: conglomerate of gneiss pebbles cemented by organodetritic limestone with *Inoceramus* ex gr. *pictus* — the Cenomanian;
3. the overlying stratum of conglomerate: calcareous claystones with *Frondicularia fritschi* PERNER and *Vaginulina robusta* (CHAPMAN) — the Lower Turonian.

Kutná Hora District:

Kamajka: organodetritic limestones with *Dictyopsella fragilis* n. sp., *Vaginulina robusta* (CHAPMAN) and *Gavelinella belorussica* (AKIMEC) — the Lower Turonian.
KAŇK — National Nature Reserve "Na Vrších": organodetritic limestones with *Gaudryina serrata* FRANKE, *Dictyopsella fragilis* n. sp., *Patellina subcretacea* CUSH-

MAN & ALEXANDER and *Gavelinella belorussica* (AKIMEC) — the Lower Turonian.
Karlov, quarry:

1. the walls of the abraded gneiss block (medium to strongly migmatized biotite to muscovite-biotite gneiss);
2. so called scyphia-spongolites, which originally surrounded the gneiss block, containing species *Frondicularia fritschi* PERNER, *Gavelinella belorussica* (AKIMEC) and *Cibicides gorbenkoi* AKIMEC — the Lower Turonian;
3. conglomerates cemented by marlstones, containing remains of macrofauna (situated under the gneiss block ad 1.).

Starkoč, quarry: calcareous claystones with *Vaginulina robusta* (Chapman) and *Gavelinella belorussica* (AKIMEC) — the Lower Turonian.
Skalka near Žehušice: organodetritic limestones with *Dictyopsella fragilis* n. sp., *Vaginulina robusta* (CHAPMAN) and *Gavelinella belorussica* (AKIMEC) — the Lower Turonian.
Zbyslav: organodetritic limestones with *Vaginulina robusta* (CHAPMAN), *Gavelinella belorussica* (AKIMEC), *Gavelinella polessica* AKIMEC and *Dicarinella longoriai* PERYT — the Lower Turonian.

It is not possible to determine the age of *Acruliammina* attached to lydites or gneiss walls with absolute certainty: we suppose they originated in the Lower Turonian, because the sediments surrounding them are of Lower Turonian age and also *Acruliammina* occurs occasionally in the Lower Turonian communities of foraminifers (Skalka near Velim, Kamajka), but we can not eliminate the possibility that they lived already in the Cenomanian and were covered by the sedimental layer only in the Lower Turonian.

The conservation of the tests of the studied foraminifers depended both on the structure and composition of the walls of individual species, and on the sedimental rocks, in which they were preserved. Specimens of *Acruliammina longa* with less solid walls with the majority of cement are in all localities fairly damaged in contrast to *Acruliammina nekvasilovae* with solid walls made predominantly of quartzitic grains with a little amount of cement.

Bdelloidina cribrosa and *Axicolumella cylindrica* with robust and resistant tests are on majority of localities (Kamajka, Skalka near Velim, Starkoč, Zbyslav, Kaňk and Skalka near Žehušice) in organodetritic limestones or calcareous claystones conserved very well and in great number of specimens. In marlstones from Tuchoměřice occur only short fragments of *Bdelloidina cribrosa*, covered with a thin limonite coating. Only one species, *Bdelloidina cribrosa*, was found in glauconite claystones from Vrapice. The tests from this locality are the most damaged, partly decalcified and corroded.

Considering, that in four of the studied localities occur specimens of a new species *Dictyopsella fragilis*, I included their description, although they do not belong among attached species treated in this paper.

Dictyopsella Munier-Chalmas in Schlumberger, 1900

Dictyopsella fragilis n. sp.

Fig. 1/1–3

Holotype: the specimen JH 291 figured in fig. 1/1, deposited in the collections of the Geological Survey, Prague.

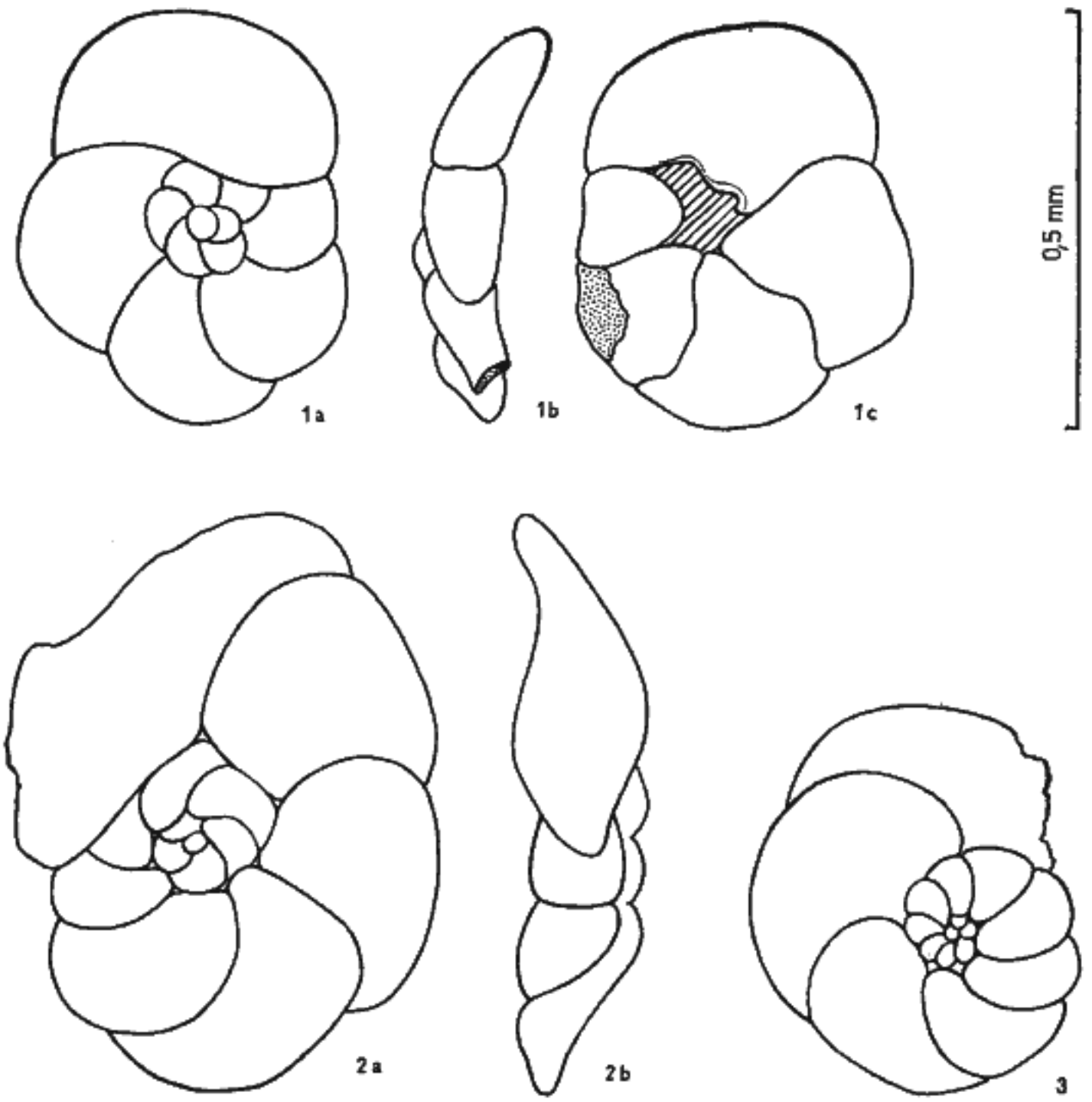
Derivation of name: the tests are very fragile, the majority of specimens is damaged.

Materia : more than 20 specimens.

Type locality: Kaňk near Kutná Hora, National Nature Reserve "Na Vrších".

Type horizon: the Lower Turonian, organodetritic limestones.

Diagnosis: The test is trochospirally coiled, with 5 to 6 chambers in the last whorl. The wall finely arenaceous, calcareous. Chambers are subdivided by delicate subepidermal network system of secondary partitions. Aperture inconspicuous, umbilical, interiomarginal.



1. *Dictyopsella fragilis* n. sp.; Kaňk near Kutná Hora
1 – holotype; 2, 3 – paratypes

Description: Test nearly round to broadly elliptical, trochospirally coiled; the spiral side slightly convex, umbilical side slightly concave. In side view the test is lowly depressed. The test is evolute on the spiral side, consisting of 2 1/4 to 2 1/2 whorls; the last whorl is composed of 5 to 6 chambers. Only chambers of the last whorl are visible on the umbilical side. Periphery narrow, rounded; faintly lobulate in juvenile specimens, more distinctly lobulate in adult ones. The spiral side of the chambers is slightly inflated, sutures are depressed, bent backward. On the umbilical side the chambers are flat or slightly concave, sutures sigmoidal. Chambers increase gradually and distinctly in size as added. Aperture shaped as a little arch with a faint rim is interiomarginal, nearly in the centre of umbilical side. The wall is finely arenaceous, calcareous, with smooth and lustrous surface.

Due to the fragility of the tests, it was not possible to make thin-sections. All specimens promptly disintegrated during grinding. Therefore the internal build could be studied upon immersion only. When using the immersion oil the delicate subepidermal network system became distinctly visible; near the periphery, where the tests are the most thin, also secondary radial partitions could be observed.

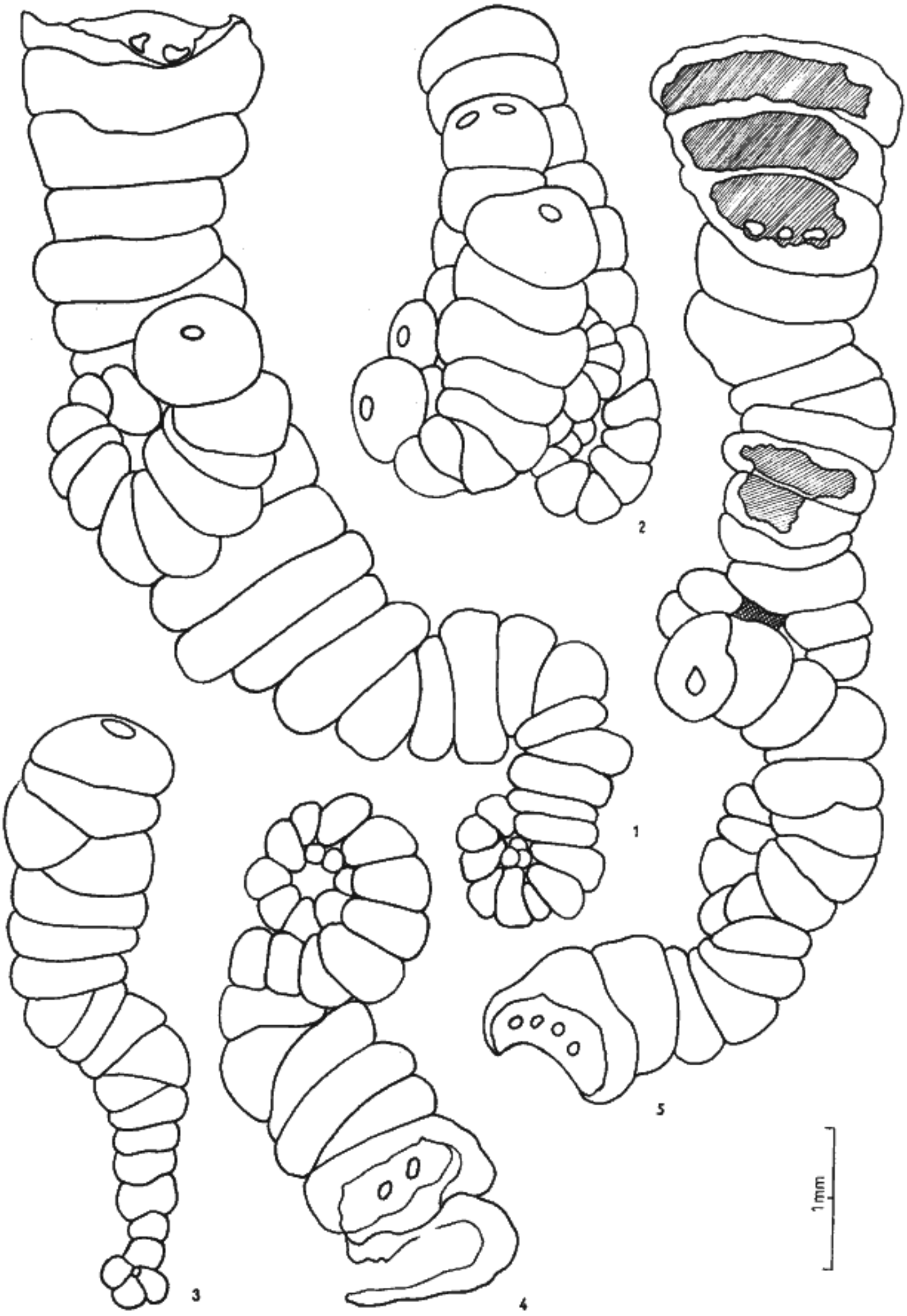
Dimensions:

	holotype	paratypes			
greater diameter:	0.50	0.47	0.58	0.38	0.36 mm
thickness:	0.11	0.13	0.13	0.11	0.11 mm

Relationships: Of all the *Dictyopsella* species, *D. fragilis* is most similar to the tests found by MOULLADE (1966) in organodetritic facies from the Barremian of "Fosse Vocontienne" and described as *Dictyopsella* sp. (p. 20, pl. 1, figs. 6—7, pl. 10, figs. 2—3). This description agrees almost precisely with that of the Bohemian specimens but tests depicted by MOULLADE differ in having more convex spiral side, less lobulate periphery and mainly in having a relatively narrower last whorl.

Dictyopsella libanica SAINT-MARC, 1975, *Dictyopsella tenuissima* (REUSS, 1862), *Dictyopsella chalmasi* SCHLUMBERGER, 1900, *Dictyopsella kiliani* MUNIER-CHALMAS, 1900 and *Dictyopsella muretae* HOTTINGER, 1967 have all, in addition to further different features, a larger number of chambers in the last whorl. *Dictyopsella cuvillieri* GENDROT, 1968 with 4 to 5 chambers in the last whorl has a highly conical test consisting of 4 to 5 whorls and a round, nonlobate outline.

In the general build of the test and in the shape of the chambers *Dictyopsella fragilis* most closely resembles the specimen from the Lower Cretaceous (Gargasmergel) of North Germany, depicted by REUSS (1862, pl. 11, fig. 5) as *Rosalina Schlönbachi* m. According to the original description this species differs from *D. fragilis* in having a smaller size (diameter 0.3 mm), 3 whorls (instead of 2 1/2), five chambers in the last whorl only (instead of 5 to 6) and in having a very narrow, slitlike aperture. Since the original description lacks any reference to the internal build, the first three differences may be included into the variability range of *D. fragilis*. But on the basis of the shape of the aperture it is more probable that


1
2
3
4
5
1 mm

"*Rosalina*" *schlönbachi* belongs to the genus *Conorbina* from the family *Discorbidae*.

As to the problem of systematic position of the genus *Dictyopsella* I accept the opinion of MOULLADE (1966) and SAINT-MARCK (1973) who consider preferable to place it in the family *Trochamminidae* according to the trochospiral build of the test, while LOEBLICH - TAPPAN (1964) ranged it among the *Ataxophragmiidae* according to its internal structure.

Occurrence: In the Bohemian Massif *Dictyopsella fragilis* was found in organodetritic limestones of the Lower Turonian only, in the localities Kaňk, Kamajka, Skalka near Žehušice and Černovičky.

Systematic part

(According to the LOEBLICH - TAPPAN's, 1964 classification).

Lituolidae DE BLAINVILLE, 1825

Placopsilininae RHUMBLER, 1913

Acruliammina LOEBLICH & TAPPAN, 1946

Acruliammina longa (TAPPAN, 1940)

Fig. 2/1–5; fig. 3/1–7; fig. 4/1–20; pl. I, figs. 1–6; pl. II, figs. 1–7; pl. III, figs. 1 3, 5, 6; pl. IV, figs. 2, 3; pl. XII, figs. 1–3, 5

1892 *Lituola cenomana* D'ORBIGNY; PERNER, p. 20–22, pl. 2, figs. 1–6; pl. 4, fig. 15; p. 21 fig. 4; p. 22, fig. 5.
1940 *Placopsilina longa* TAPPAN; TAPPAN, p. 100, pl. 15, figs. 9–10.
1943 *Placopsilina longa* TAPPAN; TAPPAN, p. 493, pl. 79, figs. 8–9.
1946 *Acruliammina longa* (TAPPAN); LOEBLICH - TAPPAN, p. 252, pl. 36, figs. 20a–c.
1959 *Acruliammina longa* (TAPPAN); BALACHMATOVA - REJTLINGER, p. 230, fig. 291 A–B.
1964 *Placopsilina cenomana* (D'ORBIGNY); LOEBLICH - TAPPAN, fig. 159 / 1, 2.
1964 *Acruliammina longa* (TAPPAN); LOEBLICH - TAPPAN, p. C247, fig. 159 / 5.
non 1967 *Acruliammina longa* (TAPPAN); BRÖNNIMANN - JAYET, p. 7–23, text-figs. 2–9; pl. 1.

Description: Test attached, large, consisting of irregularly coiled initial portion and uncoiled uniserial portion almost never continuing straightly but deviating, turning aside, bending and once again straightening quite irregularly. The build and size of the coiled initial portion of individual tests is considerably variable. It consists of 1 to 1 1/2 whorls. One whorl is composed of 5 to 10 chambers, mostly roundly triangular, separated by slightly depressed sutures. Chambers either gradually enlarging or with a nearly constant size. In the centre of the coiled

---

←

2. *Acruliammina longa* (TAPPAN); Černovičky
1 – initial spire attached to the adult specimen; 2 – five mutually overgrown specimens; 3 – specimen with a small initial spire; 4 – specimen with a large spire and the end broken off; apertural openings visible on the intercameral septum; 5 – three concrescent specimens; the greatest have partly broken off dorsal walls

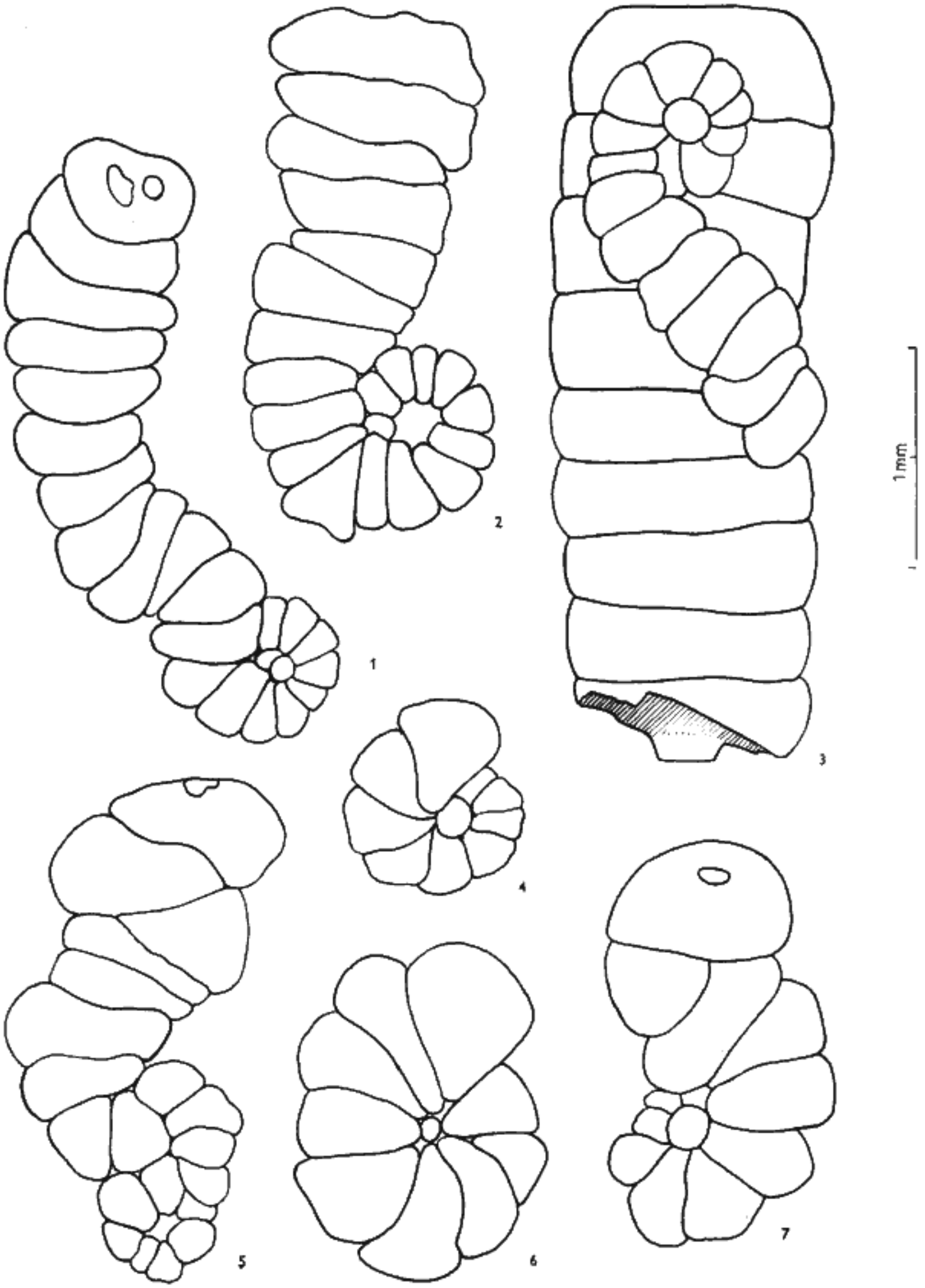
portion is a round to elliptical, inflated proloculum with a diameter of 0.11 to 1.08 mm, or a little depression which remained after its breaking off. The diameter of the coiled portion oscillates from 0.50 to 2.22 mm. This size in smaller spires (up to the diameter of 1.20 mm) does not depend on the number of chambers (5 to 9 + proloculum); only the larger ones have 8 to 9, rarely up to 10 chambers around the proloculum.

The uncoiled portion consists of numerous, short and broad uniserial chambers, roundly oblong, in places of bending of the test triangular; the attached ventral side corresponding in shape to the substratum, the dorsal side slightly inflated. Chambers are separated by distinct, depressed sutures. The interior of the chambers is simple, hollow; intercameral septa with apertural openings. The number of uniserial chambers oscillates from 0 to the found maximum number of 28 chambers. This number is not final, because the last, 28th chamber bears some traces of another, half-broken continuation of the test. Majority of the tests have a smaller number of uniserial chambers, usually with smoothly rounded, integral, slightly inflated apertural face, which shows that their growth was finished. Therefore we cannot suppose, that these specimens have developed the last part of the uniserial portion, in this genus rising from the substratum, straightening and becoming round to elliptical in cross-section with a greater number of terminal apertural openings.

In tests from Černovičky, attached to an abraded lydite block or to lydite pebbles, it cannot be demonstrated with certainty that they had developed the freely growing portion in spite of their numerous chambers and relatively large size. This free end of the test was found in a little number of specimens washed from calcareous claystones forming the Cretaceous filling of the so called "erosional channel Veronika" in the gneiss wall of the quarry Skalka near Velim and from organodetritic limestones from the localities Kamajka, Zbyslav and Skalka near Žehušice. These specimens, attached to minute fragments of gneiss or to the tests of *Bdelloidina cribrosa*, echinoid spines, shell fragments and the like, grew up to a considerably smaller size, but their ends disengaged and rised above the substrate much sooner, in the moment when they reached, even by a little number of chambers, the periphery of the substratum. These specimens have on the end of the free portion 2 to 5 apertural openings (pl. I, fig. 6; pl. II, figs. 5, 7).

The terminal aperture, situated usually not far from the attached base or in the centre of the apertural face of the last chamber, underwent during the ontogenetic evolution of individual specimens the following changes, which are often observable when the dorsal side of chambers is broken off, also on intercameral septal areas:

1. A simple aperture (fig. 4/1—2) in the shape of a ± broad slit to ellipse with the longer axis parallel with the base, or of a quite irregular shape, was found in 40 % of 80 measured specimens with uncoiled portion. It occurs on the chambers of the spirally coiled portion and in the first section of the uncoiled portion. The



3. *Acruliammina longa* (TAPPAN)
1, 2, 5 – specimens with evolute portions; Černovičky; 3 – specimen attached to *Axicolumella cylindrica*; Kamajka; 4, 6, 7 – juvenile specimens; Černovičky

majority of these juvenile specimens have this simple aperture on the rounded end of the test, which did not grow further, which is confirmed by the absence of any traces of breaking. The breadth of the last chamber with the simple aperture ranges from 0.55 to 1.0 mm, the length of specimens with the uncoiled portion from 1.11 to 3.88 mm.

2. The transition from one to two apertural openings was found in the test 2.4 mm long, with the breadth of the last chamber 0.94 mm. This aperture is in the shape of a dumbbell: a slit joins two nearly round openings.

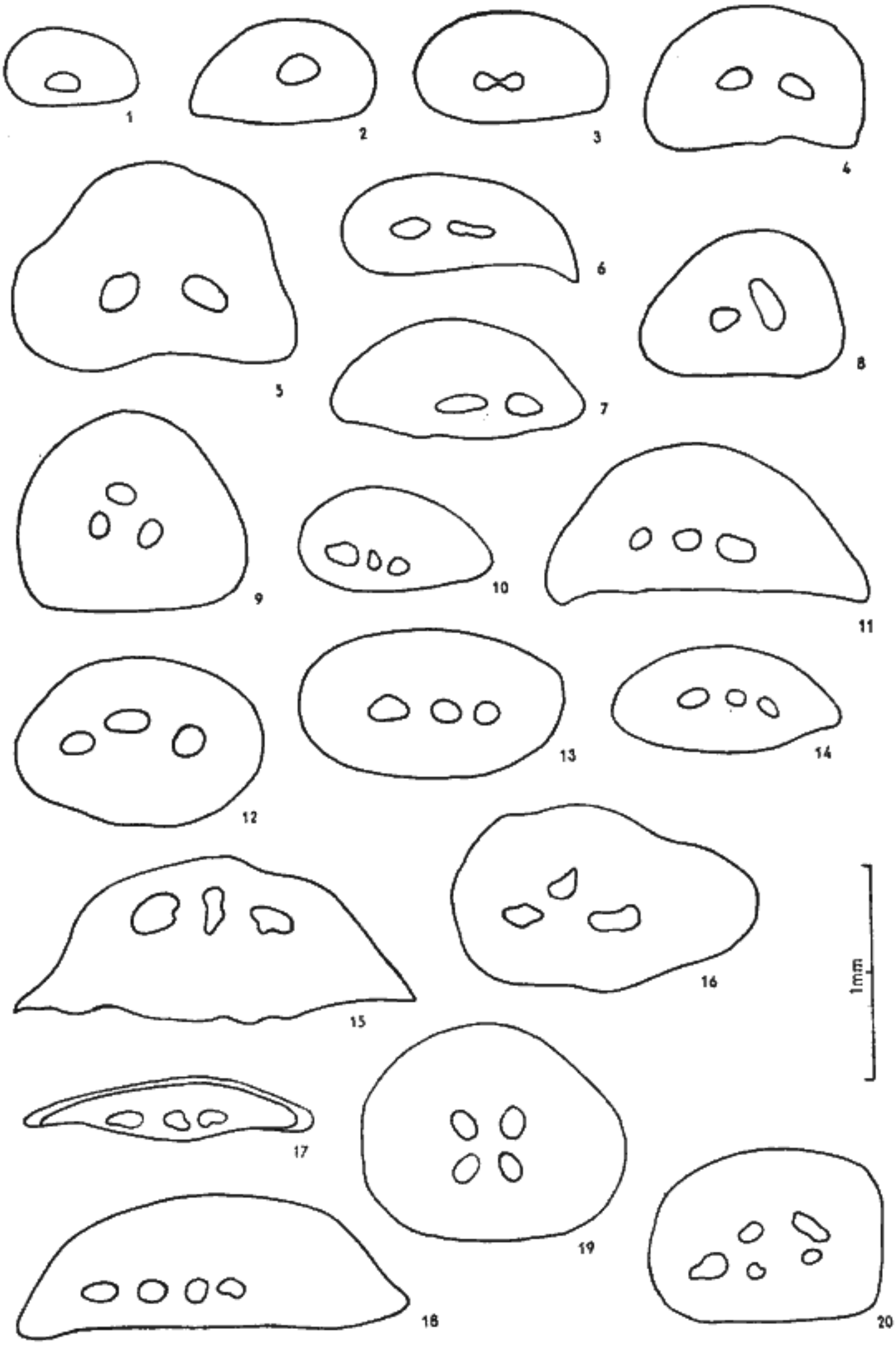
3. The first stage with the simple aperture is followed by chambers with two apertural openings (fig. 4/4—7), which are mostly elliptical, rarely almost round and situated in the same level or raise obliquely in the direction to the central axis. There were found 33.75 % of tests terminated in this stage and they probably still belong among the juvenile specimens. The aperture consisting of two openings occurs in last chambers 0.94 to 1.30 mm broad, in tests 3.43 to 5.70 mm long.

4. The aperture formed by one round and one elongate opening (fig. 4/8) can be considered a transition from two to three apertural openings. It was observed on a well preserved test with the following parameters: diameter of coiled portion 0.97 mm, number of chambers in coiled portion 9 + proloculum, diameter of proloculum 0.16 mm, length of the test 4.57 mm, breadth of the last chamber 0.8 mm, height of the apertural face 0.55 mm, number of chambers in the uncoiled portion 12 + the broken end.

5. The aperture composed of three openings was found in 18.75 % of the specimens. Irregularly elliptical to round openings are either all in one row (fig. 4/10, 11, 13—15, 17) or arranged in the shape of a ± regular triangle (fig. 4/9, 12, 16; pl. I, fig. 5). These specimens are the largest, they reach the length of up to 8.04 mm. The breadth of the last chamber 1.30 to 1.61 mm was measured on the tests with apertural openings forming a row and exhibiting during the growth invariably low and broadly arched cross-section. The evolutionarily more advanced tests already began to manifest the tendency of gradual heightening, which evidently preceded the detachment of the next stage from the substrate. The cross-section of these specimens is higher, more vaulted, broadly elliptical to nearly round with a relatively short, straight, attached base. The central apertural opening gradually moves upwards, which results in their triangular arrangement. The breadth of the chambers decreases up to 0.8 to 1.1 mm.

6. The aperture consisting of four openings (fig. 4/18, 19; fig. 2/5; pl. II, fig. 7) was found in 6.25 % of specimens with attached ends only. Part of them is 4.5 to 5.4 mm long, others could not be measured. For the breadth of the last chambers holds the same, what was mentioned about the tests with three apertural openings: the low, broadly attached chambers have apertural openings in a row, in the chambers with almost round cross-section apertural openings make apexes of a square.

7. Aperture composed of five openings was found in one specimen attached by the whole test to the substratum (Černovičky). This specimen is 5.54 mm long, the



4. *Acruliammina longa* (TAPPAN); Černovičky
1–20 – apertural openings of attached specimens

last chamber is 1.25 mm broad. Apertural openings make an irregular ellipse; their position suggests that they originated from primary four openings located circularly with the fifth, moved to the side (fig. 4/20). Free ends of the specimens from the sediments of Skalka near Velim, Kamajka and Skalka near Žehušice exhibit apertural openings arranged in a regular circle (pl. I, fig. 6) or ellipse (pl. II, fig. 5).

It is probable, that free ends of the tests that were not found in the locality Černovičky were broken off and covered with a layer of lydite pebbles on the bottom of the quarry. According to the manner of conservation of the tests it cannot be presupposed that there was a large number of these lost fragments: the majority of smaller specimens (with 1 to 2, less frequently with 3 apertural openings) have intact ends. Therefore further continuation of the growth is probable in a relatively small percentage of the specimens — in the group with 3 to 5 apertural openings.

The walls are composed from three layers:

1. the outer exostratum is build up by a thin layer of quartz grains, of the average about 0.20 to 0.05 mm, exceptionally up to 0.16 mm, arranged mosaiclike, parallelly with the surface.

2. The relatively thick mesostratum is made by smaller, less compressed quartz grains. The cementing material of both these layers is quartzitic. In the mesostratum were found both pores and wall tubules (pl. III, fig. 1b; pl. IV, fig. 3b).

3. The endostratum, made by a very thin pseudochitinous layer of brownish color is conserved only fragmentarily in some of the chambers.

Due to weathering the tests are very fragile, easily breakable and crushing already under slight pressure. Apertures can be successfully cleaned only by a soft little brush, dipped in water or better in diluted HCl, which dissolves calcareous deposits without damaging the quartzitic wall of the test.

The considerable differences in the size of initial coiled portions led to deliberation whether the tests did not belong to different generations. For the microspherical ones may be held perhaps specimens with relatively small spires and long evolute portion consisting of numerous chambers, for example tests with the following sizes:

diameter of coiled portion:	0.58 mm	1.02 mm
number of chambers in spire:	5 + proloculum	9 + proloculum
diameter of proloculum:	0.13 mm (depression)	0.16 mm (depression)
length of the test:	8.04 mm	8.04 mm
breadth of the last chamber:	2.63 mm	1.61 mm
number of evolute chambers:	28 + ?	23
number of apetural openings:	4?	3

This hypothesis is made questionable by the fact, that one of the mentioned tests has the initial coil composed of five chambers and proloculum only, while the large spires (with the diameter 1.11 to 2.22 mm) which should represent the megalospherical stage, consist of the maximum number of chambers. These spires

occur often separately, without the evolute portion of the test; they are mostly isolated from other specimens and well conserved (fig. 3/4, 6). But in case that they are followed by evolute portion, they usually form a component of groups of mutually overlapping, tangle-like grown specimens, secondarily damaged, in which it is not possible to determine mutual appurtenance of the beginnings and ends of the tests and therefore nor the exact length and number of evolute chambers in order to obtain a sufficient basis for biometrical differentiation of both generations (fig. 2/2).

Relatively more frequent occurrence of solitary longer tests with smaller spires (with diameter up to 1.05 mm) and on the other hand clusters of specimens with greater spires, confirm to a certain extent the expected differentation of generations: after leaving the tests of sexual megalospheric generation, the gametes were attached in their close proximity. Specimens originated in this manner during the growth much more accumulated and overlapped each other and therefore their differentiation was more difficult. In this group, specimens in which it was not possible to measure exact lengths of the tests, are represented by different types of apertures in the following percentage: of the whole number simple apertures represent 28 %, apertures with 2 openings 60 %, apertures with 3 openings 40 % and apertures with 4 openings 20 %.

The overgrowing of the tests is very diversified. Beside two to three specimens, which may mutually overlap either quite parallelly, directly one over another, or may be slightly shifted, we can find larger groups of specimens variously intercrossed; spires separated, but with intertwined evolute portions, which converge in one site; mutually overgrown tests of different sizes; a specimen beginning and also apparently ending by a secondarily grown spire and the like. There were found also specimens with their evolute end turned in 180° and covering their own beginning and the superimposed spires with evolute portions diverging to different directions (giving the impression of ramification), but never really bifurcated specimens.

In the locality Černovičky, where was found the greatest number of specimens of *Acruliammina longa*, the tests were attached to the abraded wall of a lydite block and to pebbles of Proterozoic lydites, which weathered from the quarry wall and made a layer on its bottom. *Acruliamminas* make light, faintly rusty, macroscopically visible accumulations of fine small chains on lydites; most specimens were found by examining the material from the bottom of the quarry. Up to 65 specimens were concentrated on one face of the pebble of the size 3.5 × 3.5 cm. The best conserved tests are usually in depressions or in slightly concave faces of lydite pebbles, which are often covered on more sides.

Dimensions:

length of the test:	0.50 (the spire only) – 8.04 mm
diameter of coiled portion:	0.50 – 2.22 mm
diameter of proloculum:	0.11 – 1.08 mm
number of chambers in 1 whorl:	5 – 10

number of evolute chambers:	0 – 28 (attached to the substratum)
breadth of the last chamber:	0.55 – 1.63 mm
height of the last chamber	
a) lowly arched:	0.27 – 0.63 mm
b) vaulted, rounded:	0.77 – 0.88 mm

Discussion and comparison: FRIEG - KAEVER (1976, p. 120—121) called attention to the fact that in the original description of *Placopsilina longa* TAPPAN, 1940 "Die Mündung dieser Art wird als halbkreisförmig, wenn die letzte Kammer aufgewachsen, und rundlich, wenn die letzte Kammer frei ist, beschrieben." and "In einer weiteren Beschreibung (TAPPAN, 1943) bildet die Autorin ein Exemplar von *Placopsilina longa* ab, dem bei die am rundlichen Querschnitt erkennbare, freigewachsene letzte Kammer eine deutliche, zentral gelegene, einfache Mündung zeigt." The specimen with more apertural openings (LOEBLICH - TAPPAN, 1946, pl. 36, fig. 20) does not originate from the Type locality. "Daraus folgt, daß bei der Beschreibung der Gattung heterogenes, zumindest von der Typus-Lokalität abweichendes Material vorgelegen haben muß, das nicht in allen Merkmalen mit dem Holotypus übereinstimmt. Es ist demnach eine Trennung zwischen Formen mit einfacher Mündung (fide TAPPAN 1940 und 1943) und Formen mit multipler Mündung (fide LOEBLICH - TAPPAN 1946) notwendig. Dabei verbleiben Formen mit einfacher Mündung unter Artnamen *longa* bei *Placopsilina*. Für die Gehäuse mit cribröser Mündung muß eine neue, zu *Acruliammina* gehörende Art eingeführt werden".

On the basis of the study of abundant, very variable tests of *Acruliammina longa* (TAPPAN) from the Bohemian Cretaceous Basin, I presume that the specimens of *Placopsilina longa* (TAPPAN 1940 and 1943) also belong to the genus *Acruliammina*, for the following reasons:

1. With respect to the fact that in the Bohemian Cretaceous Basin in different localities the juvenile specimens of *Acruliammina longa* (TAPPAN) with one apertural opening occur relatively more abundantly than the more developed tests with a greater number of apertural openings (e.g. in the Perner's collection in the National Museum, Prague are tests with the simple aperture only, denominated mainly as *Lituola cenomana* D'ORB.) and that the form of the apertural openings is considerably variable (see fig. 4), I presume that such analogical situation most probably exists also in America. For this reason it can not be decisive that TAPPAN (1940) introduced in the original description of *Placopsilina longa* finding of specimens with a simple aperture only. Because the authors LOEBLICH - TAPPAN, 1946 at the establishement of the genus *Acruliammina* denominated *Placopsilina longa* as the genotype, I am convinced, that by comparison with the original findings in Texas, they themselves found the coincidence with the more abundant material from Oklahoma which also contains the more ontogenetically advanced stages.

2. The comparison of specimens depicted by TAPPAN (1940, 1943) showed clearly the coincidence with the Bohemian material not only in the shape of the

tests, but also in the creation of aperture of specimens within the frame of corresponding dimensions. The holotype (1940, pl. 15, fig. 9) resembles the tests called juvenile in this paper. The specimen (TAPPAN, 1940, pl. 15, fig. 10) is almost conforming with the attached test from Černovičky (see fig. 2/3) with a simple round terminal aperture, too. Also the test 2.26 mm long, with the spire-diameter 0.37 mm (TAPPAN, 1943, pl. 79, fig. 9) corresponds with the simple aperture of some attached Bohemian specimens of the same dimensions.

The differences between *Placopsilina longa* (TAPPAN 1940, 1943) and *Acruliammina longa* (LOEBLICH & TAPPAN, 1946): the coiled portion consisting from 1 to 1 1/2 coils (according to the picture), composed of more numerous chambers and the larger number of apertural openings corresponds to the span of the specific variability ascertained in the Cretaceous in Bohemia. In addition the fact, that the last chamber of specimens attached to the substratum by a larger portion has smaller number of apertural openings than the relatively shorter tests with the ends getting free sooner from the attachment in dependence on the smaller size of substrate, agrees with our observation.

The shape of apertural openings (LOEBLICH - TAPPAN, 1946, pl. 36, fig. 20c) is similar as in pl. II, fig. 5.

Bohemian specimens differ from the American ones, described (but not depicted) by LOEBLICH - TAPPAN (1946) with cribrate aperture, in apertural openings found in greatest number of five and in larger dimensions of some of specimens.

3. For a further confirmation of identity of *Placopsilina longa* (TAPPAN 1940, 1943) with *Acruliammina longa* (LOEBLICH & TAPPAN, 1946) I hold the specimen of *Acruliammina longa*, originated from the Upper Senonian near Vigny (nw. from Paris) and attached to the organodetritic limestone (pl. III, fig. 5). Its initial coiled portion is composed of five chambers; the strongly inflated proloculum protrudes above the coil (= the typical feature in description of *Placopsilina longa* TAPPAN). The last of the long row of uniserial chambers has two apertural openings (= the typical feature of *Acruliammina*). The test is very robust: length 11.73 mm; greatest width (across penultimate chamber) 2.39 mm; diameter of coiled portion 2.17 mm; thickness of coiled portion through center of proloculum 0.91 mm.

PERNER (1892) described specimens of *Acruliammina longa* from Kamajka as *Lituola cenomana* D'ORBIGNY. Because the tests of the genus *Lituola* are not attached and have a terminal cribrate aperture, LOEBLICH - TAPPAN (1964) corrected PERNER's determination and re-ranged his species to the genus *Placopsilina* (test attached, with a simple terminal aperture). They could not have known, that PERNER found juvenile specimens of another genus only.

Since D'ORBIGNY (1850) described *Placopsilina cenomana* originally by a sole sentence "Espèce contournée en crosse adhérente aux corps", his followers described a great number of different species under this name. Therefore I include in the synonymy the Perner's findings only, because I could compare my own

material with Perner's autotypes in Perner's collections in the National Museum Prague.

Acruliammina longa differs from the closely related species *Acruliammina neocomiana* BARTENSTEIN, 1962, described from the uppermost Valangian of Switzerland and later by FRIEG - KAEVER (1976) from the Cenomanian and the Cenomanian/Turonian boundary from the Ruhr (Mühlheim/Ruhr-Broich), as follows:

1. the absence of any internal structure inside chamber's cavities;
2. more numerous chambers in the coiled portion (5 to 10 in one coil);
3. the coiled portion made from 1 to 1 1/2 coils;
4. the linear attached portion which never bifurcates;
5. the dimension of proloculum with the diameter oscillating from 0.11 to 1.08 mm;
6. the aperture never slitlike (but oval to round) in juvenile specimens, and smaller number of variably shaped apertural openings, which by increasing in number, following after the stage with simple aperture, do not correspond to the description of FRIEG - KAEVER (1976, p. 121): "In den folgenden Kammern wird dieser Schlitz durch einen, später zwei Stege geteilt, so daß die Kammern vier Öffnungen zeigen können, die von zwei sich kreuzenden Stegen voneinander getrennt werden." The number of apertural openings increases gradually: apertures consisting of 3 openings are more common than 4 ones. Their distribution is variable: three as well as four openings may be arranged either in one row next to each other, or triangularly or tetragonally; they are either round or irregularly elongated. The true cribrose aperture has not been found.

The tests of *Acruliammina longa* a) have not internal pillars as *Acruliammina neocomiana* (FRIEG - KAEVER, 1976, p. 123): "Mesostratum-Pfeiler, die das Kammerlumen durchziehen, beschränken sich jedoch häufig nur auf eine einzelne, zentral gelegene Pfeilermasse, die im direkten Zusammenhang mit der Verteilung der Mündung-poren steht"; b) never bifurcate; c) have no cribrate apertures. Consequently they are much more primitive than *A. neocomiana*, notwithstanding that the oldest stratigraphical finding of this species originates from the Valangian and A. longa from the Upper Albian only.

Specimens described by BRÖNNIMANN - JAYET (1967) as *Acruliammina longa* (TAPPAN) from the Lower Hauterivian in Switzerland have some features common with Bohemian specimens, but others, fairly important features are different. Some of described features suggest even *Acruliammina nekvasilovae* n. sp. but they do not quite agree with this species in full extent.

Acruliammina longa described by BRÖNNIMANN - JAYET (1967) is to a certain extent conforming with Bohemian specimens in the formation of initial spire composed of 1 to 2 coils (Bohemian of 1 to 1 1/2 coils); one coil consists of 4 to 12 chambers (Bohemian of 5 to 10 chambers). The embryonal chamber either pro-

trudes above the coiled portion as in our *A. longa*, or is hidden below the spire as in *A. nekvasilovae*. The uncoiled uniserial stage never bifurcates.

Sutures of the chambers free of the attachment, are depressed; but sutures of the attached stage, described as indistinct dark lines, differ from our specimens. Apertural face of the free cylindrical chambers is bordered by a narrow marginal rim: "— un léger bourrelet marginal" (BRÖNNIMANN - JAYET (1967), p. 15). This rim was observed in the tests of *A. nekvasilovae*, but already in some of attached specimens. The cylindrical free portions of the tests have according to BRÖNNIMANN - JAYET up to ten apertural openings, which is much more than has our *A. longa*. But the main difference is (p. 15): "Les ouvertures des loges imbriguées et fixées ne sont pas visibles de l'extérieur", or (p. 20): "— la derniére loge imbriquée ne paraît jamais être pourvue d'une ouverture." The septal openings communicating with older chambers develop perhaps (p. 15): "— par résorption au cours de la formation d'une nouvelle loge." BRÖNNIMANN and JAYET studied these septal openings in thin sections and found, that after the terminal and nearly basal first opening follows the second one (p. 20): "— l'autre perfore la face supérieure de la loge imbriquée dans une position intermédiaire entre la base at la suture." This location of openings one above another also differs from the Bohemian specimens with openings laying parallelly with the base next to each other.

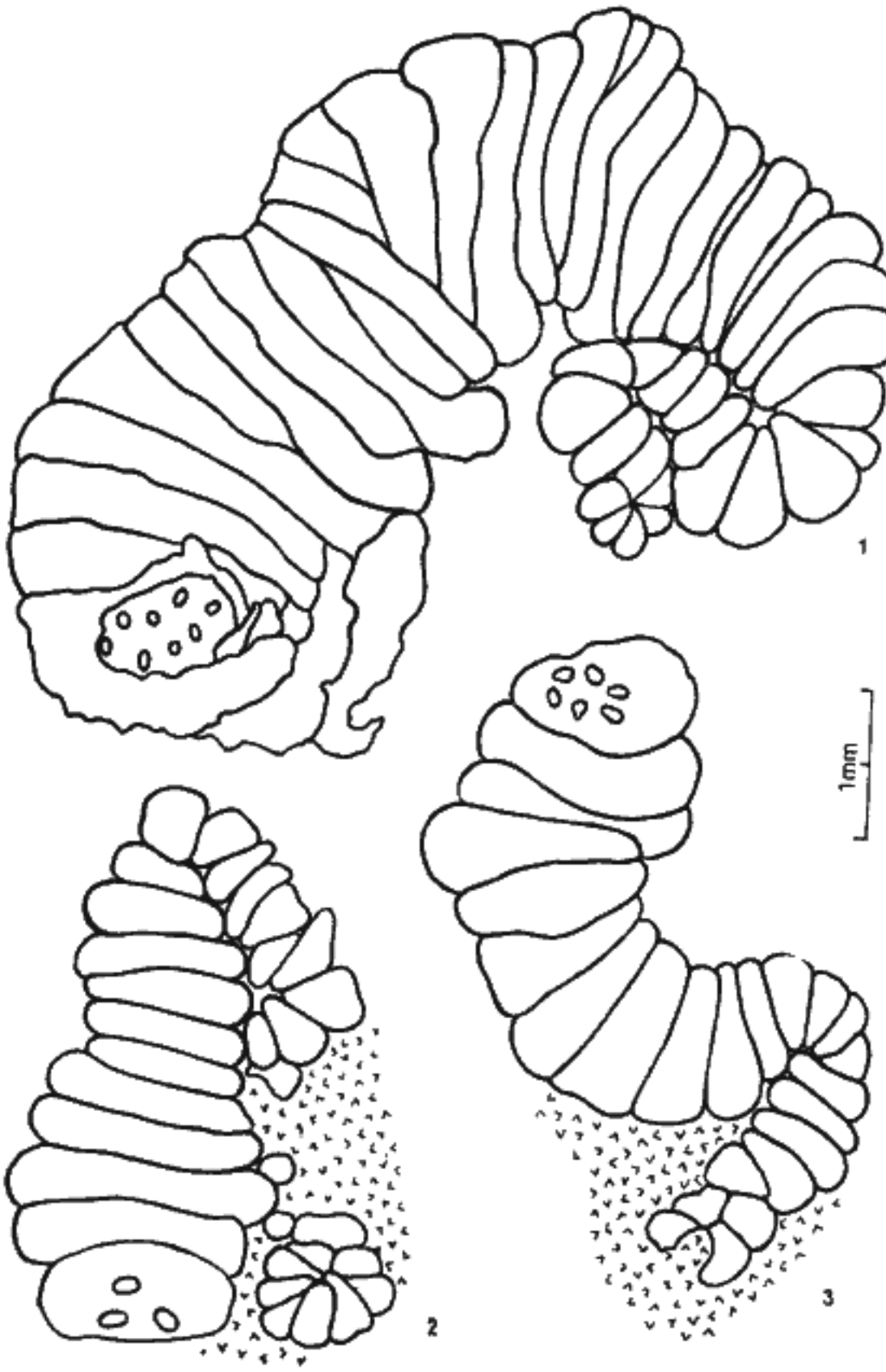
The Bohemian specimens of *A. longa* agree with the Swiss ones in the absence of the secondary septa in the hollows of chambers. But an essential difference is in the matter building the walls. According to BRÖNNIMANN - JAYET the surface "protective" layer, consisting of tightly packed quartz grains with an imperceptible amount of calcareous cement is insoluble in HCl. In the thicker inner layer prevails the secreted microgranular calcite over the foreign matter; this layer is soluble in HCl. The pseudochitinous endostratum is not present; instead of it a very fine layer of dark microgranular calcite is developed. All Bohemian *Acruliamminas* are quite insoluble in HCl. In addition they have the wall tubules opening out at the septa as supplementary apertures, that P. Brönnimann and A. Jayet also did not find anywhere.

From the stated comparison follows that *Acruliammina* from the Lower Hauterivian in Switzerland may be the ancestor of both Bohemian species *A. longa* and *A. nekvasilovae* which after evolution in the course of the Lower Cretaceous arose from them during the Lower/Upper Cretaceous boundary.

Occurrence: *Acruliammina longa* was originally described by TAPPAN (1940) from the Lower Cretaceous, Washita Group, Grayson formation (= the uppermost Albian) from Texas; later (TAPPAN 1943, LOEBLICH - TAPPAN 1946) from Denton formation, Duck Creek formation, Paw Paw formation and Kiamichi formation from Texas and Oklahoma. According to the picture, a very similar "*Placopsilina*" *cornueliana* D'ORBIGNY, unfortunately without description, was mentioned from the Neocomian of France (D'ORBIGNY in CORNUEL, 1848, p. 259, pl. 2, fig. 36;

D'ORBIGNY, 1850, p. 111). *A. longa* was found in France also in the Upper Senonian, attached to the organodetritic limestones near Vigny.

In the Bohemian Massif it occurs in the transgressive sediments of the Lower Turonian and on rocky substrate (Cenomanian ? Lower Turonian ?). Till this time it has been found in the following localities: Černovičky (on an abraded lydite block and on pebbles); Tuchoměřice — quarry Kněživka (on the abraded wall of a lydite monadnock); Skalka near Velim (on the abraded gneiss wall and in calcareous claystones). The specimens attached to minute rock fragments, most frequently of gneiss, to the *Ostrea* shell fragments, to echinoid spines, to bryozoan zoaria, to damaged tests of *Bdelloidina cribrosa* and *Axicolumella cylindrica*, to shark teeth and to the segments of crinoidal stalks were found in organodetritic limestones in the localities Kamajka, Skalka near Žehušice and Zbyslav.



5. *Acruliammina nekvasilovae* n. sp.; Skalka near Velim
1 – holotype; 2, 3 – paratypes

Acruliammina nekvasilovae n. sp.

Fig. 5/1–3; fig. 6/1; pl. III, figs. 2, 4; pl. IV, fig. 1; pl. V, figs. 1–5

Holotype and paratypes are attached together to one pebble of gneiss, which is deposited in the collections of the Geological Survey, Prague, under no. JH 290. Holotype is depictet in fig. 5/1 and in pl. V, fig. 1; paratypes: fig. 5/2–3.

Derivation of name: in honour of O. NEKVASILOVÁ, who found specimens of this species when collecting brachiopods.

Material: more than 50 differently conserved specimens.

Type locality: Skalka near Velim (Němeček's quarry, erosional channel "Veronika").

Type horizon: the Upper Cenomanian; it occurs also in the Lower Turonian (?).

Diagnosis: Test attached, with initial coiled portion and evolute uniserial later portion consisting of numerous low and broad chambers. Terminal aperture is composed of 2 to 10 apertural openings. Very stout walls are built of quartzitic grains with an imperceptible amount of quartzitic cement. Proloculum not rising above the centre of the spire.

Description: Attached, macroscopically visible tests begin by a small, irregularly coiled spiral portion consisting of 6 to 9, sporadically of a greater number of indistinct chambers. The shape of the chambers is various — elliptical, triangular to roundly oblong. Proloculum does not rise above the surface, it is hidden in the depressed centre of the coil.

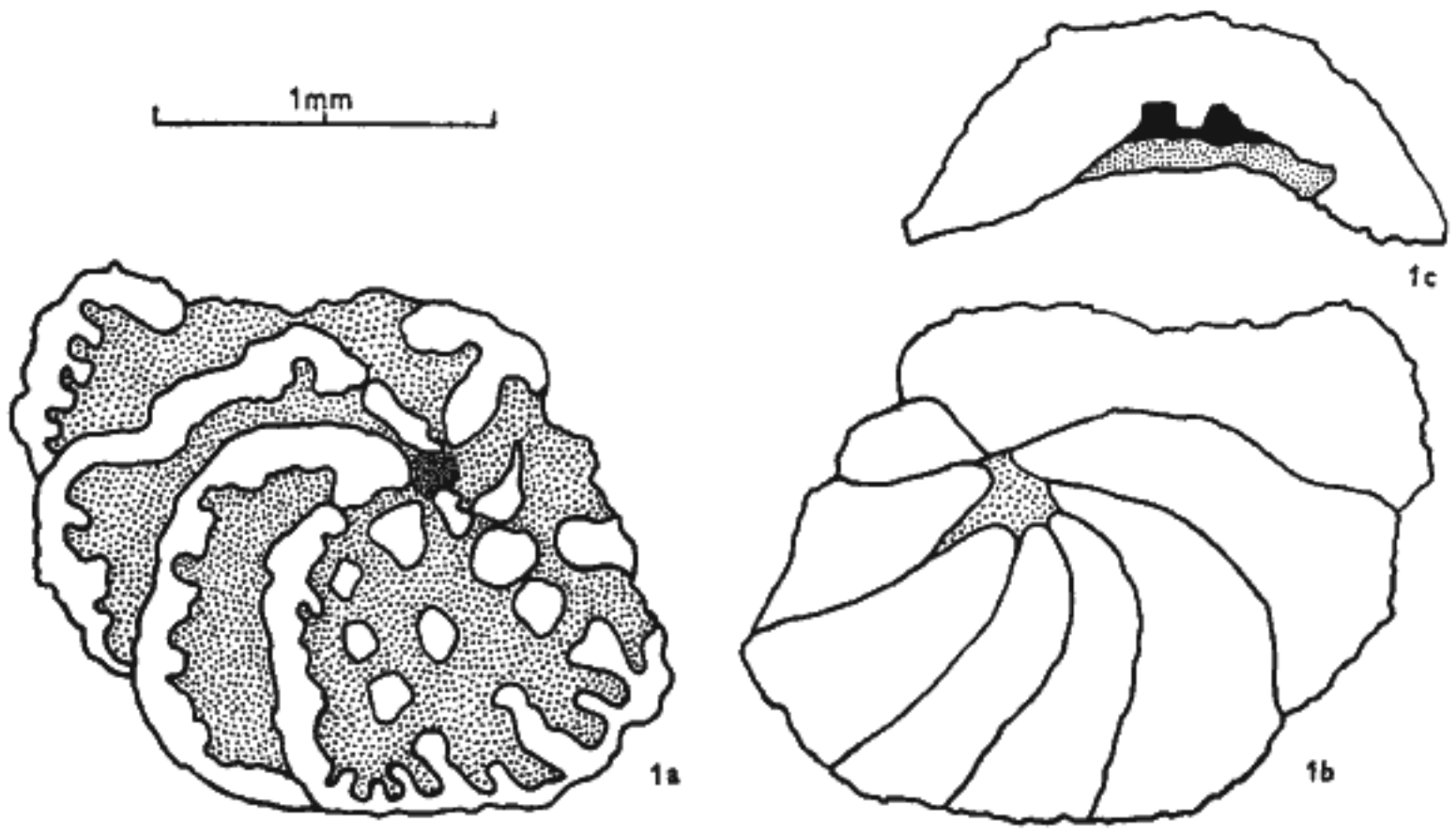
The following evolute uniserial portion winds and meanders, more rarely continues nearly straightly by an irregular row of chambers, at the beginning gradually increasing in size, later with an approximately constant size. Chambers are on the dorsal side slightly inflated, on the periphery they often appear like dispersed on the substrate; the ventral side corresponds in shape with the bottom.

The fragment of the specimen which was successfully separated from a gneiss pebble (fig. 6) showed that the test was attached to the substratum by lateral walls and intercameral septa which grew thicker at the base and are strenghtened mainly on the periphery by irregular digital projections. Basal walls of the chambers between intercameral septa are partly destructed; they are built of the pseudochitinous endostratum only.

Chambers are very short and broad, separated by shallowly depressed, in places obscure, narrow sutures. The terminal aperture is composed of several apertural openings; the number of openings increases during the ontogenetic evolution similarly as in *Acruliammina longa* (TAPPAN): the initial coiled portion (fig. 6) has two apertural openings, the end of the evolute portion minimally 3 and maximally 10 openings. Apertural openings are arranged either regularly — triangularly to elliptically or quite irregularly.

The aperture is conserved in a part of specimens only, usually on the deformed terminal face (paratypes, fig. 5/2—3), on the internal intercameral septum (holotype, fig. 5/1); incomplete aperture was preserved on partly broken ends of the tests (pl. V, figs. 3, 5). If the apertural face is not deformed, its transition into the

side walls is not gradually rounded as in *Acruliammina longa*, but the apertural face is nearly flat and its free periphery is bordered by the edge of the external wall of the chamber, which appears like a smooth, upright collar (pl. V, figs. 2, 4). The free end portions of the tests of this species were not found.



6. *Acruliammina nekvasilovae* n. sp.; Skalka near Velim; initial portion of the test separated from the substrate:
1a – view on the attachment face with intercameral septa fortified on the base, 1b – dorsal side, 1c – apertural face

Specimens of *Acruliammina nekvasilovae* occur either separately, or similarly as *Acruliammina longa*, in accumulations and mutually owergrown groups.

The internal structure of the wall is likewise as in Bohemian specimens of *Acruliammina longa* and in *Acruliammina neocomiana* BARTENSTEIN (FRIEG & KAEVER, 1976) porous and composed of three layers:

1. the outer exostratum is a relatively thick layer consisting of closely compressed larger quartz grains most frequently of the average about 0.08 to 0.19 mm, exceptionally up to 0.30 mm; amount of the quartzitic cement is imperceptible.
2. the mesostratum is made by more minute quartz grains; the density of the grains in the quartzitic cement is smaller.
3. the very thin, pseudochitinous endostratum of brownish color was for the present found exclusively on the base of the test disengaged from the substrate, where it was preserved as sole, partly destructed, incontinuous layer, forming the wall among the septa.

In the mesostratum, there are pores and tubules, opening out by alveolar openings as additional sutural apertures. They were found in a broken end of the test (pl. IV, figs. 1a—c).

Comparison: *Acruliammina nekvasilovae* differs from the closely related species *Acruliammina longa* (TAPPAN) in the following features:

1. greater size: *A. longa* reaches the maximum length of 8.04 mm; specimens of *A. nekvasilovae* reach up to 15 mm;
2. greater breadth of chambers: the length of chambers of *A. longa* is equivalent to 1/2 — 1/5 of their breadth; the length of chambers of *A. nekvasilovae* makes only 1/6 to 1/11 of their breadth;
3. greater number of apertural openings: juvenile specimens of *A. longa* have a simple aperture, the adult ones in the Bohemian Cretaceous Basin maximally five openings; the juvenile spires of *A. nekvasilovae* have two apertural openings, an adult specimen up to ten openings;
4. greater number of chambers of evolute portion: it was found maximally 28 chambers in *A. longa*; evolute portion of the holotype of *A. nekvasilovae* consists of 43 chambers;
5. different shape of chambers, which appear in *A. nekvasilovae* like diffused on the substratum;
6. less distinct sutures;
7. composition of the walls: in the test walls of *A. longa* prevails a great amount of quartzitic cement; the size of the quartz grains is in average from 0.02 to 0.05 mm in the exostratum; this layer of *A. nekvasilovae* is composed of quartz grains most commonly about 0.08 to 0.19 mm, but occasionally up to 0.30 mm. The amount of cement is not great. Therefore the specimens are much stouter, better conserved and specimens with a broken off part of the dorsal side are much less frequent as in *A. longa*;
8. the more fortified internal structure: irregular digital projections strenghtening the basal parts of the attached walls of *A. nekvasilovae* lack in *A. longa*;
9. the position of embryonal chamber: in the centre of the initial coil of *A. longa* is an inflated proloculum or a distinct trace of its breaking off. The proloculum of *A. nekvasilovae* is hidden below the spire, composed of one coil only; in *A. longa* are 1 to 1 1/2 coils in the spire;
10. the nearly flat apertural face, bordered by the edge of the external wall.

Acruliammina nekvasilovae differs from *Acruliammina neocomiana* BARTENSTEIN in the coiled portion, built of one coil, which is composed of 6 to 9, sporadically even of more indistinct chambers. The proloculum is not visible on the surface of the spire. The test does not bifurcate. The chambers differ in the shape: they appear like diffused on the substratum.

The specimens of *A. nekvasilovae* are in their general appearance very similar to the attached stage of *Bdelloidina cribrosa* (REUSS). They differ from them in the wall matter, quite insoluble in HCl (the walls of *B. cribrosa* have calcareous cement), in the simple internal structure and in the apertural face: the aperture of *B. cribrosa* is typically cribrate, it is composed of more numerous apertural openings.

Dimensions: the length of the test (measured along the central axis of the

chambers): holotype 12.1 mm, paratypes 7.76 mm, 6.10 mm; maximum breadth: holotype 3.04 mm, paratypes 1.52 mm, 1.45 mm; diameter of the spire: holotype 0.63 mm, paratype 0.86 mm.

Occurrence: *Acruliammina nekvasilovae* is restricted to the shallow-water marine environment, where it was attached to the solid rocky substratum. In Skalka near Velim the specimens were found attached:

1. to the highest part of the abraded gneiss wall of the erosional channel in the subsoil of the Cretaceous;
2. to the pebble from the Cenomanian conglomerates cemented by organodetritic limestone (with *Inoceramus* ex. gr. *pictus* according to personal communication of S. Čech) filling the deeper part of the erosional channel;
3. to *Ostrea* shell fragments from the Lower Turonian calcareous claystones with a foraminiferal assemblage with index-species, filling the higher part of the erosional channel.

The sheet of the so called "*Scyphia*" spongolite marlstones with *Inoceramus* ex gr. *labiatus* (according to S. Čech), which fill the highest part of the erosional channel, protected the attached foraminifers against destruction (HOUŠA - NEKVASILOVÁ 1984, p. 97).

Coscinophragmatinae THALMANN, 1951

Bdelloidina CARTER, 1877

Bdelloidina cribrosa (REUSS, 1846)

Fig. 7; fig. 8/1–7; pl. VI, figs. 1–8; pl. VII, figs. 1–9; pl. VIII, figs. 1–6; pl. IX, figs. 1–3; pl. XI, figs. 3, 4, 7; pl. XII, figs. 1–3, 11, 12.

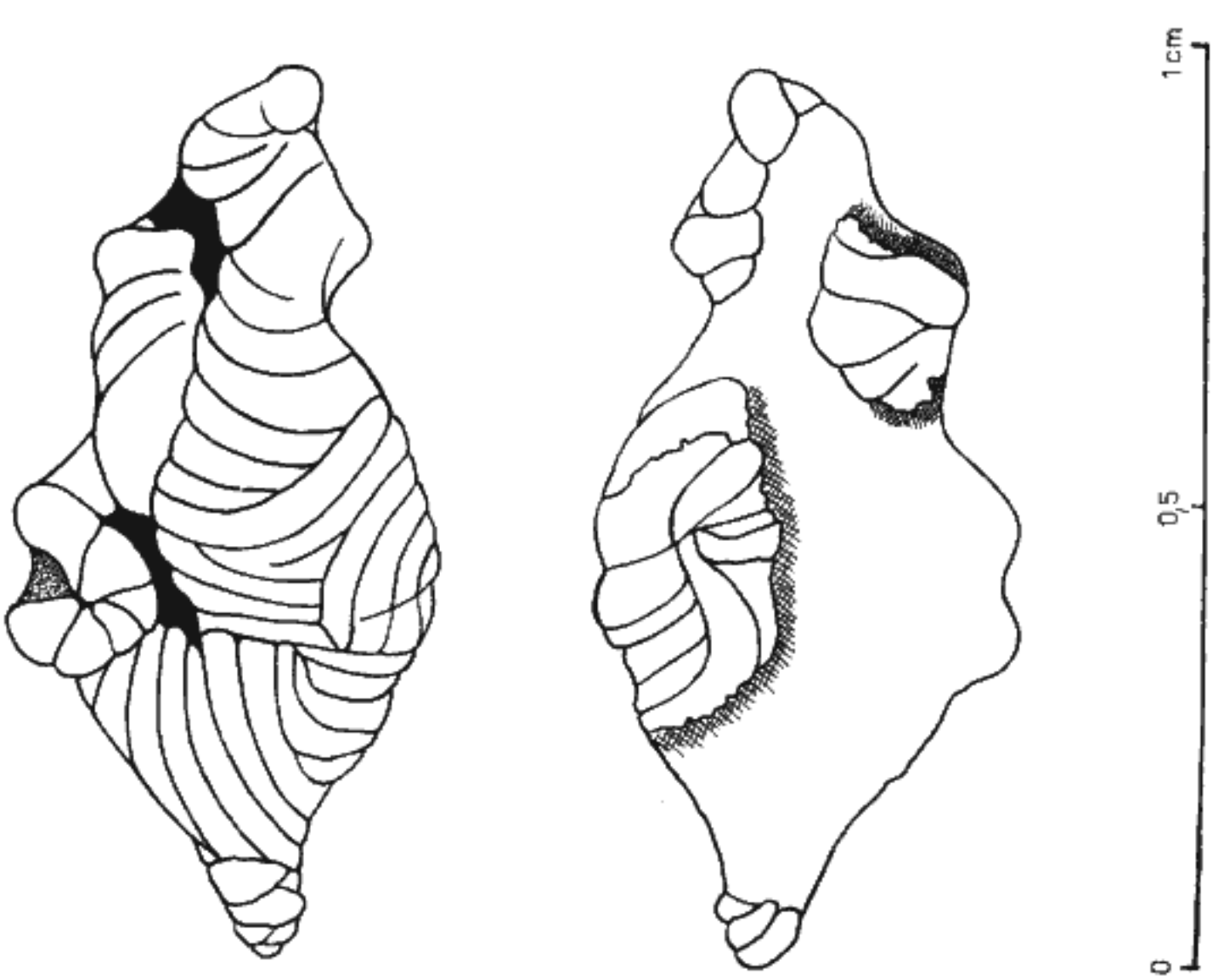
1846 *Lichenopora cribrosa* REUSS; REUSS, p. 64, 123, pl. 14, fig. 10; pl. 24, figs. 3–5.
1871 *Polyphragma cribrosum* REUSS; REUSS, p. 277.
1872 *Polyphragma cribrosum* REUSS; REUSS in GEINITZ, p. 139, pl. 33, figs. 8–10.
1892 *Polyphragma cribrosum* REUSS; PERNER, p. 18–20, pl. 1, figs. 1–14; p. 18, fig. 2; p. 19, fig. 3.
1913 *Bdelloidina laurenti* FRANKE; FRANKE, p. 259, pl. 6, figs. 1a–c.
1928 *Polyphragma cribrosum* REUSS; FRANKE, p. 21, pl. 2, figs. 8a, b.
1939a *Polyphragma cribrosum* REUSS; AUGUSTA - ŽEBERA, p. 277–279.
1939b *Polyphragma cribrosum* REUSS; AUGUSTA - ŽEBERA, p. 213.
1950 *Polyphragma cribrosum* REUSS; CUSHMAN, pl. 19, figs. 8–10.
1952 *Polyphragma cribrosum* REUSS; SIGAL, pl. 4, fig. 21.
1954 *Coscinophragma cribrosum* (REUSS); POKORNÝ, p. 127, fig. 107.
1957 *Coscinophragma cribrosum* (REUSS); MAYNC, p. 184, figs. 1–3.
1958 *Coscinophragma cribrosum* (REUSS); POKORNÝ, p. 201, figs. 129–130.
1964 *Coscinophragma cribrosa* (REUSS); LOEBLICH - TAPPAN, p. C249, figs. 162/6–7.
1974 *Coscinophragma cribrosa* (REUSS); KAEVER, p. 18, figs. 1a–c, 2a–f.
1975 *Bdelloidina cribrosa* (REUSS); FRIEG - KAEVER, p. 453–461, figs. 1/1–4; 2/1–4, 6; 3/1–9.
1980 *Bdelloidina cribrosa* (REUSS); FRIEG, p. 229–230, pl. 1, fig. 7.

Description: Test robust, macroscopically visible. Early stage is attached,

later one gets free and becomes cylindrical. Since the first finding of *Bdelloidina cribrosa* by REUSS (1846) who only described broken ends of free portions and secondarily disengaged shorter specimens, the statement concerning the initial stage attached to the rocky substratum is completely missing in all reports announcing findings of this species in the Bohemian Cretaceous Basin.

The first discovery of the attached specimens of *Bdelloidina cribrosa*, denominated as *Bdelloidina laurenti* n. sp. is mentioned by FRANKE (1913) "— auf der Knollenbank des Cenomans in Hörde, Münstersches Becken, Deutschland". Later FRANKE (1928) also found the broken free ends "Im Schlämmrückstand der Mergel von Mühlheim und Hörde" and as the first, he recognized the appurtenance of both these attached and free portions to the only one species "*Polyphragma*" *cribrosum*.

FRIEG - KAEVER (1975) elaborated the specimens of this species in detail with the main view to the structure of the walls. They also tried to distinguish the tests in view of the variation of generations. They designated the smaller specimens (maximally up to 15 mm long), composed of the early coiled portion followed by a short row of uniserial chambers as the megalospherical tests. The tests of this type occur sporadically in the Bohemian Cretaceous Basin in the localities Karlov near Kutná Hora, attached to the wall of an abraded gneiss block, where they range in size



7. *Bdelloidina cribrosa* (REUSS) attached to a little fragment of Ostrea shell from Lower Turonian calcareous claystone of Skalka near Velim

from 4 to 6 mm (pl. VI, fig. 1 above, on the left) and in Středokluky (pl. VI, fig. 5): length 4.08 mm, diameter of the spire 2.91 mm, diameter of the proloculum 0.56 mm.

The larger, attached, irregularly star-like branched tests were found in the Bohemian Cretaceous Basin in the localities Středokluky and Karlov, where their span extends up to 51 mm (pl. VI, figs. 1, 2). FRIEG - KAEVER (1975) suppose, that these specimens may belong to the microspherical generation, although there was not possible to distinguish any initial stage.

Bdelloidina cribrosa attached to a little fragment of *Ostrea* shell has been found in the calcareous claystones of Lower Turonian age filling the erosional channel "Václav" in the gneiss wall in Skalka near Velim (fig. 7; pl. VI, fig. 3). This finding is slightly weathered and abraded, the sutures are partly indistinct. We could differentiate with certainty the tests of two adult specimens and one initial coil attached to the surface of the other, and it can not be ruled out, that the number of mutually overgrowing specimens is larger. The tests are mostly attached to one side of the fragment, but they also reach over to the other side. This finding resembles not clearly arranged formations in the middle of the star-like specimens attached to the rocky substratum.

In addition to these rare permanently attached initial portions of the tests, the fragments of the free ends and the short specimens secondarily disengaged from the substratum are very common in many Bohemian localities.

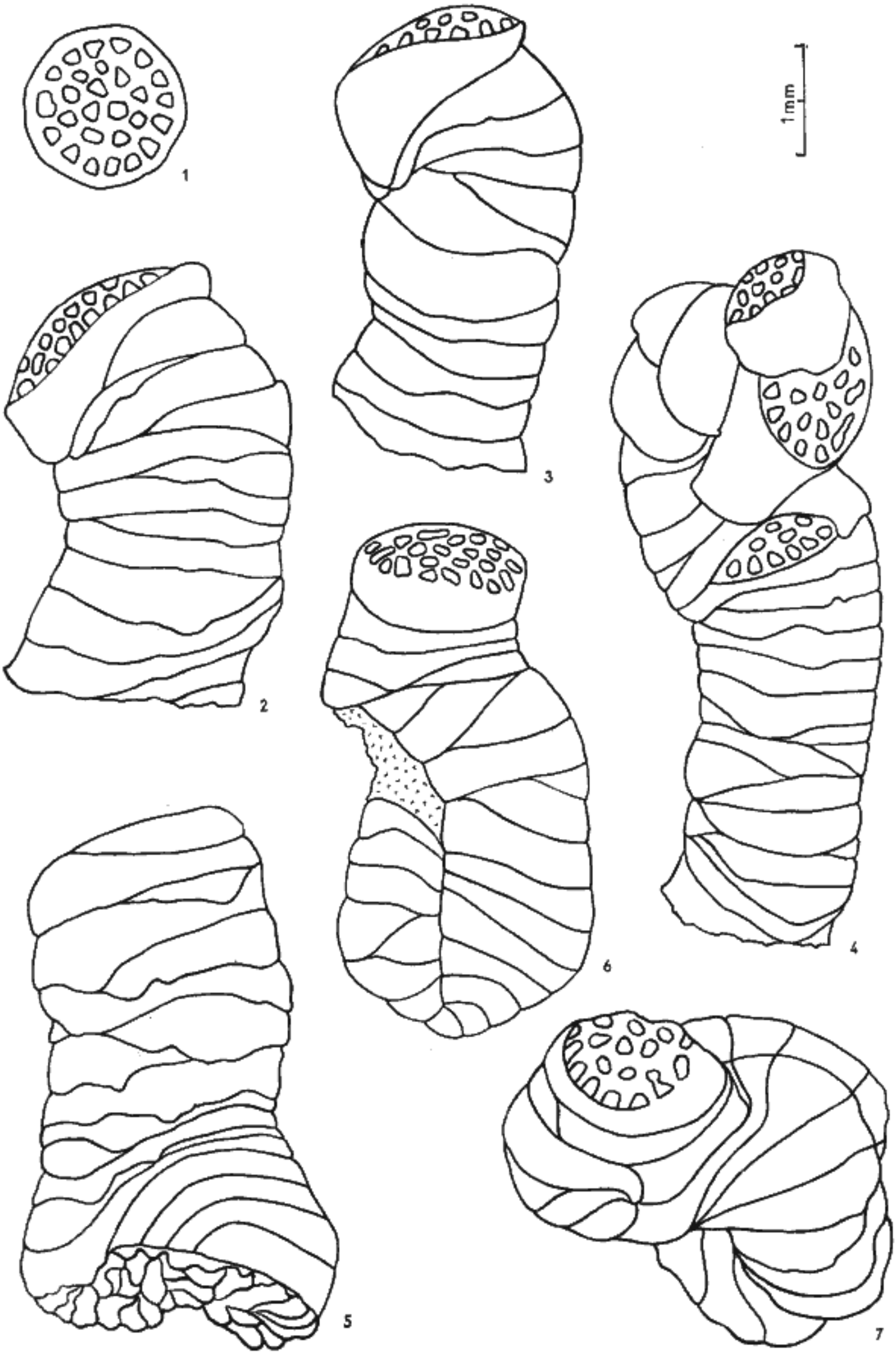
1. The uniserial fragments of free ends of the tests are irregularly cylindrical; their cross-section is round to oval. The chambers are much broader than high. According to PERNER (1892, p. 19) "the chambers are 4 to 6 times broader than high". According to the results of our measurements, this difference is even more conspicuous: there were found specimens with chambers 9 times broader than high. Chambers are not regular (with parallel sutures), not even in relatively straight sections with nearly constant breadth, but they very changeably lower and heighten and in some sites they even wedge out. Some of the specimens exhibited a sudden shift of the axis, associated with a partial narrowing of the test. The last broader chamber preceding this displacement shows a disclosed part of the apertural face (fig. 8/4; pl. VII, figs. 1, 2). This phenomenon is in some of specimens repeated several times. It is possible that it is the preparatory (preliminary) stage, preceding the ramification of the test, but which did not appear in any of these specimens.

REUSS (1846) in the original description did not mention any bifurcation of the

---

→

8. *Bdelloidina cribrosa* (REUSS); Kamajka
1 – apertural face; 2, 3 – relatively straight specimens; 4 – specimen with irregularly grown shifted chambers disclosing parts of earlier apertural faces; 5 – specimen with rugged attachment face; 6 – specimen turned at 180° back and attached by its later portion to its early portion; 7 – specimen prevailingly attached to the substrate, with a short free end only


1
2
3
1mm
4
5
6
7

tests. Also AUGUSTA - ŽEBERA (1939a) in the rich material "of many hundreds of specimens ... observed broadening of the shape of a flattened funnel in upper part of the test, but missed the bifurcated forms, which are according to PERNER (1892) common in Kamajka and Kaňk." Also among more than 700 specimens of *Bdelloidina cribrosa* from 9 localities (including Kamajka and Kaňk), the study of which was the basis for this paper, was not found any really bifurcated specimen. Only the material of Kamajka sporadically displays either closely concrescent specimens, giving the impression of this bifurcation (pl. VII, fig. 6), or specimens with the beginning of bifurcation indicated only (pl. VII, fig. 4).

This discrepancy could be solved only by examination of Perner's autotypes in the collection of the National Museum in Prague. The result was surprising: in addition to the bifurcated fragments of free ends of the specimens depicted by PERNER (1892, pl. 1, figs. 3, 6), in the collection are preserved numerous additional ones; some of them are also distinctly bifurcated. It has one probable explanation only: at Kamajka J. Perner took the samples from a place, which is today, almost after 100 years, not accessible and in which evidently occurred to a certain extent different foraminifers.

Intercameral sutures are slightly depressed. In some of the specimens are distinct, in others almost obscure; sometimes alternate deeper sutures with shallower ones in the same specimen: several chambers illusorily merge on the surface thus making the impression, that they are less numerous and higher than in reality.

The terminal apertural face, round to elliptical or secondarily deformed, slightly convex or nearly flat, is cribrate, with numerous (up to 36) apertural openings of various shape. Apertural openings of regular tests are mostly arranged concentrically in more circles, but they can be spaced out also quite irregularly.

2. The short tests, secondarily disengaged, were most probably attached to the substratum of very fine dimensions. In case that the test was attached to the substratum by the base of a single chamber (proloculum ?) only, this first chamber may be either quite conforming (also in size) with the following chambers, or somewhat broader. Specimens attached by more chambers occur very often. Chambers oblique to the substrate were usually attached in a relatively small number only and they were soon followed by free, straight stage. Chambers attached perpendicularly to the substratum (laying on their side) continued in this position for a fairly long time: they are often twisted into quite irregular coils to tangles which build the larger portion of the test, terminated by a quite short rised free section. These specimens exhibited no regularity in the shape of the coils. They do not agree with the tests with the regular initial coil of the megalospherical stage (according to FRIEG - KAEVER, 1975), attached to the rocky substratum.

The specimens quite surrounding the substratum were also found; they appear as free living tests with an irregularly furled beginning (e.g. fig. 8/6; pl. XII, fig. 3).

According to the type of the substratum the little specimens of *Bdelloidina cribrosa* may be divided into three groups:

1. A relatively small part of the total number is formed by specimens attached to a permanent solid substrate, for example to fragments of hard rocks (e.g. gneiss), or to the tubes of serpulid worms, to echinoid spines, to parts of bryozoan zoarias, to the fragments of *Ostrea* shells or to damaged, earlier died tests of *Bdelloidina cribrosa*. These specimens were attached either by the base only (usually to the flat fragments), or by the whole length of the test, mostly winding around the substratum of an elongate shape (echinoid spines, bryozoan fragments etc.).

2. Specimens attached probably to a solid substratum which has not been preserved, exhibit mostly a broadened base, composed rarely of one, more frequently of several chambers. The attachment face is formed by a relatively smooth solid wall, in shape corresponding to the substratum; it is usually slightly concave (pl. XI, fig. 7). The internal structure of the test does not show on this face.

3. Specimens with distinctly rugged attachment face influenced by the internal structure of the test (fig. 8/5; pl. VIII, fig. 3; pl. XI, figs. 3b, 4). It is probable, that these specimens were attached to much softer substratum, the shape of which did not affect the appearance of the attachment face, but on the contrary, gave way to the pressure of protuberances of the test. Such properties may be expected most likely in the substratum of *Algae*, although even careful examination of numerous specimens at large magnification showed no impressions of plant tissues (as in some *Hemisphaeramminae*, see HERCOGOVÁ - KŘÍŽ, 1983), nor any other proof of this hypothesis.

Corroded specimens with a damaged surface of the wall (pl. VIII, fig. 6) have the internal structure visible externally.

The internal structure of the free ends of the tests was studied in the thin-sections (pl. VIII, figs. 1, 2; pl. IX, figs. 1—3). The specimens of the permanently attached stage, laid open to the influences of the weather, have the surface weathered so strongly, that the internal structure is directly visible (pl. VI, figs. 4—6).

The wall of the test is agglutinated, alveolar-porous; it is composed of three layers. The glauconite grains sporadically participate in common with the quartz grains in the foreign matter of the walls, in dependence on composition of the substratum. FRIEG - KAEVER (1975) described in detail the structure of the wall.

Dimensions:

1. The attached initial portion:

a) megalospherical spires with a short uniserial portion: length 4—6 mm;
b) star-like branched specimens: the largest span up to 51 mm, breadth of the uniserial chambers 1.5—5 mm.

2. The fragments of free ends and the secondarily disengaged short tests:

a) the average length 4—6 mm; the average breadth 1.6—2.3 mm;
b) dimensions of the largest found specimens:

length:	7.25	7.38	7.95	8.90	9.77 mm
breadth:	2.60	2.08	2.56	2.39	3.26 mm.

Occurrence: *Bdelloidina cribrosa* is in the Bohemian Massif limited to shallow-water transgressive sediments of the Lower Turonian. It has not been yet found with certainty in the Cenomanian. The PERNER's stratigraphical classification (1892) of Kaňk and Kamajka (the Cenomanian age) was corrected: these localities pertain to the Lower Turonian (HERCOGOVÁ 1974, 1977).

The initial stage attached to the rocky substratum was found in Karlov near Kutná Hora and in Středokluky. The Lower Turonian age was ascertained in Karlov by index-species of foraminifers occurring in the sediments which originally surrounded the gneiss block, making the substratum of *Bdelloidina*. We have no stratigraphical confirmations for the age of Středokluky.

The free ends and the short, secondarily disengaged tests were found in newly studied localities Kamajka, Kaňk, Skalka near Velim, Starkoč, Vrapice, Tuchoměřice, Zbyslav, Skalka near Žehušice and sporadically in Černovičky. But they occur even in other places.

MAYNC (1957) described the stratigraphically oldest finding of *B. cribrosa* from the Urgo-Aptian organodetritic limestones of Switzerland.

From Germany was this species described by REUSS (1872) near Plauen in Saxony and by FRANKE (1913, 1928) from the Upper Cenomanian and Lower Turonian of Westphalia and Cenomanian or Lower Turonian of Rhineland. KAEVER (1974) described *B. cribrosa* from "Münsterschen Kreidebeckens" from the Turonian with *Inoceramus schloenbachi* of Westphalia and FRIEG - KAEVER (1975) from Franke's locality Kassenberg in Rhineland. FRIEG (1980) mentioned the mass occurrence of specimens attached to phosphorite concretions of the uppermost Cenomanian from Westphalia.

Remark: ADAMS - KNIGHT - HODGKINSON (1973) described a new genus *Labyrinthidoma* with the type species *L. dumptonensis* ADAMS, KNIGHT & HODGKINSON, 1973 from the Senonian of Kent (England). The labyrinthic internal structure of this genus is very similar as in *Bdelloidina cribrosa*, but the tests of the stratigraphically younger *Labyrinthidoma* are free — not attached, and have the streptospirally coiled initial portion. Some sporadic specimens of *Labyrinthidoma dumptonensis* ADAMS, KNIGHT & HODGKINSON were found in the Lower Santonian of the Bohemian Massif.

Axicolumella n. gen.

Type species: *Lituola cylindrica* PERNER, 1892, p. 22, pl. 2, figs. 7–12; p. 22, fig. 6.

Diagnosis: Test uniserial with base attached by one or more chambers; later portion growing free from the attachment, cylindrical, rarely bifurcating. Numerous chambers are broader than high, distinct, with almost constant shape and size

mostly along the whole course of the test. The terminal face of the last chamber is slightly convex to flat, in adult not deformed specimens with 6 to 14 apertural openings circularly spaced and often with 1 to 2 openings in the centre. The wall is arenaceous, consisting of quartz grains and calcareous cement. It is alveolar-porous, composed of three layers. The larger quartz grains dominate in the outer exostratum over a little amount of calcareous cement. Mesostratum is formed of small quartz grains scattered in a larger amount of cement. The thin homogeneous endostratum is composed of the microcrystalline calcite. The tubules penetrate the mesostratum and pass into the alveoles in its upper layer. The alveoles open out among the quartz grains of exostratum.

The interior of the test is not chaotically labyrinthic but regularly arranged: in the centre of the test, there is an axial column composed of segments, which are components of individual chambers. These segments have the shape of truncated cones standing on the base with the smaller diameter. The early ones have the interior compact; during the ontogenetic evolution they gradually develop one to two little internal cup-shaped cavities emerging in the centre of the apertural face as one to two central apertural openings.

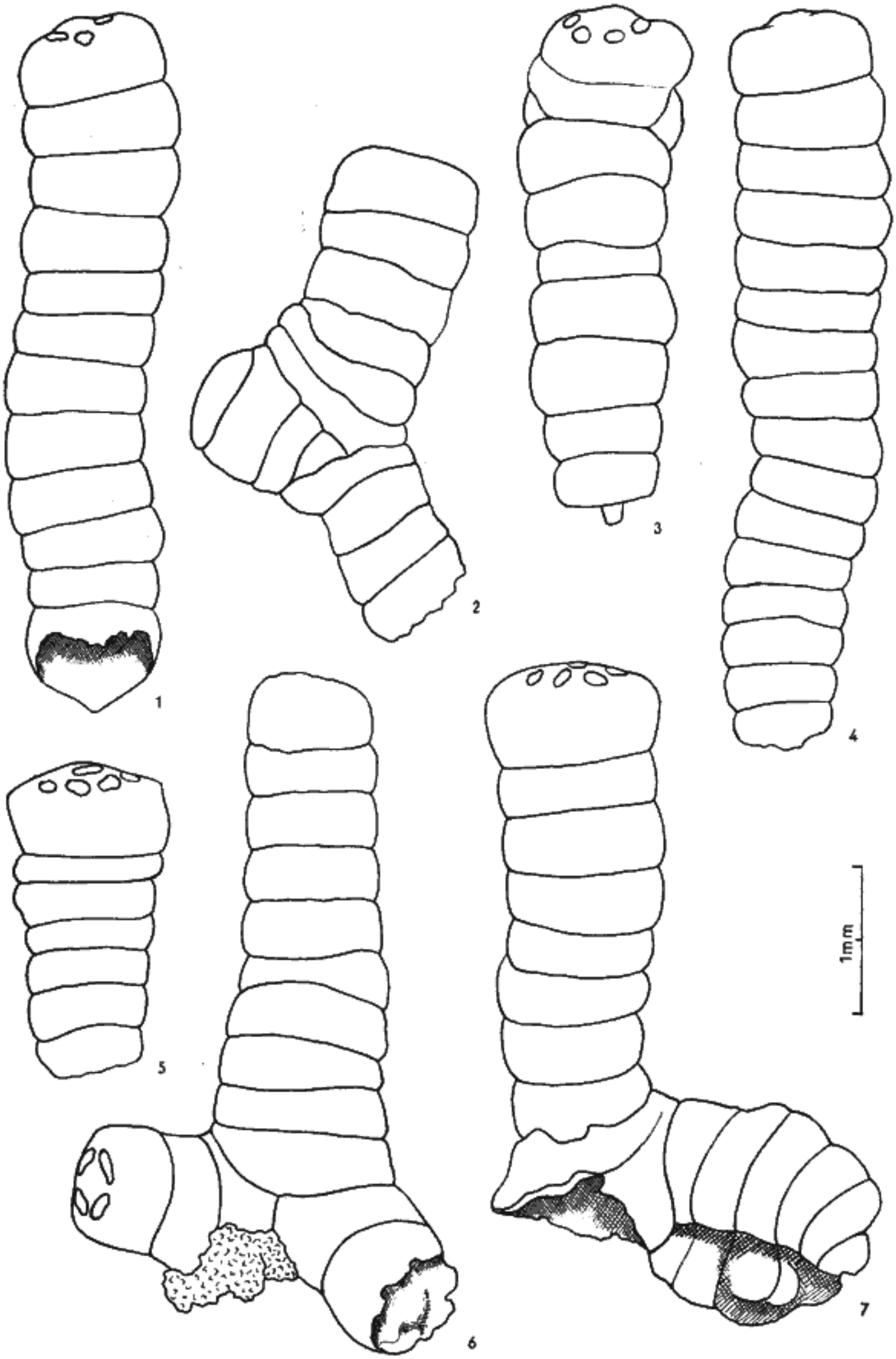
Axicolumella cylindrica (PERNER, 1892) emend. HERCOGOVÁ

Figs. 9–12; pl. IX, figs. 1, 2; pl. X, figs. 1–5, pl. XII, figs. 4–10, 13.

1892 *Lituola cylindrica* n. sp.; PERNER, p. 22, 52; pl. 2, figs. 7–12; p. 22, fig. 6.
1944 "*Lituola cylindrica*" PERNER; CUSHMAN, p. 108, pl. 18, figs. 1, 2.

Material: The revision of the species was based partly on the study of Perner's autotypes in the National Museum in Prague, partly on the study of topotypes from Perner's Lower Turonian (HERCOGOVÁ 1974) locality Kamajka. 105 topotypes were measured and for comparison another 84 specimens from Skalka near Velim. The results obtained were quite coincident. In addition specimens from further localities were examined.

Description: Test large, narrowly cylindrical, almost straight or slightly bent; cross-section round to elliptical or irregularly rounded. It is composed most frequently of 6 to 16, rarely up to 23 chambers (maximum length found is 8.17 mm); the initial portion of many specimens is broken off. Chambers are distinct, slightly inflated, separated by shallowly depressed sutures. They are fairly low and broad, not increasing in size as added but irregularly alternating larger chambers with smaller ones. The last chamber is usually the largest; however, this fact does not contradict the above mentioned statement, because it does not mean, that the chamber grew up to a larger size, but that it is totally visible — i.e. not covered by the next chamber. The differences in the size of the chambers are much smaller than in *Bdelloidina cribrosa* (REUSS). The average height of chambers is from 0.28 to 0.39 mm, the height of the lowest chamber is most frequently 0.21 mm and that of the highest one 0.43 mm. The breadth of the test, also not very variable, oscillates mostly between 0.91 and 1.26 mm.


1
2
3
4
5
6
7
1mm

The tests are mostly uniserial, but rarely occur specimens bifurcating either immediately above the base (fig. 9/6), in the middle (fig. 9/2) or at the end of the test (fig. 12/2).

The tests occur free in the sediments, but originally they were attached by their initial portions to the substratum. With regard to the fact that the external shape of the broken ends and of the secondarily disengaged specimens of *Axicolumella cylindrica* is similar to *Bdelloidina cribrosa* (REUSS) and that both these species lived in the same conditions together (they are found together in many localities), we can presume that *Axicolumella cylindrica* may also have the attached initial portions of the tests which could be analogous to the fairly spacious star-like branched formations attached to the rocky substrate as *Bdelloidina cribrosa*. However, this stage has not been yet found. But the existence of the specimens originally attached by a larger number of uniserial chambers (e.g. fig. 9/7; pl. VIII, fig. 10) supports this possibility. These specimens have many counterparts in *B. cribrosa*, likewise specimens originally attached by one chamber only. Analogous are also specimens, which surround a small fragment of the substrate by their irregularly furled beginning; they appear like free living tests of other genus (e.g. pl. XI, fig. 1).

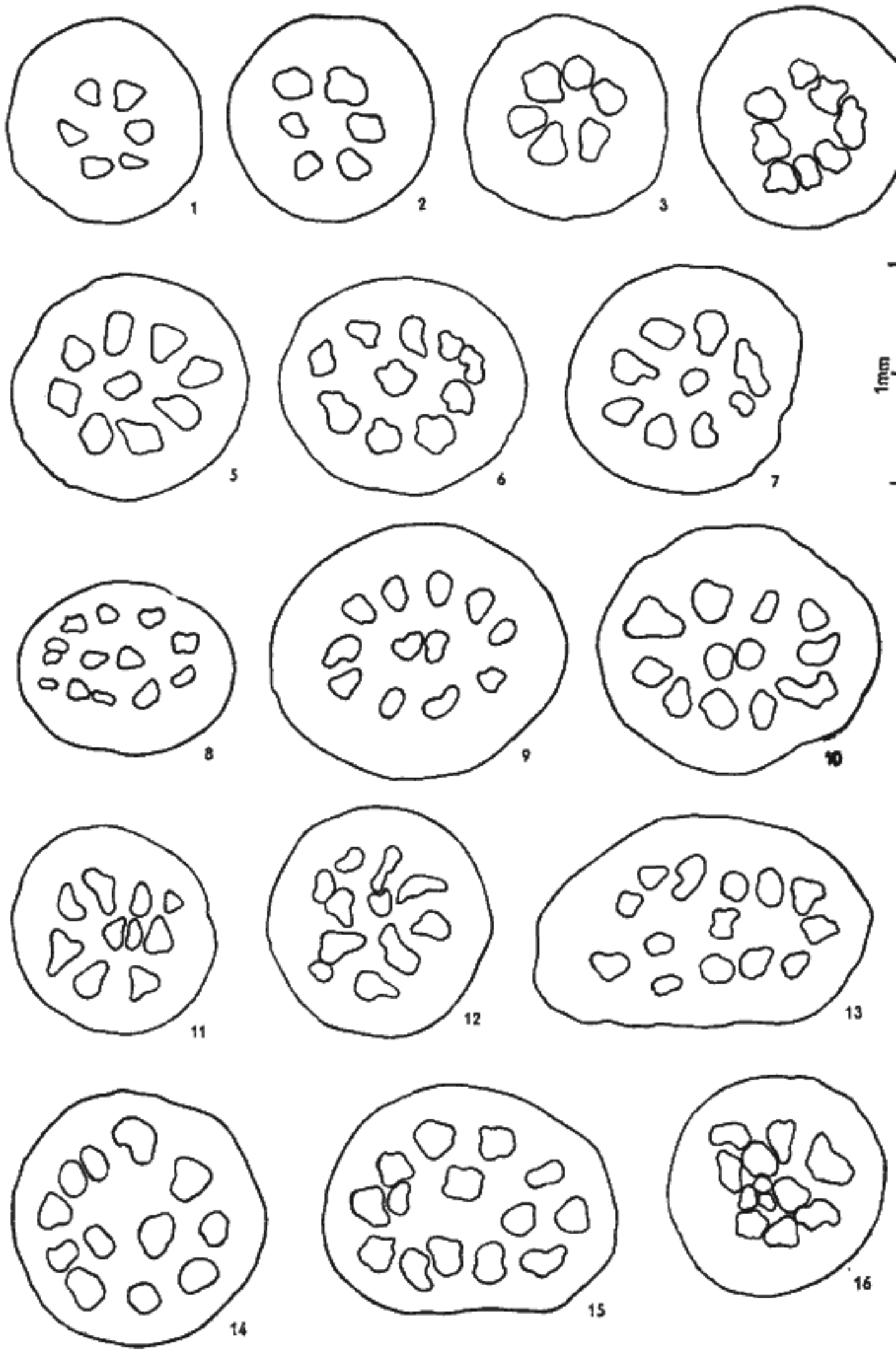
The first chamber having preserved the attachment face differs mostly in shape from the next ones: it is larger, broader and conical (fig. 11/1, 2); the face disengaged from the substratum may be concave and in shape corresponding to the substratum, but sometimes it reveals the internal structure (fig. 11/2). The attached portion of specimens attached by a larger number of initial chambers is irregular in shape, but also uniserial (fig. 9/7).

The terminal apertural face of the last chamber is slightly convex or flat. Apertural openings (commonly 6 to 12, rarely 5 to 14) are in the regularly built specimens circularly spaced. Smaller specimens have the centre of apertural face compact, inperforated, the larger ones have one to two central openings (fig. 10). The development of central apertural openings is dependent on the internal structure of the test: all specimens of *Axicolumella cylindrica* have a central column running along the test-axis (fig. 12/1; pl. X, figs. 3—5). Its existence was found not only in thin-sections, but also in some of the broken specimens; a part of the column protrudes either from their base (fig. 9/3; pl. XII, fig. 9) or from the upper face (fig. 11/1; pl. XII, fig. 13). This constrictedly-cylindrical column, composed of segments, which are components of individual chambers, is at the beginning compact and during growth of the test gradually enlarges, which is associated with the development of cup-shaped cavities, at first one cavity, later two next to each

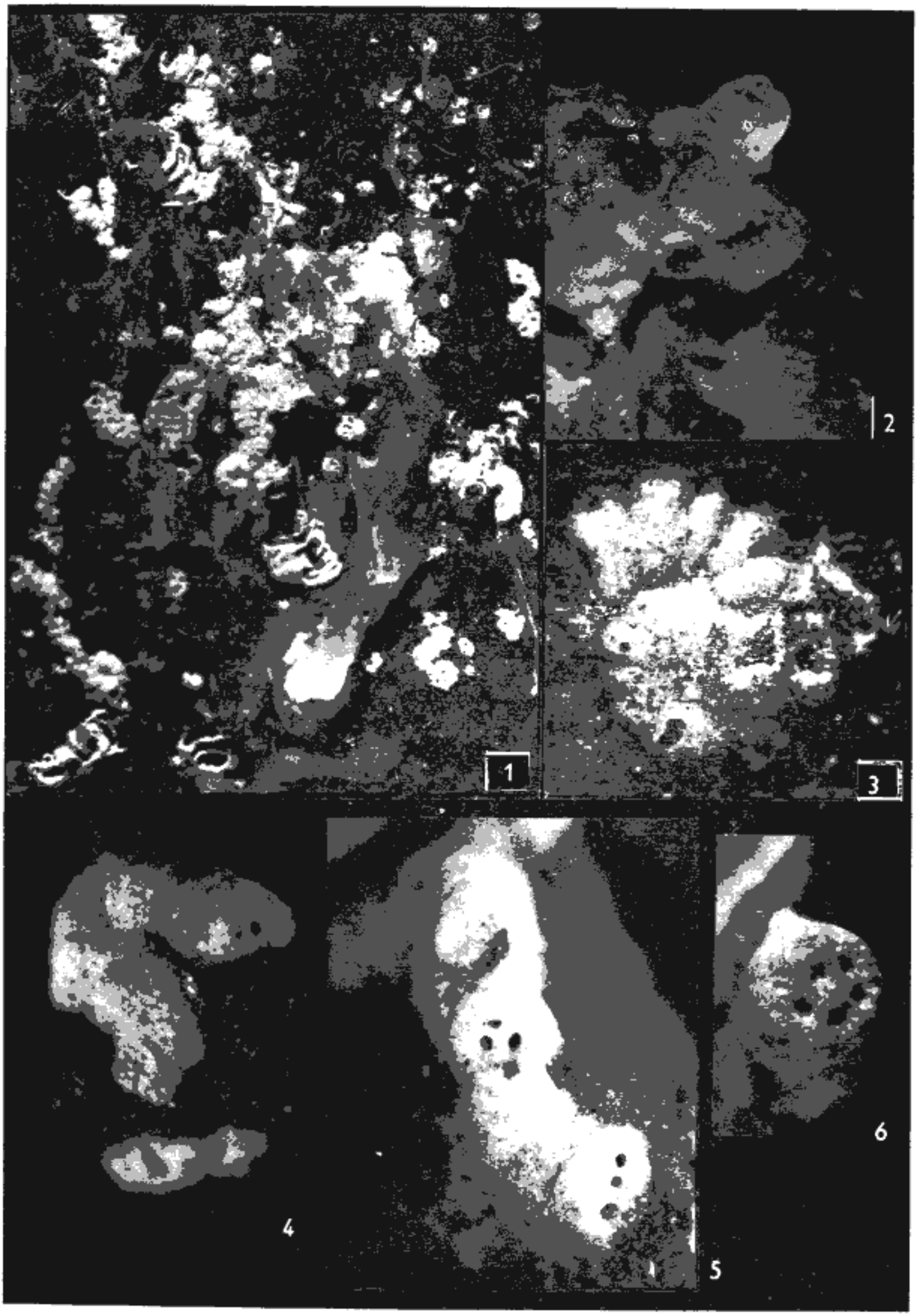
---

←

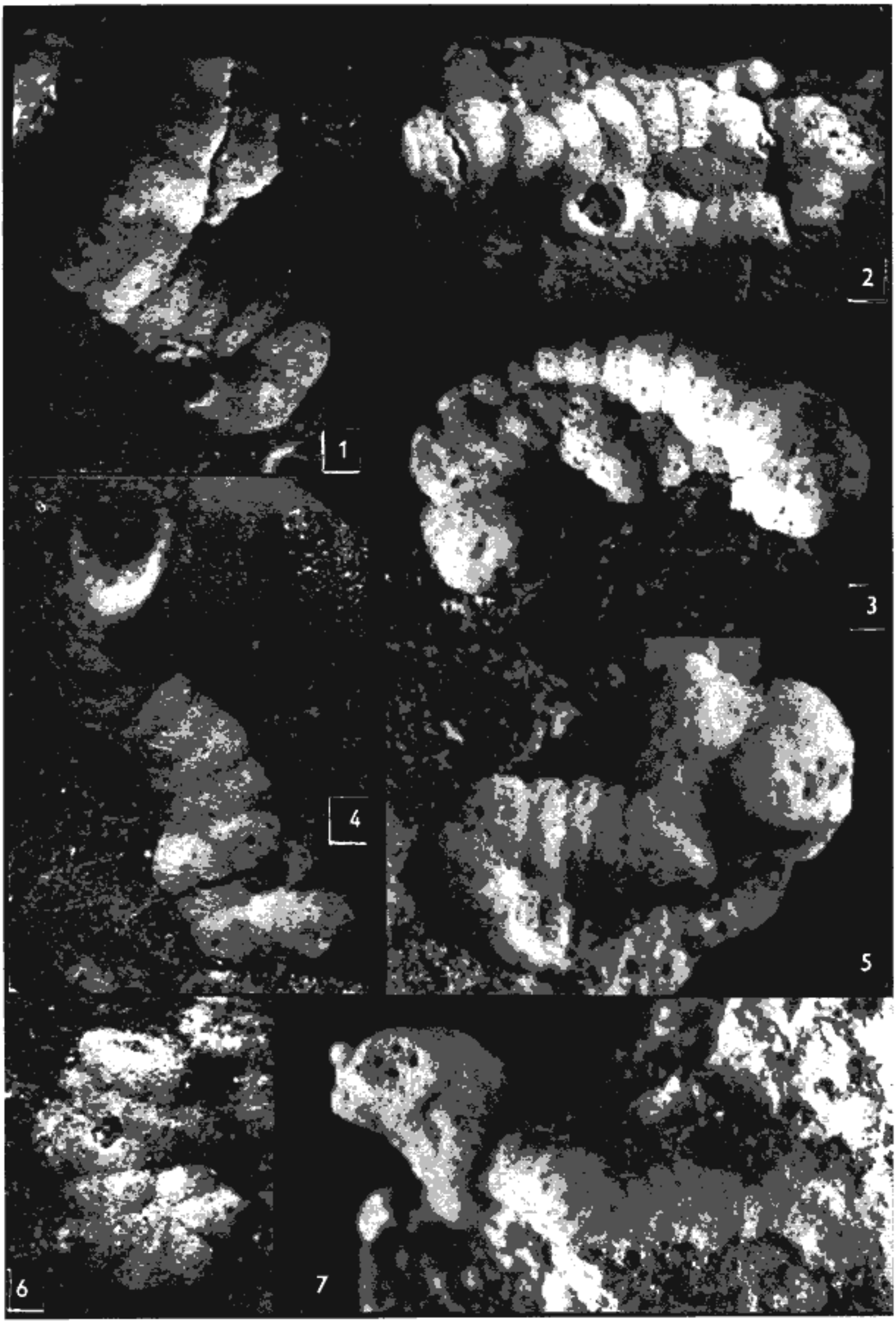
9. *Axicolumella cylindrica* (PERNER); Kamajka
1 – specimen with a concave attachment face of relatively larger initial chamber; 2 – specimen bifurcating in the middle of the test; 3 – specimen with the base broken off: centrally protrudes axial column; 4, 5 – variously long fragments of specimens; 6 – specimen bifurcating on the base; 7 – specimen attached to the substrate by larger number of chambers

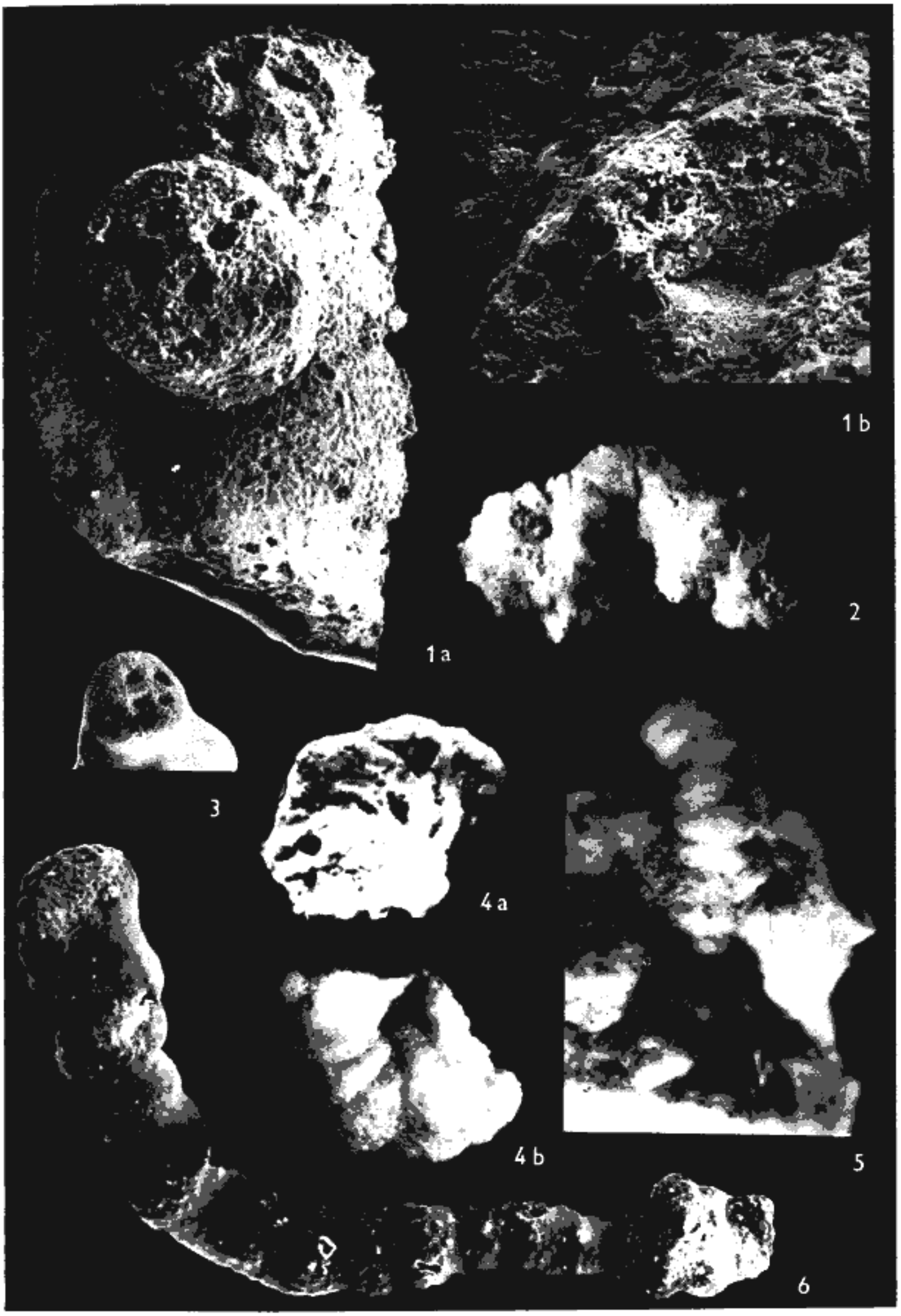


10. *Axicolumella cylindrica* (PERNER); Kamajka, Skalka near Velim; apertural faces: development of apertural openings
1–4 – juvenile specimens with openings arranged in ± regular circles; 5–7 – specimens with one central opening; 8–11 – specimens with two central openings; 12–16 – irregularly developed or secondarily deformed specimens

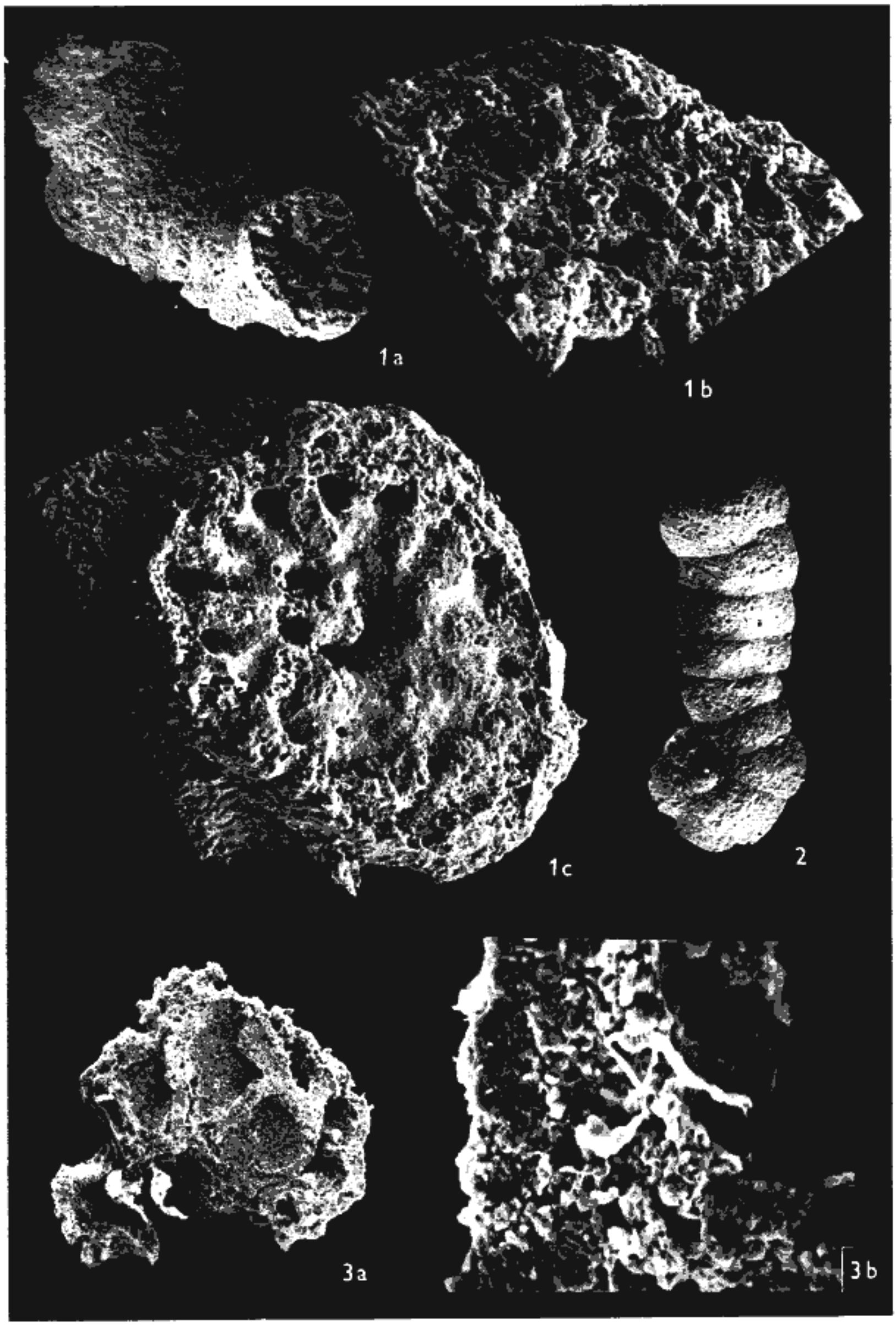

1
2
3
4
5
6

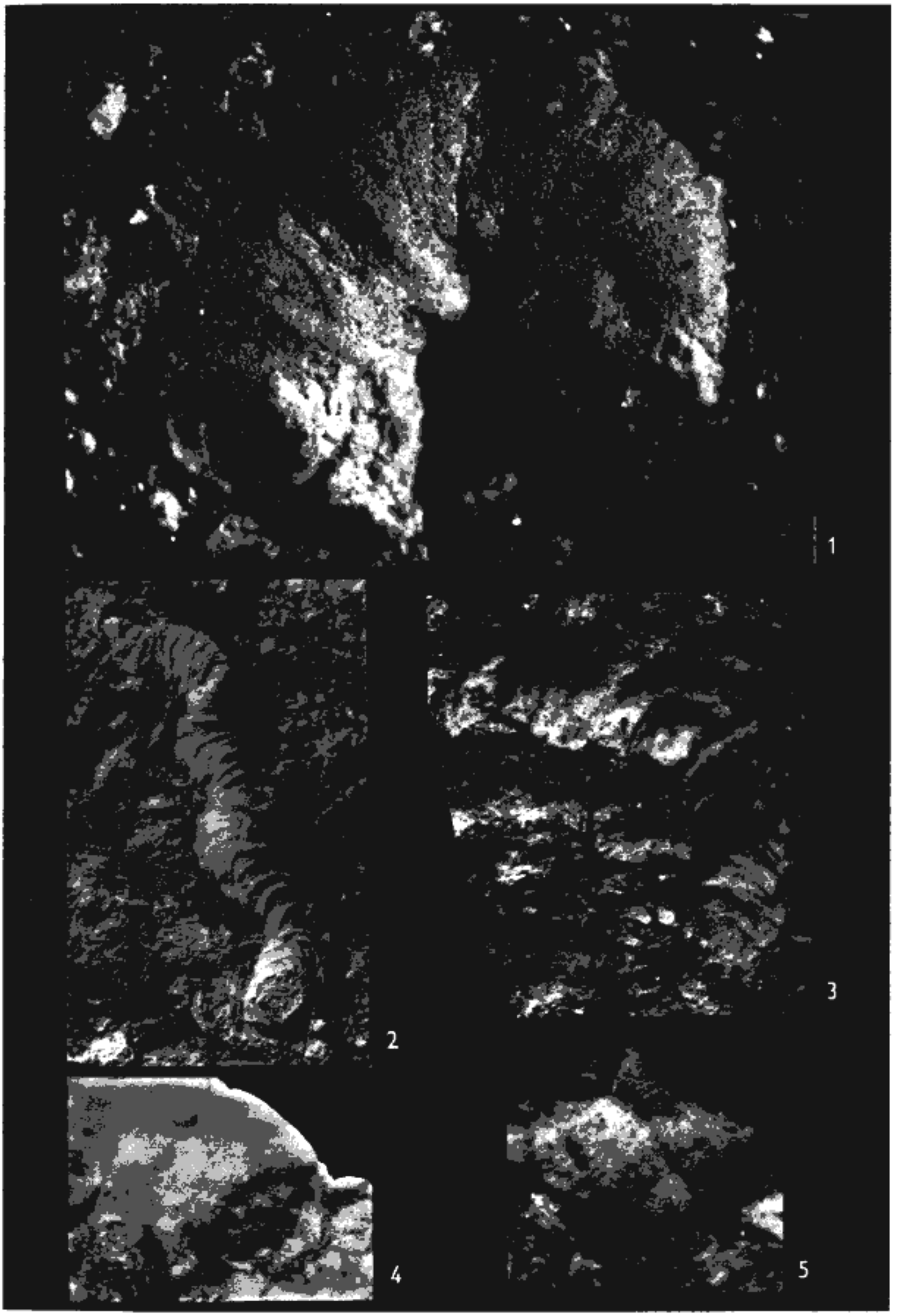
Pl. II



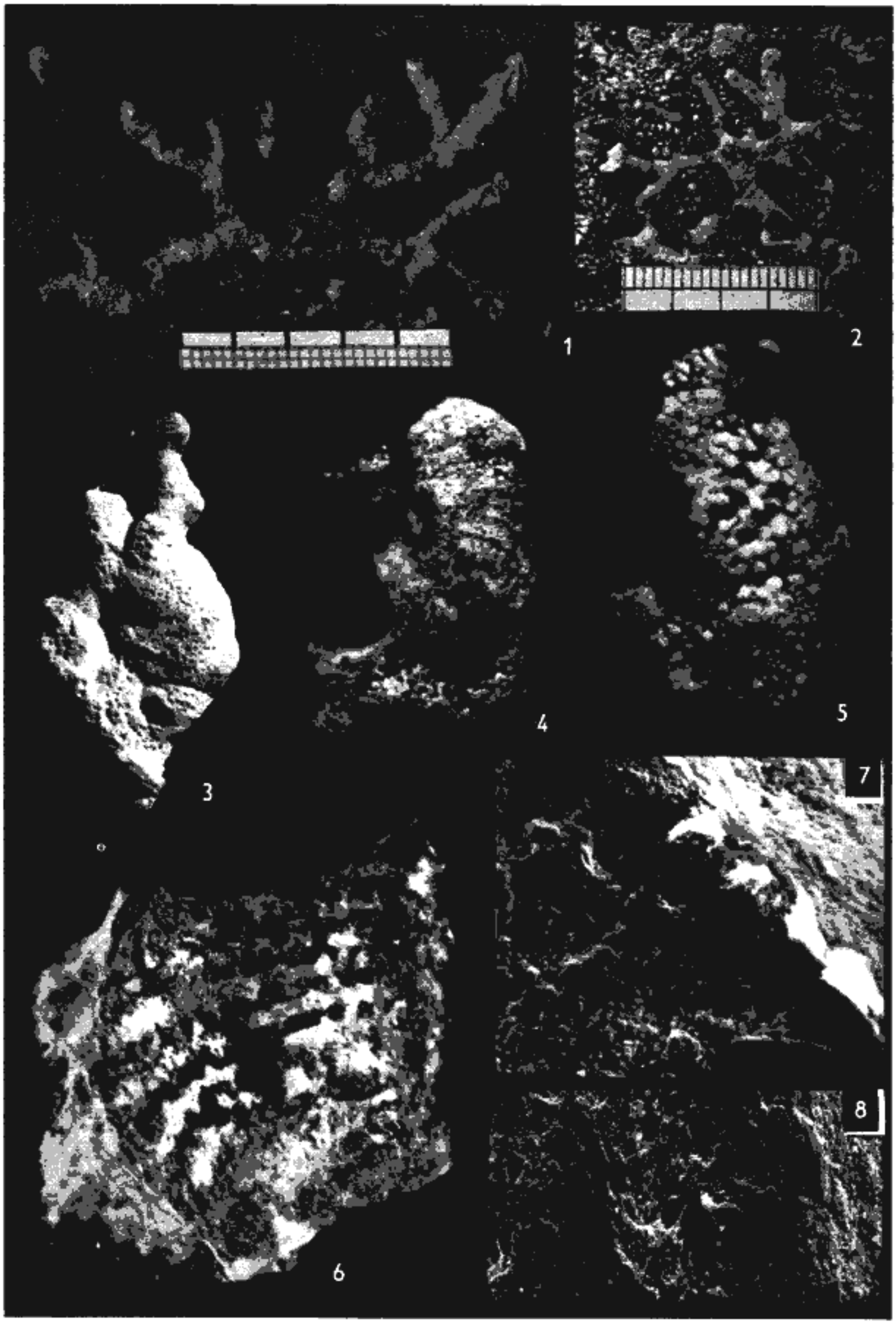

1 a
1 b
2
3
4 a
4 b
5
6

Pl. IV



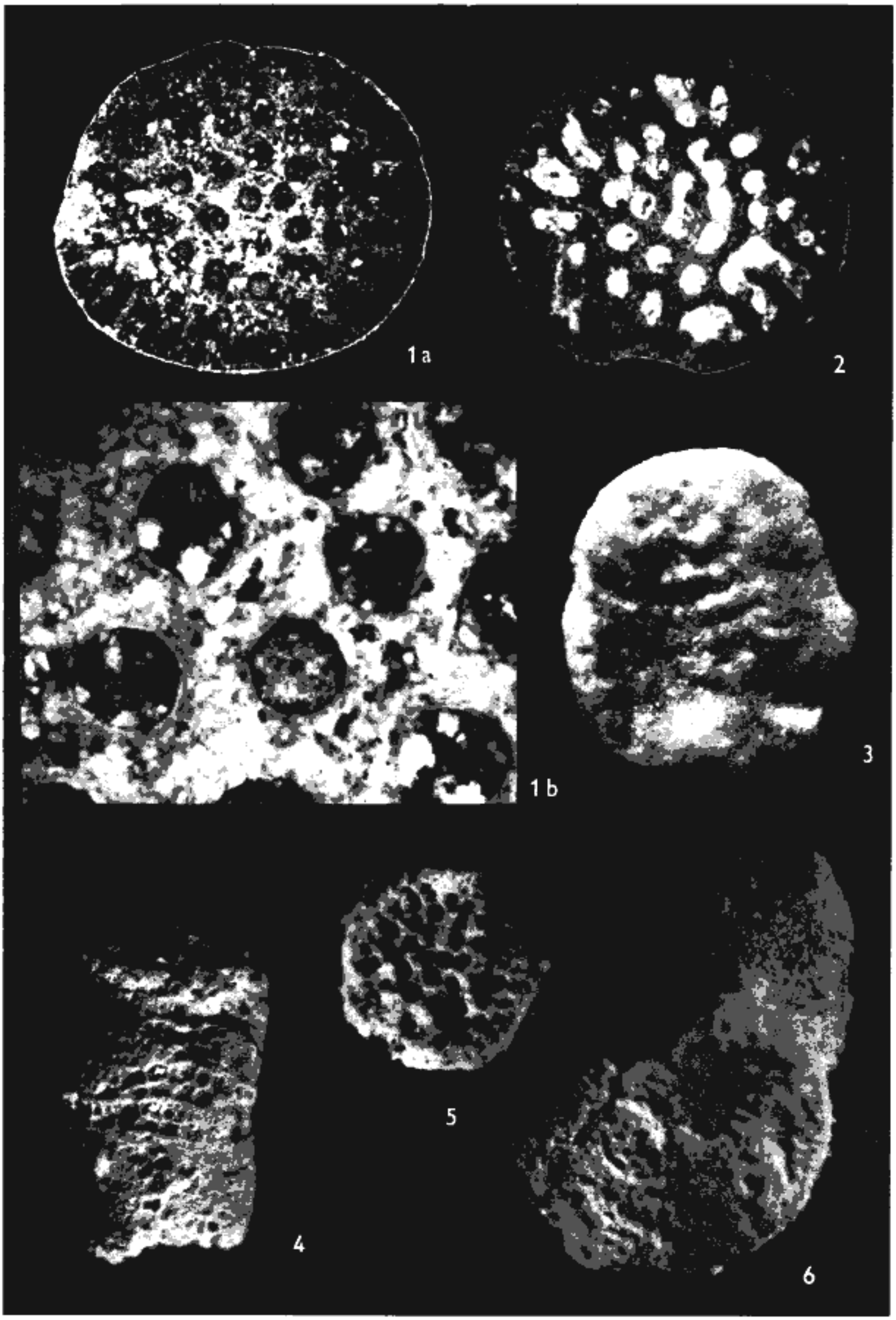

1
2
3
4
5

Pl. VI



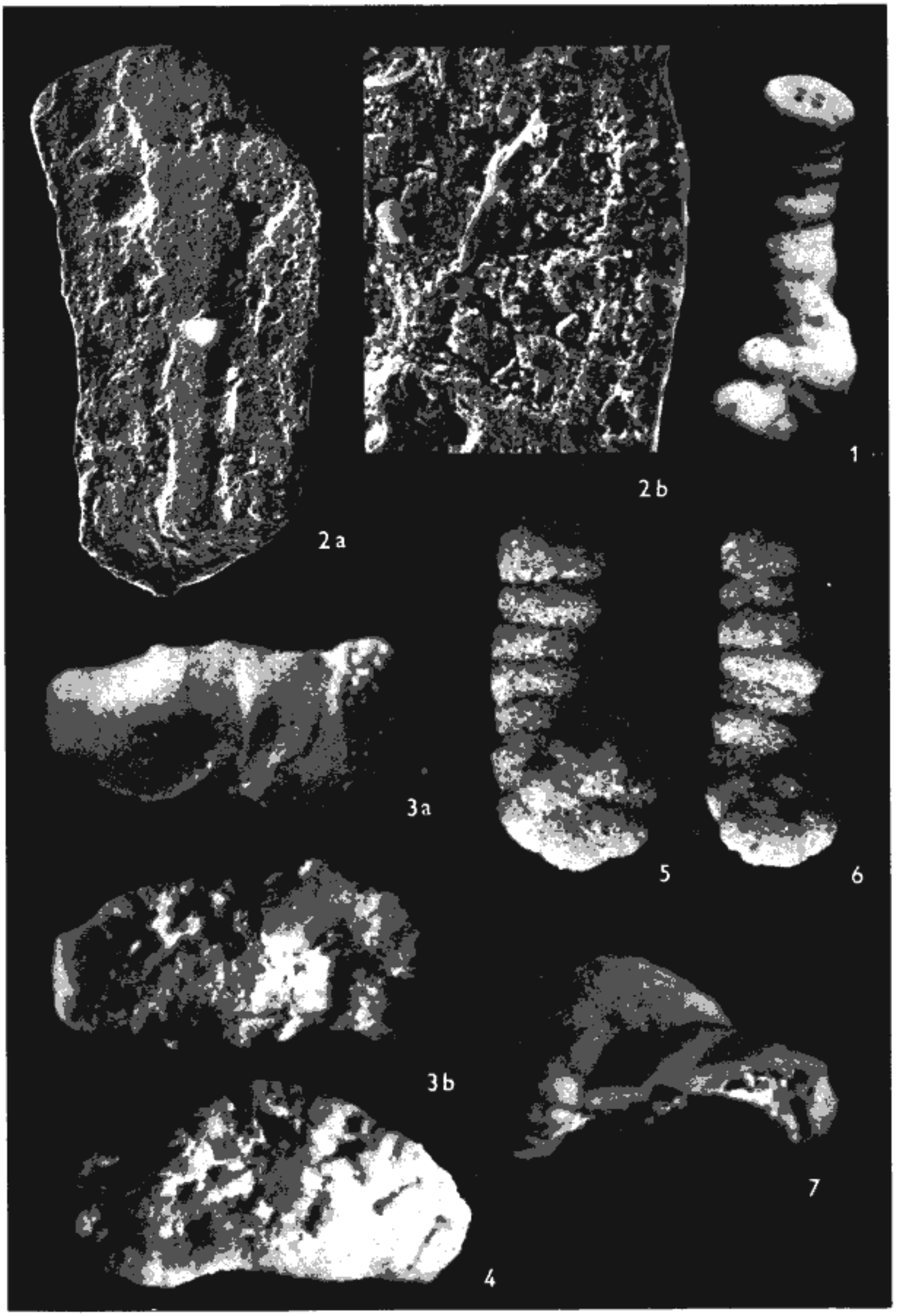

1
2
3
4
5
6
7
8
9

Pl. VIII

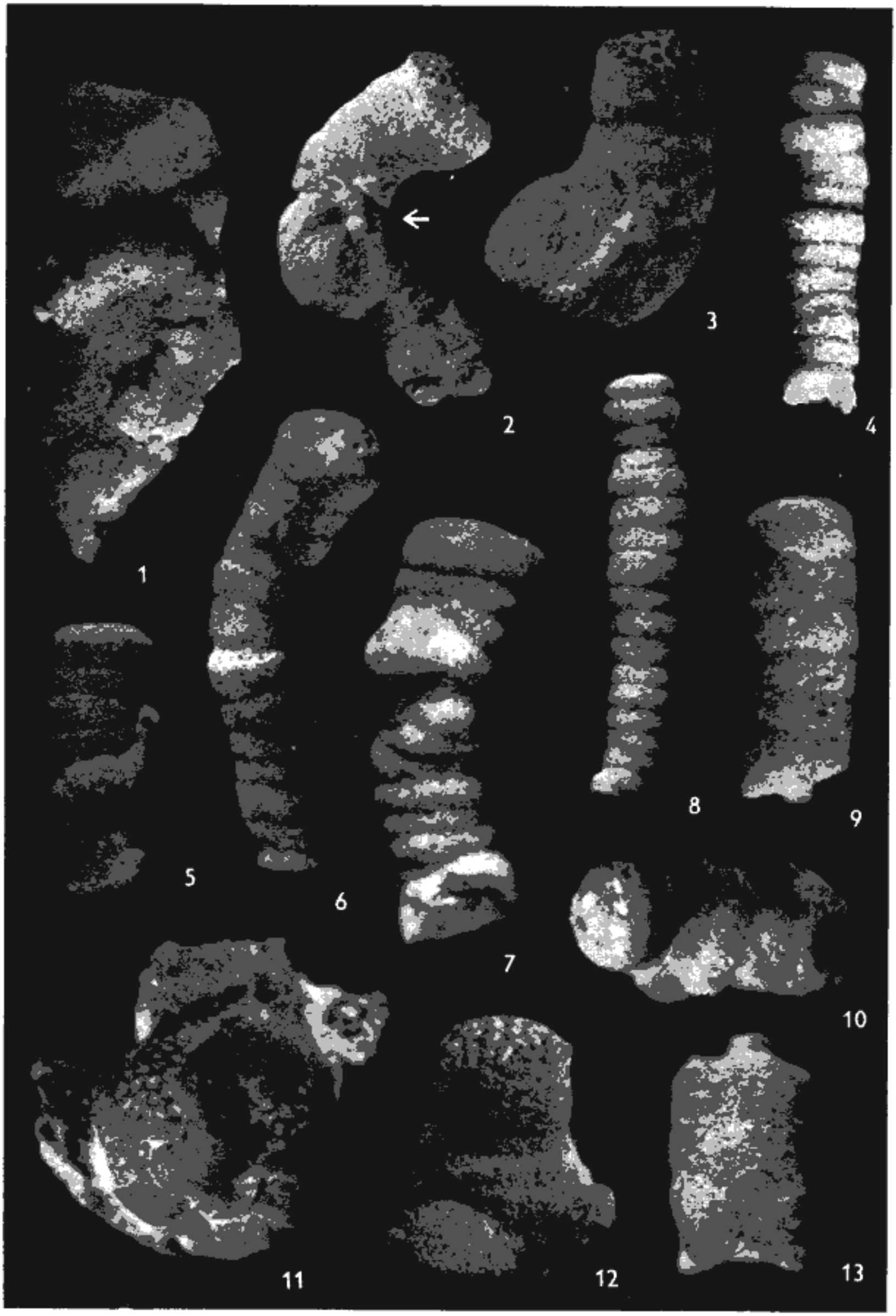



1a
1b
2a
2b
3

Pl. X

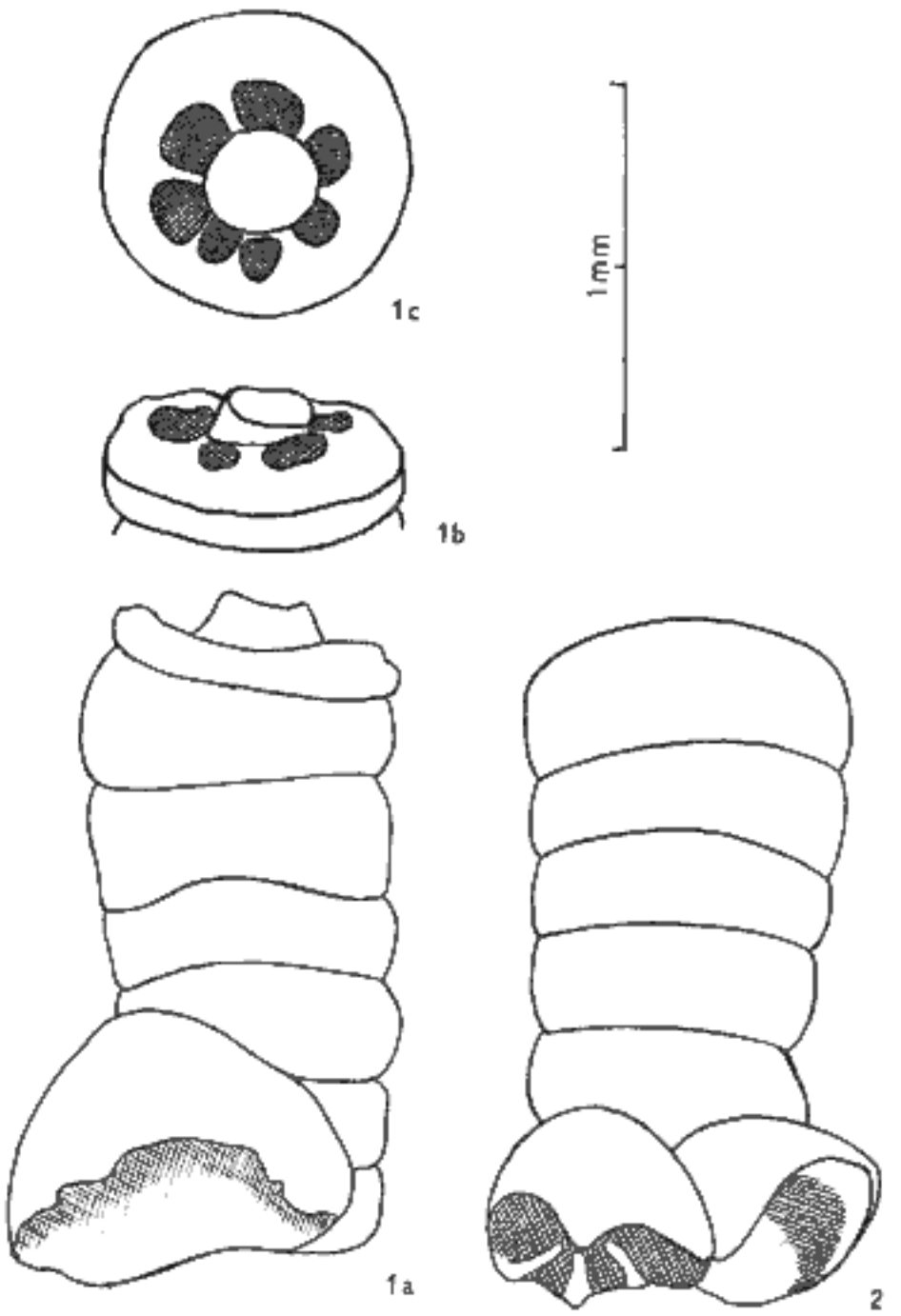

1
2a
2b
3a
3b
4
5
6
7

Pl. XII



other. Their emerging on the surface of the apertural face results in the central apertural openings.

PERNER (1892) did not mention this central column evidently because his thin-sections did not pass trough the medium plane of the test. But the cross-section, depicted (PERNER 1892) in pl. 2, fig. 2 shows it partly. PERNER's pictures of thin



11. *Axicolumella cylindrica* (PERNER); Skalka near Velim
1 – axial column protruding from the broken end of the test; 1, 2 – first chambers of both specimens differ in shape from the following ones; they are modified by the substrate

sections (text-fig. 6 and pl. 2, fig. 9) are oriented upside down, because he held the last chamber for the proloculum. This mistake resulted in further error in the description (p. 52): "— die Querwände sind in der Richtung nach vorne concav —".

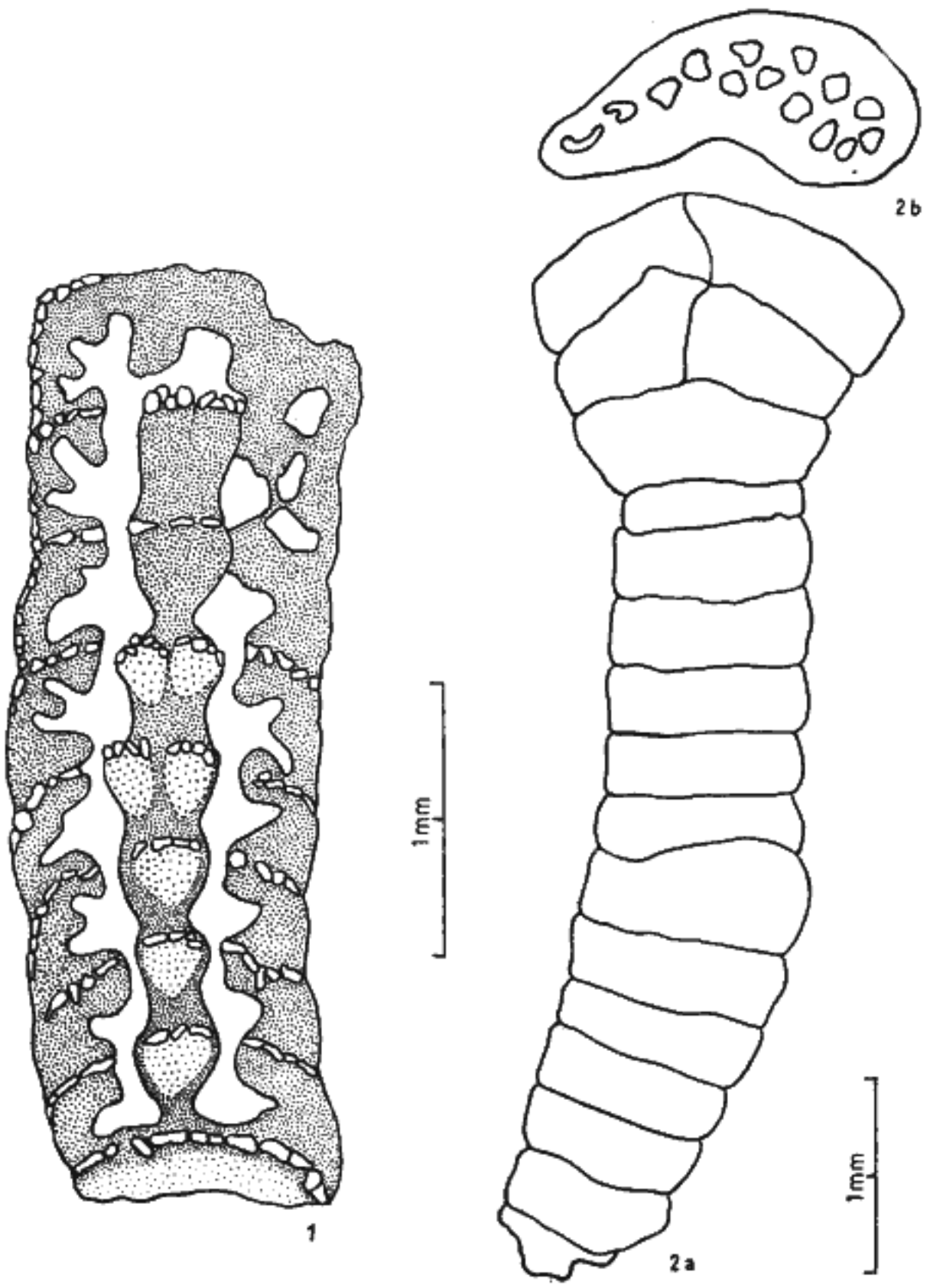
PERNER (1892) differentiated two layers in the walls. However, the walls of *Axicolumella cylindrica* are alveolar-porous and composed of three layers:

1. Exostratum is relatively thin, consisting of the larger quartz grains and a little amount of calcareous cement. It covers the lateral walls and the apertural faces, but it is lacking on the base of the chambers. The mesostratum and the endostratum inside the next chamber rest directly on the exostratum of the preceding one.

2. Mesostratum forms the majority of the walls. A small grains of quartz

are scattered in calcareous cement. The tubules penetrate the mesostratum and extend towards the surface where they pass into the alveoles. These alveoles within the uppermost layer of mesostratum open out among the quartz grains of exostratum.

Mesostratum also builds the central column; it is interrupted on each septal face by a layer of exostratum.



12. *Axicolumella cylindrica* (PERNER); Kamajka
1 – schematic picture of thin section parallel with the test axis: individual chambers are bordered by a thin layer of larger quartz grains; the axial column of the earlier chambers exhibits one cup-shaped cavity, the later ones two cavities next to each other; 2 – specimen beginning to bifurcate at the end of the test; 2b – apertural face is elongated, but still without distinct separation

3. Endostratum is a thin, homogeneous layer composed of the microcrystaliline calcite, orientated perpendicularly to the chamber cavity. Endostratum beds the chamber hollows and it also coates the axial column.

Dimensions: length 1.82—8.17 mm, most frequently 2.2—4.95 mm; breadth 0.78—1.34 mm, most frequently 0.91—1.26 mm; average height of chambers of individual specimens 0.24—0.52 mm, most frequently 0.28—0.39 mm; the real height of chambers 0.08—0.65 mm with the lowest chamber of the test 0.08 to 0.34 mm, most frequently 0.21 mm and the highest chamber of the test 0.34 to 0.65 mm, most frequently 0.43 mm.

Discussion and comparison: PERNER (1892) described this species as *Lituola cylindrica* n. sp. The tests of the genus *Lituola* LAMARCK are free and they have planispirally coiled initial portion, simple internal structure and a cribrate aperture.

The older stages of *Axicolumella cylindrica* are in shape, dimensions and formation of apertural openings (without the central ones) fairly resembling the tests of *Acruliammina neocomiana* BARTENSTEIN, in which FRIEG - KAEVER (1976, p. 123, fig. 2c) established a central pillar built by the mesostratum and connected with the partitions separating the apertural openings. From this pillar the central column of *Axicolumella* differs both in the more regular shape and in the successive rise of internal cavities. The main difference between both these genera is in the matter of the walls: while the tests of *Acruliammina* are insoluble in HCl, *Axicolumella* has the calcareous cement.

Occurrence: *Axicolumella cylindrica* is locally very abundant, usually associated with *Bdelloidina cribrosa*, in shallow-water transgressive sediments from the Lower Turonian of the Bohemian Massif. It was found in the localities Kamajka near Kutná Hora, Skalka near Velim, Kaňk, Starkoč, Zbyslav and Skalka near Žehušice.

Notes on ecology:

We can state that all the above treated species — both *Acruliamminas*, *Bdelloidina cribrosa* and *Axicolumella cylindrica* are restricted to the environment of the shallow sea which transgressed over a hard bottom. Specimens of these species were attached to the substratum, which may be differentiated into four groups (types):

1. On the rocky bottom were found specimens of the genus *Acruliammina* and the initial portions of *Bdelloidina cribrosa* (REUSS). *Acruliammina longa* (TAPPAN) was attached mostly to abraded Proterozoic lydites, less frequently to the gneiss walls; *Acruliammina nekvasilovae* n. sp. was found on the gneiss walls only, often immediately beside the shells of bivalvias *Atreta* ?, serpulid worm tubes and less frequently bryozoans; *Bdelloidina cribrosa* was attached to both, to the lydite and to the gneiss block, too.

2. On the pebbles of conglomerates with a diameter greater than 3 cm were found *Acruliamminas* only: *A. longa* on lydite pebbles again, *A. nekvasilovae* on gneiss pebble. *Acruliammina longa* is represented on the pebbles as well as on the rocky bottom by all stages of ontogenetic evolution, beginning from isolated initial spires up to adult specimens, but often also by mutually overgrown specimens. On the basis of the findings of the tests growing in up to five superimposed layers we may presume an undisturbed development of *A. longa* on the pebbles for a longer period; but the determination of its precise duration is not possible, because the time-span of growing of *A. longa* is not known.

In case that the pebbles are intact, *Acruliamminas* are attached in maximum number to one of the larger flats (upper ?), less frequently to the sides and they are absent only on the opposite greater flat. The specimens are oriented quite irregularly on the pebbles, their apertures being set in all directions (pl. I, fig. 1), so that no dependence on direction of currents or other ecologic factors is manifested.

3. On little fragments (with a maximum diameter up to 1 cm) were found *Acruliammina longa*, a part of specimens *Bdelloidina cribrosa* and sporadically *Acruliammina nekvasilovae*. They were attached to various substrata, such as various angular or rounded solid inorganic materials (lydites, gneisses, quartz, etc.) and residues of shells and of skeletal elements of organisms. Although on the rocky substratum and on pebbles the tests of *Acruliammina* were found always on hard, abraded planes, in the washed sediment was established a specimen attached to a gneiss fragment covered with limonite coating cracked probably prior to its attachment (pl. II, fig. 2).

Specimens of *Acruliammina longa* and *Bdelloidina cribrosa* were found on fragments of *Ostrea* shells, on echinoid spines, on bryozoan zoarias and on withered (more damaged) tests of *Bdelloidina cribrosa*. In addition *Acruliammina longa* was attached to specimens of *Axicolumella cylindrica*, to shark teeth and to segments of crinoidal stalks. Attachment restricted to withered organic remainders only is proved by the occurrence of *Acruliammina longa* and *Bdelloidina cribrosa* both on shark teeth or on internal walls of bivalvia shells, as well as by their growth over faces resulting from fracture of echinoid spines or over planes of crinoidal segments, which were closely connected during their lifetime.

4. To the substratum which did not outlast fossilization were attached nearly all specimens of *Axicolumella cylindrica* (specimens with gneiss fragments attached to the base occur quite rarely) and the majority of specimens *Bdelloidina cribrosa*. On the basis of two different types of the shape of attachment faces of *Bdelloidina cribrosa* it is probable, that they secondarily disengaged either from a hard or from a soft (perhaps vegetable ?) substratum. These differences in *Axicolumella cylindrica* are less distinct. Its attachment faces are prevailingly concave, rounded or less frequently elongately channel-shaped. In case of elongated bases it may be presumed that they were attached to a thin cylindrical portion of

the plant (e.g. thalli of algae) but in majority of others the shape of attachment faces suggests nothing about the character of the substratum.

During long geological ages *Acruliamminas* did not change very much either in the shape of the tests, or in the style of their life. It has been confirmed by findings of *Acruliammina bradyi* (CUSHMAN & MCCULLOCH, 1939), which is closely related to Cretaceous species. The species was originally described from recent sea of Isle Ildefonso, Lower California, Mexico, as *Placopsilina*. This species occurring attached to shell fragments, to echinoid spines or to sponge spicules "is not the same as the Cretaceous one described by d'Orbigny" (i.e. *Placopsilina cenomana* D'ORB., 1850). Its pictures and description (CUSHMAN - MCCULLOCH, 1939, p. 112, pl. 12, figs. 14, 15) are very similar to those of *Acruliammina longa*, however the description is unfortunately considerably incomplete and therefore insufficient for precise identification.

The tests of *Bdelloidina cribrosa* and *Axicolumella cylindrica* which occur in sediments only, were found prevailingly in organodetritic limestones and in calcareous claystones. They occur in associations with foraminifers either preferring shallow-water environment, but not directly restricted to it as e.g. *Ataxophragmium depressum* (PERNER), *Arenobulimina* div. sp., *Textularia trochus* D'ORB., *Frondicularia fritschi* PERNER, *Vaginulina robusta* (CHAPMAN), *Lenticulina* div. sp., *Palmula cordata* (REUSS), etc., or with species occurring in specifically shallow sea only, as e.g. *Dictyopsella fragilis* n. sp. and *Patellina subcretacea* CUSHMAN & ALEXANDER. Both these species found in the Bohemian Cretaceous in organodetritic limestones only, have small, delicate tests, but they adapted to the high-energy litoral environment by enlarging resistance through reinforcement of their internal structure: chambers are divided by numerous incomplete secondary transverse septa (*Patellina*) or subdivided by secondary radial partitions and partial transverse subepidermal partitions (*Dictyopsella*).

The close dependence on the environment is confirmed also by absence of *Bdelloidina cribrosa* and *Axicolumella cylindrica* in typically shallow-water sediments of the higher part of the Lower Turonian and in the Middle Turonian, occurring for example in the Cretaceous of "Dlouhá mez" in wider neighbourhood of Čáslav. For foraminiferal associations from these beds is characteristic a very abundant occurrence of arenaceous species with large tests which lived free, not attached. Among them are most abundant *Ammobaculites* and *Bulbophragmium*. The tests of both these genera have the initial coiled portion followed by rectilinear chambers. Aperture of *Ammobaculites* is terminal and simple, *Bulbophragmium* has aperture terminal and cribrate. In washed sediments very often occur broken off uniserial portions of *Bulbophragmium irregulare* (ROEMER) (pl. XI, figs. 5, 6), which may be at first sight confused with Axicolumella cylindrica: fragments are up to 4.15 mm long; their breadth is somewhat greater than that of *Axicolumella cylindrica* (up to 1.43 mm), but both the average height of chambers (cca 0.35 mm) and their shape are almost conformable with those of *A. cylindrica*. Apertural openings in number

from 7 to 12 are also circularly spaced, the centre of apertural face is, same as in *A. cylindrica*, inperforated or with up to 2 central apertural openings. But these specimens differ from *A. cylindrica* in having a simple internal structure, which is distinctly visible in cross-section, on the broken off base; they are always without traces of attachment.

Conclusion

This paper contains results of the paleontological study of arenaceous foraminifers with large tests from the family *Lituolidae*, which were found either in situ, attached directly to the rocky substratum (*Acruliammina*, *Bdelloidina*), or attached to pebbles disengaged from conglomerates (*Acruliammina*), or, in finer sediments, on shell fragments or skeletal elements of different organisms, or secondarily disengaged (*Bdelloidina*, *Axicolumella*, *Acruliammina*). The studied species were found in eleven localities selected from the so called surf facies of the Bohemian Cretaceous Basin. Their stratigraphy was determined prevailingly on the basis of the composition of foraminiferal associations; by-product of their evaluation was the determination of new species *Dictyopsella fragilis*.

The study of *Acruliammina* specimens brought the following results: in addition to more abundant *A. longa* which is both regionally and stratigraphically wider distributed (Texas, Oklahoma — Albian, Bohemian Massif — Cenomanian ? Lower Turonian, France — Upper Senonian), in the Upper Cenomanian and Lower Turonian of the Bohemian Massif was newly found *Acruliammina nekvasilovae*, whose specimens distinctly differ from *Acruliammina longa*.

Also the permanently attached specimens of the initial stage of *Bdelloidina cribrosa* (REUSS) were found for the first time in the Bohemian Cretaceous Basin. The much more abundant fragments of the free ends and the secondarily disengaged tests were studied with a view to the considerable variability of the tests. The new genus *Axicolumella* was determined mainly on the basis of internal structure for "*Lituola*" *cylindrica* PERNER. Revision of *Axicolumella cylindrica* is also treated in this paper.

Perner's autotypes, both published and unpublished, were studied in collections of the National Museum in Prague. Besides correctly determined species (*B. cribrosa*, *A. cylindrica*) there were found in PERNER's collection also specimens of *Acruliammina longa*, denominated not only as *Lituola cenomana*, but also as *Polyphragma cribrosum*.

K tisku doporučil J. Salaj

Přeložila autorka

References

ADAMS C. G. - KNIGHT R. H. - HODGKINSON R. L. (1973): An unusual agglutinating Foraminifer from the Upper Cretaceous of England. — Palaeontology, 16, 3, *637–643*. London.

AUGUSTA J. - ŽEBERA K. (1939a): O dírkonožci Polyphragma cribrosum Reuss z křídových sedimentů od Vrapic na Kladensku. – Věda přír. 19 (1938–39), č. 8–10, *277–279*. Praha.
– (1939b): Nové naleziště dírkonožce Polyphragma cribrosum Reuss v české křídě. – Příroda, 32, *213*. Brno.
BALACHMATOVA V. T. - REJTLINGER E. A. (1959): Ataxophragmiida. – *In:* RAUZER-ČERNOUSOVA D. M. - FURSENKO A. V.: Osnovy paleontologii, obščaja čast', prostejšie, *219–233*, Izdat. Akad. nauk. Moskva.
BARTENSTEIN H. (1962): Neue Foraminiferen aus Unterkreide und Oberkeuper NW-Deutschlands und der Schweiz. – Senckenberg. lethaea, 43, 2, *135–149*. Frankfurt a. M.
BARTENSTEIN H. - BURRI F. (1954): Die Jura-Kreide-Grenzschichten im schweizerischen Faltenjura und ihre Stellung im mitteleuropäischen Rahmen. Eine Untersuchung auf mikropaläontologischer Grundlage. – Eclogae geol. Helv., 47, 1, *426–443*. Basel.
BRÖNNIMANN P. - JAYET A. (1967): Sixième note sur les Foraminifères du Crétacé inférieur de la région genevoise. Sur la présence d'un Foraminifère arénacé, Acruliammina longa (Tappan), dans l'Hauterivien inférieur de la Clie-du-Vuarne (Chainon de la Dole, Jura vaudois, Suisse). — Compte rendu Soc. Phys. Hist. nat., N.S. 2, 1, *5 — 23*. Genève.
CUSHMAN J. A. (1944): Notes on some of the Cretaceous Foraminifera described by Perner in 1892 and 1897. — Contr. Cushman Lab. foram. Res., 20, 4, *107 — 111*. Sharon, Mass.
— (1950): Foraminifera, their classification and economic use. — Harward Univ. Press. Cambridge, Mass.
CUSHMAN J. A. - MCCULLOCH I. (1939): A report on some arenaceous Foraminifera. – Allan Hancock Pacif. Exped., 6, 1, *1–113*. Los Angeles.
FRANKE A. (1913): Die Foraminiferen der Kreideformation des Münsterschen Beckens. – Verh. Naturhist. Ver. preuß. Rheinl. Westf., 69, *255–285*. Bonn.
– (1928): Die Foraminiferen der Oberen Kreide Nord- und Mitteldeutschlands. – Abh. Kön. preuß. geol. Landesanst., N. F., 111, *1–207*. Berlin.
FRIEG C. (1980): Neue Ergebnisse zur Systematik sandschaliger Foraminiferen im Cenoman des südwestlichen Münsterlandes. – Paläont. Z., 54, 3/4, *225–240*. Stuttgart.
FRIEG C. - KAEVER M. (1975): Bau und systematische Stellung von Bdelloidina cribrosa (Reuss 1840). – Neu. Jb. Geol. Paläont., Mh., 8, *449–464*. Stuttgart.
– (1976): Morphologie, Wandungsbau und Verbreitung von Acruliammina neocomiana Bartenstein 1962. – Neu. Jb. Geol. Paläont., Mh., 2, *118–128*. Stuttgart.
HERCOGOVÁ J. (1974): Foraminifera from the Cenomanian of the Bohemian Massif. – Sbor. geol. Věd, Paleont., 16, *69–103*. Praha.
– (1977): Foraminifers in the Cenomanian of the Bohemian Massif and Perner's "Foraminifers of the Bohemian Cenomanian, 1892". – Actes du VI[e] Colloque Africain de Micropal., Tunis, 1974. Ann. Mines Géol., 28, *389–399*. Tunis.
HERCOGOVÁ J. - KŘÍŽ J. (1983): New Hemisphaeramminae (Foraminifera) from the Bohemian Cretaceous Basin (Cenomanian). – Věst. Ústř. Úst. geol., 58, 4, *205–215*. Praha.
HOUŠA V. - NEKVASILOVÁ O. (1984): Paleoekologické zhodnocení epifaun přicementovaných k pevnému substrátu. – Paleoekologie. Sborník z konference. *90–98*. Univ. J. E. Purkyně. Brno.
KAEVER M. (1974): Sandschalige Foraminiferen und andere Epizoen auf einem erratischen Geröll im Turon (Soester Grünsand) des südöstlichen Münsterlandes (Westfalen). – Neu. Jb. Geol. Paläont., Abh., 146, *179–184*. Stuttgart.
LOEBLICH A. R. - TAPPAN H. (1946): New Washita Foraminifera. – J. Paleont., 20, *238–258*. Tulsa.
– (1964): Sarcodina chiefly "Thecamoebians" and Foraminiferida. *In:* Treatise on Invertebrate Paleontology, Part C, Protista 2. – Geol. Soc. of America and Univ. of Kansas Press.
MAYNC W. (1957): Coscinophragma cribrosum (Reuss) in a Lower Cretaceous limestone from Switzerland. – Micropaleontology, 3, 2, *183–186*. New York.

MOULLADE M. (1966): Étude stratigraphique et micropaléontologique du Crétacé inférieur de la "Fosse Vocontienne". – Doc. Lab. Géol. Fac. Sci. Lyon, 15, fasc. 1–2, *1–369*. Lyon.

NEKVASILOVÁ O. (1983): The genus Argyrotheca (Brachiopoda) from the Bohemian Cretaceous Basin (Czechoslovakia). – Čas. Mineral. Geol., 28, 1, *23–30*. Praha.

D'ORBIGNY A. (1850): Prodrome de paléontologie stratigraphique universelle des animaux mollusques et rayonnés. Vol. 2. – V. Masson. Paris.

PERNER J. (1892): Foraminifery českého cenomanu. – Palaeontogr. Bohem. 1, *1–65*. Praha.

POKORNÝ V. (1954): Základy zoologické mikropaleontologie. – Nakl. Čs. Akad. věd. Praha.

– (1958): Grundzüge der zoologischen Mikropaläontologie, Bd. I. – VEB Dtsch. Verl. Wiss. Berlin.

REUSS A. E. (1846): Die Versteinerungen der Böhmischen Kreideformation, Bd. II. – Stuttgart.

– (1862): Die Foraminiferen des norddeutschen Hils und Gaults. – Sitz.-Ber. K. Akad. Wiss., math.-naturwiss. Kl., 46, *5–100*. Wien.

– (1871): Vorläufige Notiz über zwei neue fossile Foraminiferen-Gattungen. – Sitz.-Ber. K. Akad. Wiss., math.-naturwiss. Kl., 64, *277–281*. Wien.

– (1872): Die Bryozoen und Foraminiferen des unteren Pläners. – *In:* GEINITZ H. B.: Das Elbtalgebirge in Sachsen, I. Der untere Quader. – Palaeontographica, 20, 1, *97–142*. Kassel.

SAINT-MARC P. (1973): Dictyopsella libanica (Foraminifère), nouvelle espèce du Cénomanien inférieur du Liban. – Rev. esp. Micropaleont. 5, 3, *409–416*. Madrid.

SIGAL J. (1952): Ordre des Foraminifera. *In:* PIVETEAU J.: Traité de paléontologie, t. 1, *133–301*. – ed. Masson. Paris.

TAPPAN H. (1940): Foraminifera from the Grayson formation of northern Texas. – J. Paleont., 14, *93–126*. Tulsa.

– (1943): Foraminifera from the Duck Creek Formation of Oklahoma and Texas. – J. Paleont. 17, *476–517*. Tulsa.

ZELENKA P. (1982): Chráněný přírodní výtvor Kněživka – významná geologická lokalita pražského okolí. – Bohemia cent., 11, *7–16*. Praha.

Explanations of plates

Pl. I, II, III, figs. 2, 4, 5; V, figs. 1, 4, 5; VI, figs. 3–6; VII, VIII, figs. 3–6; XI, figs. 1, 3–7; XII: macrophotographs by ÚÚG – V. Skala. Pl. VIII, figs. 1, 2; IX, X: microphotographs by ÚÚG – K. Navrátilová. Pl. III, figs. 1, 3; IV, VI, figs. 7, 8; XI, fig. 2: electron micrographs by ČKD – A. Gabašová. Pl. V, figs. 2, 3; VI, fig. 1: microphotographs by L. Záporožcová, ČSAV. Pl. VI, fig. 2: microphotograph by O. Nekvasilová, ČSAV.

Pl. I

Acruliammina longa (TAPPAN)

1. Specimens attached to lydite pebble. Černovičky; × 4.8;
2. Free end of the test, protruding above gneiss fragment. Skalka near Velim; × 18.3;
3. Juvenile specimen with a simple aperture, on lydite pebble. Černovičky; × 19;
4. Specimen with 2 apertural openings, on quartz pebble. Kamajka; × 15.8;
5. Damaged specimen on uneven substrate of lydite pebble; protruding earlier part shows disclosed intercameral septum with three apertural openings arranged differently compared to the terminal face of the test. Černovičky; × 17;
6. Free end of the test with five apertural openings. Kamajka; × 21.

Pl. II

Acruliammina longa (TAPPAN)

1. Initial part of the specimen, which continued its further growth on the reverse side of the *Ostrea* fragment. Skalka near Velim; × 20;

2. Specimen attached to gneiss fragment with cracked limonite coating; in the hollow after broken off dorsal side of the initial coil there are visible attached basal parts of intercameral septa. Skalka near Velim; × 17.5;
3. Two mutually overgrown specimens on a gneiss fragment. Skalka near Velim; × 18;
4. Specimen attached to internal side of *Ostrea* shell. Kamajka; × 17.5;
5. Specimen with five apertural openings, protruding by the free end above an *Ostres* shell. Skalka near Velim; × 25.5;
6. Juvenile specimen attached to lydite pebble. Černovičky; × 18.8;
7. Specimen with four apertural openings on the free end, protruding above gneiss substrate. Skalka near Velim; × 14.7.

Pl. III

1. *Acruliammina longa* (TAPPAN) attached to a fragment of *Ostrea* shell from the calcareous claystones (Lower Turonian) of Skalka near Velim; the additional apertures and pores are visible on the periphery of the chamber with the broken wall; 1a: × 40; 1b: × 180;
2. *Acruliammina nekvasilovae* n. sp., specimen attached to the gneiss wall, Skalka near Velim × 10.5;
3. *Acruliammina longa* (TAPPAN) from the Lower Turonian calcareous claystone of Skalka near Velim; the apertural face, × 21;
4. *Acruliammina nekvasilovae* n. sp., a part of the initial coiled portion, disengaged from the gneiss wall in Skalka near Velim; both 4a, b: × 20.5;
5. *Acruliammina longa* (TAPPAN) attached to the organodetritic limestone (Upper Senonian) of Vigny (France); × 5;
6. *Acruliammina longa* (TAPPAN) from the Lower Turonian calcareous claystone of Skalka near Velim; the additional alveolar apertures are visible on the damaged apertural face; × 21.

Pl. IV

1. *Acruliammina nekvasilovae* n. sp. attached to an *Ostrea* shell fragment from the Lower Turonian calcareous claystone of Skalka near Velim; the specimen with a broken end: in the middle are apertural openings; on the periphery are the additional alveolar apertures and pores; 1a: × 21; 1b: × 240; 1c: × 60;
2. *Acruliammina longa* (TAPPAN) from the calcareous claystone of Skalka near Velim; × 21;
3. *Acruliammina longa* (TAPPAN); the initial coiled portion disengaged from a lydite pebble of Černovičky; the attachment side view; 3a: × 48; 3b: × 480.

Pl. V

Acruliammina nekvasilovae n. sp.; Skalka near Velim

1. Holotype attached to a gneiss pebble; × 13.2;
2, 3. Specimens attached to gneiss rocky substrate, oriented same as on the wall of the quarry. — Photo by L. Záporožcová (ČSAV); the specimen was coated with ammonium chloride before photographing; 2: × 5; 3: × 6;
4, 5. Details of apertural ends; 4: × 29; 5: × 26.

Pl. VI

Bdelloidina cribrosa (REUSS)

1, 2. The star-like branched permanently attached initial stage. The scale is added (divided in 1 mm and 0.5 cm); the substrate is retouched. 1 — Karlov near Kutná Hora; the initial spire of the megalospherical specimen is above left; photo by L. Záporožcová (ČSAV); 2 — Středokluky; photo by O. Nekvasilová (ČSAV);
3. The tests attached to a little fragment of *Ostrea* shell from the calcareous claystone of Skalka near Velim; × 5.5;

4, 6. Weathered specimens attached to the wall of the lydite boulder in Středokluky; 4: × 3.5; 6: × 12;
5. Weathered initial portion of megalospherical specimen attached to the wall of the lydite boulder in Středokluky; × 13;
7, 8. Sections of the free portion of the test near the periphery; Kamajka; exostratum and mesostratum with pores and alveoles are visible; 7: × 400; 8: × 180.

Pl. VII

Bdelloidina cribrosa (REUSS)

1, 2. End of the test with shifted last chamber, disclosing a part of preceding apertural face. 1 – Skalka near Velim; × 19.3; 2 – Kamajka; × 11.8;
3. Specimen, whose later portion is closely attached to the earlier one. Kamajka; × 9.2;
4. Specimen suggesting bifurcation; one of the branches is irregularly developed. Starkoč; × 9;
5. Specimen having almost regular spiral-coiled initial portion; the attachment face is on the opposite side. Kamajka; × 10;
6. Four closely concrescent specimens giving the impression of dichotomously ramified test. Kamajka; × 5.5;
7. Two closely concrescent specimens. Skalka near Velim; × 11.3;
8. Specimen with spiral-coiled initial portion; the attachment face is on the end opposite to the aperture. Kamajka; × 8;
9. Specimen with slightly shifted last two chambers; they disclose a narrow strip of apertural face of preceding chamber. Skalka near Velim; × 11.2.

Pl. VIII

Bdelloidina cribrosa (REUSS)

1, 2. Thin sections perpendicular to the test axis. Skalka near Velim; 1a: × 22.5; 1b – detail: in the sediment filling the openings are preserved tests of small foraminifers; 2: × 22.5;
3. Attachment face. Kamajka; × 14.5;
4–6. Strongly weathered specimens from Vrapice. 4: × 11.6; 5 – apertural face, × 6.6; 6 – view on the attachment face, × 10.7.

Pl. IX

Bdelloidina cribrosa (REUSS)

1–3. Thin sections parallel with the test axis. Skalka near Velim. 1a: × 14; 1b – detail of the test end, × 38.5; 2a: × 14; 2b – detail of the middle part of the test, × 38.5; 3 – the end of the test, × 38.5.

Pl. X

Axicolumella cylindrica (PERNER); Kamajka

1. Thin section perpendicular to the test axis, × 38.5;
2. Thin section slightly obliquely deflected from the plane perpendicular to the axis; × 38.5;
3–5. Thin sections parallel with the test axis. 3a: × 38.5; 3b: detail of the end of the test, × 54; 4: × 38.5; a – axial column, b – cup-shaped cavity; 5: × 47; c – layer of larger quartz grains – exostratum.

Pl. XI

1. *Axicolumella cylindrica* (PERNER) from the Lower Turonian organodetritic limestone of Zbyslav; the initial portion quite surrounds an imperceptible fragment of the substrate: × 14;
2. *Axicolumella cylindrica* (PERNER) from the calcareous claystone of Skalka near Velim; 2a – a section of the test, × 35; 2b – detail of the wall near the periphery: the tubules in the

mesostratum pass into the alveoles opening among quartz grains of the exostratum; × 180;

3. *Bdelloidina cribrosa* (REUSS), a short attached specimen secondarily disengaged from the substrate; the Lower Turonian organodetritic limestones, Kamajka; 3a – dorsal side, × 12.3; 3b – the attachment face, × 13;
4. *Bdelloidina cribrosa* (REUSS), the attachment face of another specimen from Kamajka; × 15;
5, 6. *Bulbophragmium irregulare* (ROEMER); Podhořany near Ronov, depth 72 m, the Lower Turonian; both × 20;
7. *Bdelloidina cribrosa* (REUSS), a short attached specimen secondarily disengaged from the substrate; Kamajka; side view, × 15.

Pl. XII

1–3. *Acruliammina longa* attached to *Bdelloidina cribrosa* specimens. Kamajka; 1: × 16.2; 2: × 7.6; 3: × 10;
4. *Axicolumella cylindrica*. Skalka near Velim; × 12.8;
5. *Acruliammina longa* attached to *Axicolumella cylindrica*. Skalka near Velim; × 13.5;
6–8. *Axicolumella cylindrica*. Kamajka; 6: × 14.9; 7: × 17.6; 8: × 11;
9. *Axicolumella cylindrica* with initial portion of the test broken off; from the fracture face protrudes a part of the axial column. Skalka near Velim; × 20.5;
10. *Axicolumella cylindrica:* specimen was attached by a predominant part to the substrate; the last chamber only was growing upward from the attachment. Kamajka; × 17.5;
11. *Bdelloidina cribrosa:* irregularly coiled spherical specimen attached to the solid substrate. Kamajka; × 10;
12. *Bdelloidina cribrosa:* short specimen with broadened attachment face. Kamajka; × 10.3;
13. *Axicolumella cylindrica:* specimen with the end broken off; from the fracture face protrudes a part of the axial column. Kamajka; × 19.

Acruliammina, Bdelloidina a Axicolumella n. gen. (Foraminifera) z transgresních sedimentů křídy Českého masívu

(*Résumé anglického textu*)

JITKA HERCOGOVÁ

Předloženo 28. prosince 1984

Druhy, jejichž zpracování je zde uvedeno, pocházejí z 11 lokalit tzv. „příbojové" facie české křídy. Materiál, shromažďovaný po řadu let, mi předala O. Nekvasilová z Československé akademie věd. Stratigrafická příslušnost odebraných vzorků byla zjišťována převážně na základě zastoupení foraminifer; ve většině z nich byly zjištěny druhy, v Českém masívu význačné pro spodní turon. Na čtyřech lokalitách byly nalezeny schránky nového druhu *Dictyopsella fragilis*. V glaukonitických jílovcích z Vrapic se zachovala pouze *Bdelloidina cribrosa* (REUSS). V konglomerátech (rulové valouny tmelené organodetritickým vápencem), které tvoří výplň hlubších částí tzv. kapes v rulových stěnách lomu ve Skalce u Velimi, se z foraminifer vyskytuje pouze *Acruliammina nekvasilovae* n. sp.; jejich stratigrafickou příslušnost do cenomenu stanovil S. Čech na základě nálezu *Inoceramus* ex gr. *pictus*.

U druhu *Acruliammina longa* (TAPPAN) byly zjištěny převážně přisedlé části schránek, pouze ojediněle byly nalezeny exempláře s napřímeným koncem, uvolněným od podkladu. Bohatý materiál umožnil sledovat ontogenetický vývoj, který se projevuje hlavně postupným zvětšováním počtu aperturálních otvorů. Pokus o rozlišení mikrosférické a megalosférické generace nepřinesl, hlavně vzhledem k obtížnému rozlišování vzájemně se přerůstajících exemplářů, jednoznačný výsledek.

Acruliammina nekvasilovae n. sp. se od *A. longa* liší mnohem většími rozměry, tvarem komůrek, které vypadají jako rozteklé po podkladu, větším počtem aperturálních otvorů, větším počtem a větší šířkou komůrek, méně zřetelnými švy, pevnějšími stěnami, umístěním embryonální komůrky, téměř rovnou aperturální plochou a poněkud složitější vnitřní stavbou.

U *Bdelloidina cribrosa* (REUSS) byly poprvé v české křídě zjištěny i trvale přisedlé exempláře hvězdicovitě rozvětveného počátečního stadia, které FRIEG a KAEVER (1975) považují za představitele mikrosférické (?) generace, a krátké (megalosférické) schránky, složené z počáteční spirály a malého počtu uniseriálních komůrek. Mnohem hojnější jsou odlomené volné konce a krátké, přisedlé exempláře druhotně uvolněné od podkladu, které se vyskytují ve výplavech. U menší části těchto exem-

plářů dosud nalézáme zbytky podložky, většina schránek má přirůstací plochu volnou. Podle jejího utváření je možné předpokládat, že původní substrát, který se nezachoval, mohl být buď pevný nebo měkký (rostlinný ?).

Nový rod *Axicolumella* byl stanoven pro „*Lituola*" *cylindrica* PERNER. Schránky *Axicolumella cylindrica* nemají planispirální začátek jako *Lituola*, více připomínají rod *Bdelloidina*, od něho se však liší nejen pravidelnějším tvarem a jednodušším a pravidelnějším uspořádáním aperturálních otvorů, ale hlavně zcela odlišnou vnitřní stavbou. Dosud byly zjištěny pouze odlomené konce schránek nebo exempláře přisedající jen menším počtem komůrek; na základě analogie s *Bdelloidina cribrosa* je však dosti pravděpodobné, že by mohla být nalezena i přisedlá počáteční stadia větších rozměrů.

Všechny uvedené druhy byly svým výskytem vázány pouze na prostředí mělkého moře, které transgredovalo na pevné nebo zpevněné podloží. Nalézáme je buď přirostlé přímo na skalním podkladu, na valounech z konglomerátů nebo ve výplavech — buď na drobných úlomcích hornin nebo živočišných zbytků, nebo druhotně uvolněné. Vzhledem k tomu, že jsou úzce omezeny na jedinou facii, mají v rámci jednotlivých křídových pánví do jisté míry i stratigrafický význam, přestože se např. *Acruliammina longa* vyskytuje jinde v jiném stratigrafickém rozsahu. Těsnou faciální závislost na pevné podloží potvrzuje také úplná nepřítomnost všech uvedených druhů ve vysloveně mělkovodních sedimentech vyšší části spodního turonu a ve středním turonu, v nichž jsou místo nich hojně zastoupeny velké aglutinované schránky volně žijících rodů *Ammobaculites* a *Bulbophragmium*.

Acruliammina, Bdelloidina, Axicolumella n. gen. (Foraminifera) из трансгрессивных меловых отложений Чешского массива

Из мелководных, трансгрессивных отложений, относящихся преимущественно к нижнему турону, обработаны четыре вида крупных, макроскопически заметных, сидячих агглютинированных фораминифер семейства *Lituloidae*, именно следующие: *Acruliammina longa* (TAPPAN), описанная первоначально из отложений нижнего мела, *Acrulammina nekvasilovae* n. sp. из отложений сеномана до нижнего турона Чешского мелового бассейна, *Bdelloidina cribrosa* (REUSS) и *Axicolumella cylindrica* (PERNER) emend. HERCOGOVÁ. Новый род *Axicolumella* определен, главным образом, на основании внутреннего строения раковины; новый вид был подвергнут ревизии на основании изучения первоначального материала Пернера в Национальном музее в Праге и вновь приобретенных экземпляров с местонахождения, открытого Пернером. Внимание уделялось тоже экологическим зависимостям. При определении стратиграфического положения образцов изучаемых горных пород при помощи фораминифер был описан, кроме того, из нижнетуронских органодетритовых известняков новый вид *Dictyopsella fragilis*.

Přeložil A. Kříž