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New observations on *Uragiella liasica* (Lebouché & Lemoine) (Green Algae, Dasycladales) from the type-locality (Canders, Languedoc - Southern France)

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ABSTRACT – *New observations on abundant material from the type-locality of Uragiella liasica Lebouché & Lemoine reveal the presence of tufts of secondary laterals and suggest a new interpretation of the morphology of the "primary pores". The large and irregular pores, previously interpreted as Uragiella-type primary pores, are believed to result from incomplete calcification of primary laterals bearing a fertile ampulla originating in proximal-lateral position and lying very close above the lateral. Based on these new observations and interpretation the new combination Cyliindroporella ? liasica is proposed.*

RIASSUNTO – [Nuove osservazioni su *Uragiella liasica* Lebouché & Lemoine (Alghe verdi, Dasycladali)] – *Nuove osservazioni su materiale proveniente dalla località tipo di Uragiella liasica Lebouché & Lemoine hanno rivelato la presenza di ciuffi di rami secondari e suggerito una nuova interpretazione della morfologia dei "pori primari". I pori grandi e irregolari, precedentemente considerati come pori primari di tipo Uragiella, vengono interpretati come il risultato di incompleta calcificazione di rami primari che portano una ampulla fertile che si origina in posizione prossimale-laterale e giace al di sopra del ramo e molto vicina ad esso. Sulla base di queste nuove osservazioni ed interpretazioni viene proposta la nuova combinazione Cyliindroporella ? liasica.*

INTRODUCTION

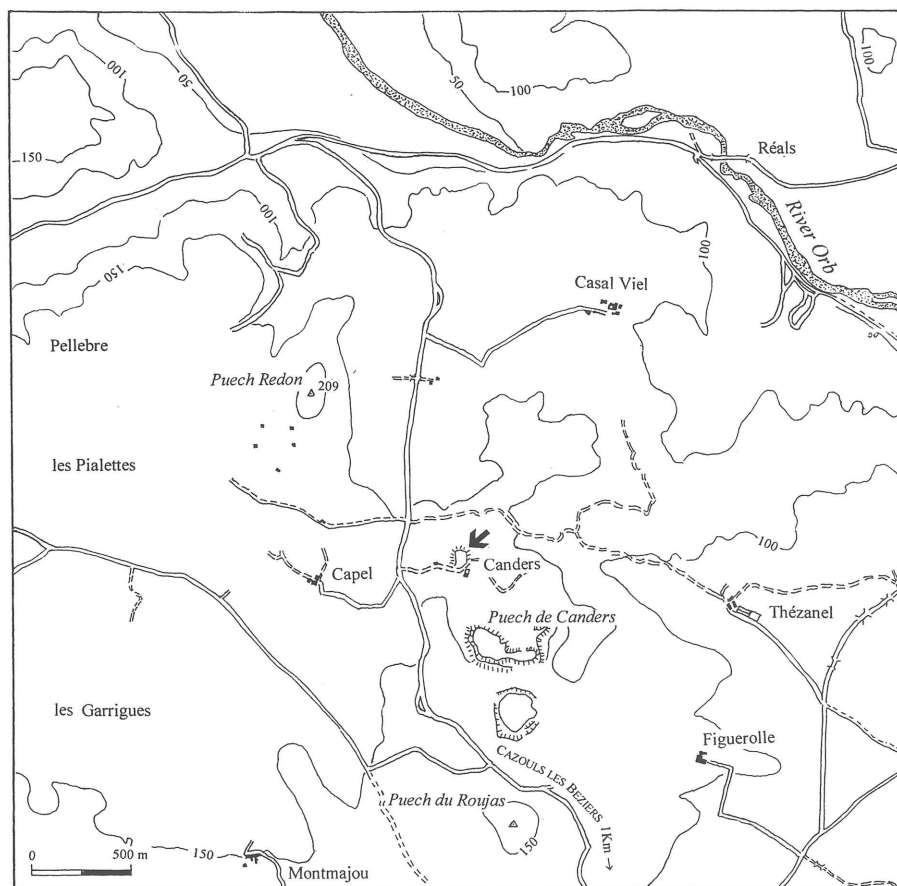
Uragiella liasica was described by Lebouché & Lemoine (1963) from the Lotharingian (Liassic) of Southern France and subsequently validated by the same authors (*in* Granier & Deloffre, 1994) with the designation of a lectotype. The specimens studied and figured by Lebouché & Lemoine (1963) come from 2 localities in the massif of St. Chinian (the Fontcaude brook and a road north of Canders) and from Boutenac, located some tens of km to the south. The road north of Canders is to be considered the type-locality following the designation of the specimen figured in pl. 1, fig. 5 of Lebouché & Lemoine (1963) as the lectotype of *U. liasica* (see Granier & Deloffre, 1994).

The redescription and emendation of *U. liasica*, proposed in the present paper, are based on samples coming from an abandoned quarry located north of Canders (Text-fig. 1), not far from the point individuated by the coordinates supplied by Lebouché & Lemoine (1963). The samples consist of oolitic bioclastic grainstones, and subordinate packstones, with abundant dasycladaleans, nerineids, crinoids, pelecypods, echinoderms and serpulids. Along with *U. lia-*

sica dasycladaleans are represented by *Eodasycladus barrabei* (Lebouché & Lemoine *in* Granier & Deloffre 1994, non 1963) emend. Barattolo *et al.* 1994; *Chinianella ellenbergeri* (Lebouché & Lemoine *in* Granier & Deloffre 1994, non 1963) emend. Granier *et al.* 1994; and rare specimens referable to *Tersella* sp.

Our new observations on *Uragiella liasica* reveal the presence of tufts of secondary laterals (see De Castro, 1997 for a revised terminology on the morphology of fossil Dasycladales) and suggest a new interpretation of the morphology of the "primary pores". The large and irregular pores, previously interpreted as *Uragiella*-type primary pores, are believed to result from incomplete calcification of primary laterals bearing a fertile ampulla originating in proximal-lateral position and lying very close above the lateral. Based on these new observations and interpretation the new combination *Cyliindroporella ? liasica* is proposed, with the specimen figured in pl. 1, fig. 5 of Lebouché & Lemoine (1963) as the lectotype (Granier & Deloffre, 1994).

Cyliindroporella ? liasica would be, together with *Eodasycladus ogilviae* and *E. barrabei*, among the oldest choristospore species of Dasycladales.



Text-fig. 1 - Location map of the type locality of *Cylindroporella ? liasica* nov. comb.

CYLINDROPORELLA ? LIASICA (Lebouché & Lemoine
in Granier & Deloffre 1994, non 1963) nov. comb.

Pls. 1-6; Text-figs. 2-4

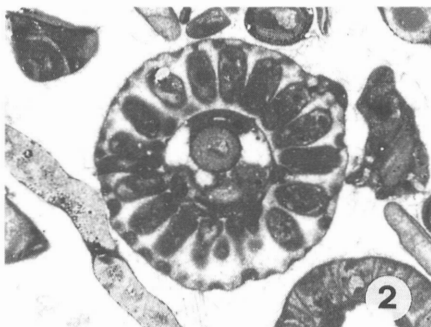
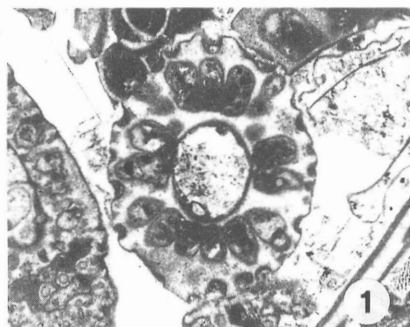
- 1962 Dasycladacée - COMBES, figs. 3a-b
 1963 nom. nud. *Uragiella liasica* n.sp. - LÉBOUCHÉ & LÉMOINE, pl.1, figs. 1, 3-7.
 1966 nom. nud. *Uragiella liasica* - SOKAC & NIKLER, pl. VI, fig.3.
 1967 nom. nud. *Uragiella liasica* - NIKLER & SOKAC, pl.2, fig.4.
 1968 nom. nud. *Uragiella liasica* - NIKLER & SOKAC, pl.6, fig.3.
 1969 nom. nud. *Uragiella liasica* - FARÈS, pl. L, figs. 1-2.
 1978 nom. nud. *Uragiella liasica* - BASSOULLET *et al.*, pl. 37, figs. 3-5, from LÉBOUCHÉ & LÉMOINE (1963) pl.1, figs. 3, 5, 7.
 1994 *Uragiella liasica* LÉBOUCHÉ & LÉMOINE in GRANIER & DELOFFRE, N.F.

EMENDED DIAGNOSIS

Thallus cylindrical, not segmented. Wide "primary pores" with a rather irregular longitudinal section swollen in the middle-upper part. Their transversal section is usually square to sub-rectangular. "Primary pores" are arranged in close whorls. They are almost perpendicular to the central stem axis; their inclination decreases moving toward the apex of the thallus where they are almost vertical. Each "primary pore" is believed to result from a stout primary lateral bearing a fertile ampulla that originates in proximal-lateral position and lies very close above the lateral. Incomplete calcification of the thin wall separating

EXPLANATION OF PLATE 1

- Figs. 1-6 - *Cylindroporella ? liasica* (Lebouché & Lemoine), type-locality: abandoned quarry north of Canders (Languedoc, France). Lotharingian (Liassic). x 15.
 1, 3) Oblique sections of specimens showing secondary laterals. Thin sections BA.579b.6 and BA.579c.4.
 2) Transversal section, secondary laterals can be seen at the outer edge of the calcareous skeleton. Thin section BA.579c.5.
 4) Oblique section. Notice the well definite expansion in the upper side of "primary pores", sometimes splitting into two pores (left side of fourth whorl from the bottom). Thin section BA.579b.13.
 5-6) Oblique sections. Thin sections BA.579b.18 and BA.579b.9



nr.	thin section	d	D	e	p _{mw}	p _{Mw}	w	h	d/D
1	BA.579b.1	875	1325	225	150	300	14		0,66
2	BA.579b.1	950	1825	437,5	180	300	14		0,52
3	BA.579b.1	1075	1900	412,5				509	0,566
4	BA.579b.1	1200	2375	587,5		360	15	361	0,505
5	BA.579b.2	1175	2375	600		320	14	405	0,495
6	BA.579b.2	1025	1775	387,5	150	220	15		0,577
7	BA.579b.2	575	1175	300	100	220	15		0,489
8	BA.579b.2	950	1650	350	120	220	18		0,576
9	BA.579b.2	1350	2600	625		280	22		0,519
10	BA.579b.2	925	1625	350		270	16		0,569
11	BA.579b.2	1275	2600	662,5	250	340	18	465	0,49
12	BA.579b.3	1350	2200	425		320	19	495	0,614
13	BA.579b.3	1000	1800	400	150	240	18		0,555
14	BA.579b.3	1400	2500	550		320	18	341	0,56
15	BA.579b.3	1200	2450	625		300	15		0,49
16	BA.579b.3	1075	2100	512,5			17		0,512
17	BA.579b.3	1200	2375	587,5	180	300	24		0,505
18	BA.579b.3	675	1200	262,5					0,562
19	BA.579b.4	1300	2600	650		400	18	495	0,5
20	BA.579b.4	1125	2250	562,5		280	14	435	0,5
21	BA.579b.4	1025	2300	625			15		0,446
22	BA.579b.4	950	1575	312,5		250	18	544	0,603
23	BA.579b.4	1100	1950	425			19		0,564
24	BA.579b.4	950	1875	462,5		300	13	423	0,507
25	BA.579b.5	1100	2100	500		260	19		0,524
26	BA.579b.5	975	1825	425		280	15	228	0,534
27	BA.579b.5	1000	2000	500			18		0,5
28	BA.579b.5	775	1375	300			17		0,564
29	BA.579b.6	575	1325	375		180	17		0,434
30	BA.579b.6	675	1825	575		220	16		0,37
31	BA.579b.7	1125	2200	537,5		300	15	356	0,511
32	BA.579b.7	1200	2325	562,5		330	15		0,516
33	BA.579b.7	1000	1625	312,5	150	220	17	302	0,615
34	BA.579b.7	1300	2500	600	200	360	17		0,52
35	BA.579b.7	1075	2200	562,5		250	18		0,489
36	BA.579b.7	1175	2000	412,5		270	16		0,587
37	BA.579b.7	1125	1900	387,5		300			0,592
38	BA.579b.7	900	1750	425		260	13		0,514
39	BA.579b.9	1050	1975	462,5		290	16		0,532
40	BA.579b.9	1000	1850	425		320	19		0,54
41	BA.579b.9	1125	2525	675			15		0,445
42	BA.579b.10	1050	2100	525		320	15		0,5
43	BA.579b.10	1000	1700	350		250	17		0,588
44	BA.579b.10	1200	2125	462,5		300	15	495	0,565
45	BA.579b.15	1175	2250	537,5		270	23	365	0,522
46	BA.579b.15	1000	1775	387,5		250	16		0,563
47	BA.579b.15	1375	2525	575				500	0,544
48	BA.579b.16	1150	2075	462,5		310	13		0,554
49	BA.579b.16	950	1450	250			13		0,655
50	BA.579b.16	875	1600	362,5	180	320	14	465	0,547
51	BA.579b.16	1350	2250	450		300	16	488	0,6
52	BA.579b.17	1100	2175	537,5				525	0,506
53	BA.579b.17	1175	2375	600		310	17		0,495
54	BA.579b.17	1100	2000	450			18		0,55
55	BA.579b.18	1200	2475	637,5			20		0,485
56	BA.579b.18	1050	2075	512,5		350	15		0,506
57	BA.579b.18	1225	2250	512,5		320	17	450	0,544
58	BA.579b.18	1450	2750	650	250	350	17	509	0,527
59	BA.579b.18	1050	2325	637,5	120	310	16		0,452
	Min	575	1175	225	100	180	13	228	0,37
	Max	1450	2750	675	250	400	24	544	0,66
	Number	59	59	59	13	46	54	21	59
	Average	1074,15	2033,47	479,24	167,692	290	17	435,952	0,532
	St. Deviation	188,06	382,67	116,72	46,035	44,821	2,37	83,0920	0,0521

Tab. 1 - Main biometrical parameters of *Cylindroporella ? liasica* nov. comb. All size parameters are given in μm : *d*: inner diameter of the calcareous skeleton; *D*: outer diameter of the calcareous skeleton; *e*: thickness of the calcareous wall; *p_{mw}*: minimum verticillar width of "primary pores" (taken in the proximal portion); *p_{Mw}*: maximum verticillar width of "primary pores"; *w*: number of "primary pores" per whorl; *h*: distance between two subsequent whorls.

the lateral from the ampulla often leads to the merging of lateral and ampulla into a single pore. Each primary lateral bears a tuft of 4-8 secondary laterals.

DESCRIPTION

General characters of the calcareous skeleton - The calcareous skeleton of *Cylindroporella ? liasica* nov.comb. is cylindrical with a rounded and slightly tapering apical end (Pl.4, figs. 1-2, 10). The pores are commonly filled by matrix, more rarely by sparry cement. The central cavity is filled either by matrix or by sparry cement. The few specimens displaying a matrix-filled central cavity invariably show a smooth inner surface (Pl.1, fig.5; pl.2, fig.2; pl.3, fig.3). The specimens with a cement-filled central cavity show the inner surface of the calcareous skeleton always lined by a more or less distinct micritic rim. In these specimens the inner surface is nearly always more or less wavy (Pl.1, fig. 6; pl.2, fig.5; pl.3, fig.1), this seemingly results from the pore filling (matrix) being more deeply eroded than the calcareous skeleton.

The "primary pores" are connected to the central cavity often by relatively large openings. This suggests that the inner surface of the skeleton usually did not touch the central stem outer wall, i.e. the central cavity diameter is slightly larger than the axial stem diameter. It is difficult to say whether this is a primary, morphological character (calcification not enveloping the proximal portion of laterals) or (and to what extent) this is due to subsequent erosion. The presence of pores with large proximal openings also in specimens with no compelling evidence of erosion at the inner surface of the skeleton (i.e. specimens with smooth inner surfaces) supports the former hypothesis.

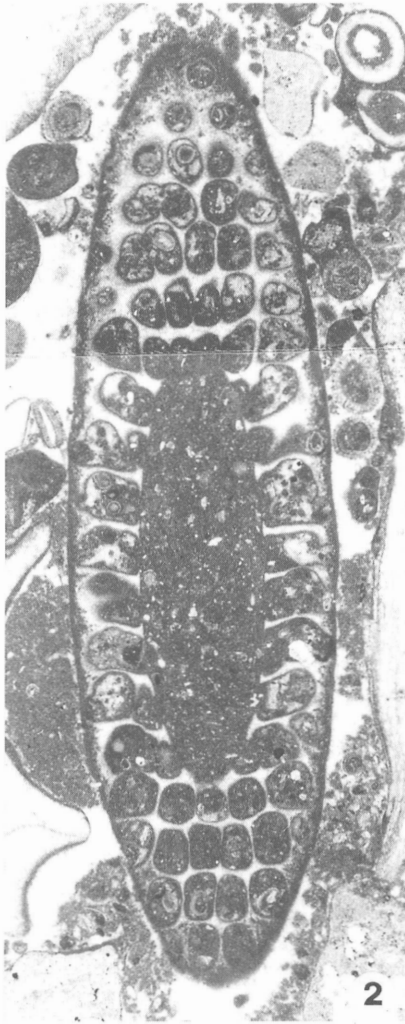
The outer surface of the calcareous skeleton is lined by a micritic rim that is thicker in some specimens (Pl.1, figs.4-6; pl.2, figs.1-2) and thin to nearly absent in those specimens preserving traces of secondary laterals (Pl.1, figs.1-3; pl.2, fig.5; pl.3, figs.1, 3; pl.4, figs.2-4). The fact that the specimens showing secondary pores are consistently found to be those with a thicker calcification (lower values of *d/D*) suggests that the secondary pores are obliterated by the abrasion of the outer surface of the calcareous skeleton.

The inner diameter of the skeleton (*d*) is 575-1450 μm , the outer diameter (*D*) 1175-2750 μm and the thickness of the calcareous skeleton (*e*) 225-675 μm (Tab.1).

EXPLANATION OF PLATE 2

Figs. 1-5 - *Cylindroporella ? liasica* (Lebouché & Lemoine), type-locality: abandoned quarry north of Canders (Languedoc, France). Lotharingian (Liassic). Oblique sections. Figs.1-4: x15; Fig.5: x 12,5.

1) Thin section BA.579b.10; 2) thin section BA.579b.28; 3) thin section BA.579b.17; 4) thin section BA.579b.29; 5) thin section BA.579b.4.



"Primary pores" - When describing *U. liasica* Lebourché & Lemoine (1963) stated that the laterals are very swollen in their median or distal part, their shape roughly resembling a more or less deformed "wineskin" (...*ayant en gros, l'allure d'outres....., plus ou moins déformées*). This species is interpreted as cladosporate, the laterals playing the role of sporanges. According to Lebourché & Lemoine (1963), the laterals were most probably closed at their distal end by a very thin calcification, usually obliterated by subsequent abrasion. However, they did not rule out the possibility that in few specimens the laterals opened outwards after a marked decrease of their diameter.

Lebourché & Lemoine (1963) state again and again in their description that the shape of the laterals in *U. liasica* is very irregular and variable (see also their drawings of fig. 5, n. 4) due to the mutual deformation of laterals lying very close each other.

Our new observations on very rich material from the type-locality of *U. liasica* suggest that there is much more than deformation in the irregular shape of "primary pores" of this species:

- The axial-vertical section of the pores, observable in longitudinal-oblique and in longitudinal sections of the calcareous skeleton, often show a rounded swelling protruding from the upper surface of the pore. This swelling is located in the middle part of the pore in the specimens with a relatively thicker calcareous skeleton. Its position relative to the whole length of the pore can shift according to the degree of abrasion of the calcareous skeleton: i.e., the specimens with a marked abrasion of the inner surface of the skeleton exhibit the swelling in the proximal part of the pore; when the outer surface of the skeleton has been considerably abraded, the swelling moves to the distal part of the pore.

Moving toward the outer surface of the skeleton the swelling comes to an end and the pore vertical diameter shows a marked decrease: the diameter of the distal portion of the "primary" pores is usually half (sometimes less) the diameter of the swollen part. The distal part of the pores is aligned with the proximal (unswollen) part or slightly bent downward. When secondary pores are present, they are attached to the thin, distal part of "primary pores"; they never originate from the swelling.

In very few specimens thin pores are occasionally alternated with pores showing the morphology described above (Pl. 3, figs. 1-2, 4-5, 7; pl. 4, figs. 2, 6, 9).

- The transversal sections of the "primary pores", observable in oblique and tangential sections of the calcareous skeleton, are almost always laterally compressed, more or less rounded or distinctly quadrangular or even polygonal. In the oblique and tangential-oblique sections of the calcareous skeleton we see roughly parallel horizontal rows of pores corresponding to whorls cut more and more distally as we move from the central cavity outwards. Both the vertical and the verticillar diameters first increase outwards and then decrease, at least in the specimens showing thicker calcareous skeletons with secondary pores. In many specimens, almost halfway between the central cavity and the outer surface of the skeleton, there are pores displaying an irregular shape with a more or less symmetrical central constriction. In some specimens thin pores, obviously not referable to secondary pores, are occasionally scattered between the largest ones. These thin pores are found a) attached to the lower side of larger pores (Pl. 4, figs. 2, 6; pl. 5, figs. 4, 8); b) beneath the larger pores (Pl. 4, figs. 4, 7; pl. 5, figs. 2, 4, 8); c) to the side and embraced by deformed larger pores (Pl. 5, figs. 1, 3).

The "primary pores" of *C. ? liasica* nov. comb. are arranged in simple whorls. The number of pores per whorl (w) is 13-24. The distance between subsequent whorls (h) is 227-544 μm and decreases toward the top of the thallus. The pores seem to alternate in subsequent whorls, but this pattern is largely obliterated moving away from the central cavity, owing to the dense crowding of the pores. The inclination of the pores decreases moving toward the top of the thallus. They are nearly perpendicular or only slightly inclined upward along most of the thallus but tend to set vertically at the apex (Pl. 4, figs. 1-2).

Interpretation of "primary pores" - From the observations reported above it follows that the most prominent feature of the "primary pores" of *U. liasica* is a marked swelling. The swollen part is more or less developed (i.e. protruding) and occupies a more or less large fraction of the pore whole length. Lebourché & Lemoine (1963) interpreted this swelling to be

EXPLANATION OF PLATE 3

Figs. 1-7 - *Cylindroporella ? liasica* (Lebourché & Lemoine), type-locality: abandoned quarry north of Canders (Languedoc, France). Lotharingian (Liassic).

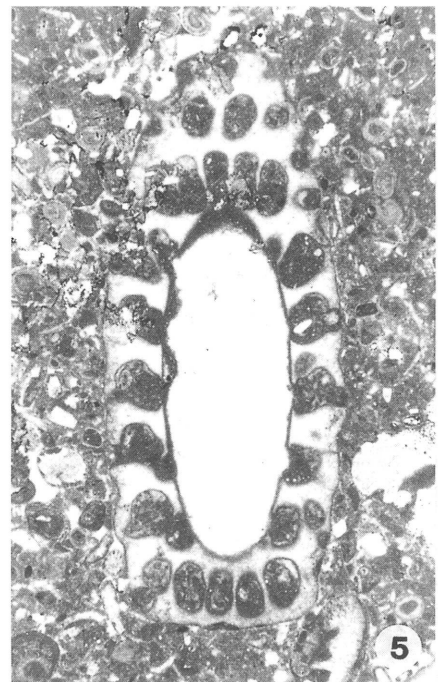
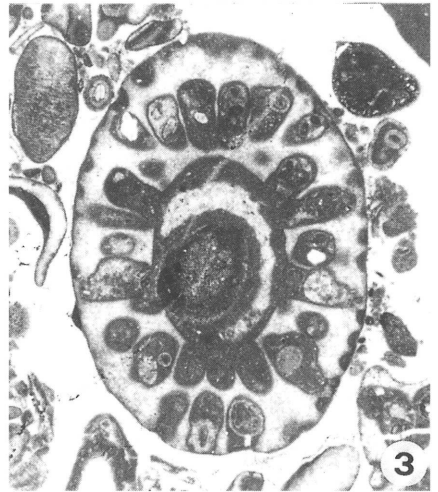
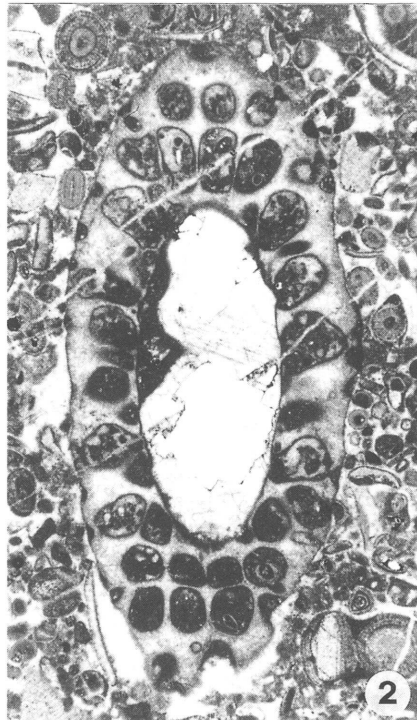
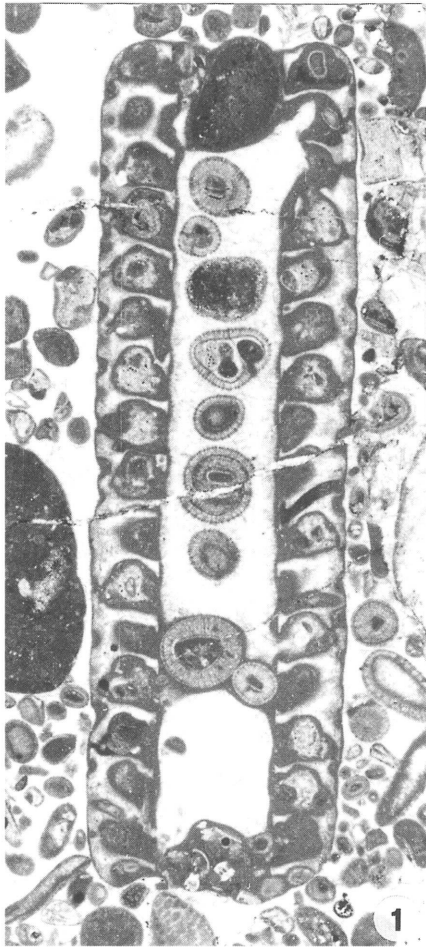
1) Axial section. Thin section BA.579b.13, x15.

2-3, 5) Oblique sections, x15: 2) thin section BA.579b.16; 3) thin section BA.579b.22; 5) thin section BA.579b.16.

4) Detail of fig. 2 (upper right side) showing a thin pore emerging from wide "primary pores". Thin section BA.579b.16, x50.

6) Detail of fig. 1. Notice the two slender akrophorous pores intervening between wide "primary pores". One secondary lateral can be seen arising obliquely from the distal end of a "primary pore". Thin section BA.579b.13, x50.

7) Detail of fig. 2 (lower right side) showing thin pores emerging from wide "primary pores". Thin section BA.579b.16, x50.



part of the lateral and, accordingly, described *U. liasica* as characterized by wineskin-shaped primary laterals. All the departures from this type-shape were attributed to deformation.

Some of our observations are at odds with this interpretation. First of all, whenever the swelling is well developed it is not symmetrical: it is more a kind of bump protruding from the upper surface of the pore (see also the lowermost drawing of fig.5, n. 4 in Lebouché & Lemoine, 1963). The specimens with a thickest calcareous skeleton show that this bump comes to an end and the pores continue for some length before originating a tuft of secondary pores (see later). The transversal sections of pores showing a central constriction in the vertical plane (see above) hint to two pores lying one above the other but so close that they easily merge in a single irregular pore when the thin space separating them is not calcified. By the way, the same occurs between adjacent pores in the same whorl: they often merge in an annular cavity (Pl.2, figs.1-2, 5). We suggest that the lower pore corresponds to a primary lateral and the upper one (the bump) corresponds to a fertile ampulla. According to this interpretation, *Cylindroporella ? liasica* nov. comb. is characterized by primary laterals bearing a fertile ampulla, originating in proximal-lateral position. The ampulla, elongate ellipsoidal in shape, runs parallel to the lateral and is very close or even lies down on the upper surface of the lateral. This causes a defective calcification resulting into a single pore with a bump protruding from its upper surface. The thin pores that in some specimens are found scattered between the larger ones are interpreted as exceptional cases of primary laterals not merged with the fertile ampullae either because there is no ampulla or because there is more space available for calcification between lateral and ampulla.

An alternative interpretation is that the thin pores are poorly developed laterals and the large pores with a central constriction are due to mutual deformation of laterals lying very close in the same whorl.

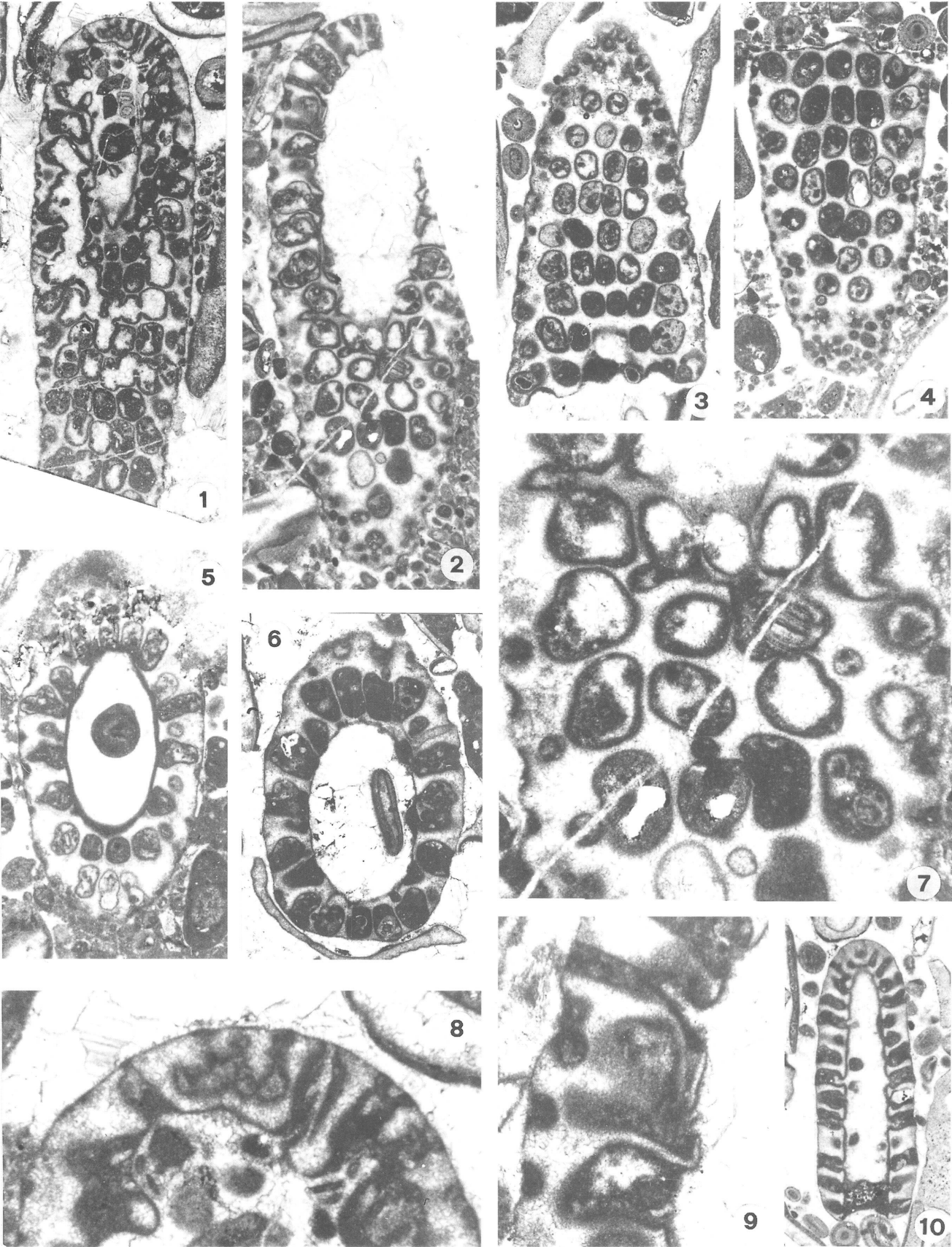
Secondary laterals - In the specimens with a thicker calcareous skeleton the outer surface is indented by many small pores (Pl. 1, figs. 1-3; pl.2, fig.5; pl.3, figs. 1-3; pl.4, figs. 1-2). These small pores corre-

nr.	thin section	d	D	p' _i	p' _d	l' _i	l'
1	BA.579.a.1	1438	2728	70			
2	BA.579.a.5	595	1934		112		
3	BA.579.a.6	893	1984		84		
4	BA.579.b.3	1042	2182	56			98
5	BA.579.b.3	1141	2480	42			126
6	BA.579.b.4	1290	2728		168	74	140
7	BA.579.b.4	794	1538	28		123	
8	BA.579.b.6	645	1835		126		112
9	BA.579.b.6				182		
10	BA.579.b.7			42	140		
11	BA.579.b.7			42	196		
12	BA.579.b.8	794	1984	56			98
13	BA.579.b.8	1190	2728	56	140		98
14	BA.579.b.9			56	252		126
15	BA.579.b.9			42	140		112
16	BA.579.b.11			56	140		
17	BA.579.b.13	1339	2728	56	154	49	98
18	BA.579.b.13	1339	2530	42	140		
19	BA.579.b.13	942	2282	42	182	62	182
20	BA.579.b.14	843	1934		126		
21	BA.579.b.14	1042	2282	42	182		98
22	BA.579.b.14	1042	2430	56	126		
23	BA.579.b.14	1190	2629	42			140
24	BA.579.b.16				182		
25	BA.579.b.16	1190	2629	42	154		140
26	BA.579.b.17			56	196		
27	BA.579.b.17	1141	2381	56	182	148	126
28	BA.579.b.17	1091	2034		126		70
29	BA.579.b.17				154		
30	BA.579.b.18			56	210		
31	BA.579.b.22	1141	2629	42	210	74	140
32	BA.579.b.22			56	182		98
33	BA.579.b.23	942	1934	42	154	98	112
34	BA.579.b.27	1141	2629	56	140	123	
35	BA.579.b.28	992	1984	56		98	98
36	BA.579.b.29	1190	2381	42	140	74	112
37	BA.579.b.32	1290	2629	70	182		182
38	BA.579.b.32	942	1934	70	182		112
39	BA.579.b.33	1240	2728	56	168	74	98
40	BA.579.b.34			56	154		
Min		595	1538	28	84	49	70
Max		1438	2728	70	252	148	182
Number		28	28	31	33	12	22
Average		1066.4	2315.3	51.032	160.788	91.225	119
St. deviation		209.35	348.65	9.9314	33.410	28.95	27.240

Tab. 2 - *Cylindroporella ? liasica* nov. comb.. Main biometric parameters of the specimens showing secondary laterals. All size parameters are given in μm . d = inner diameter of the calcareous skeleton; D = outer diameter of the calcareous skeleton; p'_i = minimum width of secondary laterals taken in the proximal portion; p'_d = width of secondary laterals in the distal portion; l'_i = length of the proximal portion of secondary laterals; l' = total length of the calcified part of secondary lateral.

EXPLANATION OF PLATE 4

- Figs. 1-10 - *Cylindroporella ? liasica* (Lebouché & Lemoine), type-locality: abandoned quarry north of Canders (Languedoc, France). Lotharingian (Liassic).
- 1-2) Oblique section cutting the top of the calcareous skeleton made by nearly vertical thin laterals. Thin sections BA.579d.5 and BA.579b.9. x15.
 - 3-4) Tangential-oblique sections showing the tufts of secondary laterals. Thin sections BA.579b.17 and BA.579b.7. x15.
 - 5-6) Oblique sections. Notice the thin pore emerging from a stout "primary pore" (upper right side of fig.6). Thin sections BA.579b.4 and BA.579b.22. x15.
 - 7) Detail of fig.2 showing thin pores set aside stouter ones, cut transversally. Thin section BA.579b.9. x40.
 - 8) Detail of fig.1 showing primary and secondary laterals at the top of the calcareous skeleton. Thin section BA.579d.5. x50.
 - 9) Detail of fig.2. Notice thin elongate pores alternated with (or joined to) stouter pores. Thin section BA.579b.9. x50.
 - 10) Axial section of a small-size specimen. Thin section BA.579c.9. x15.



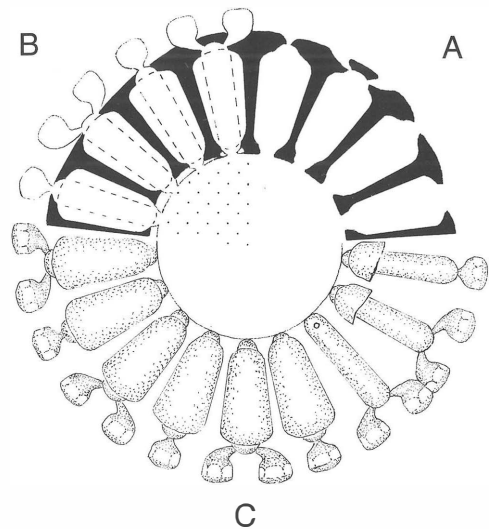
spond to the proximal part of secondary laterals. In some tangential sections these small pores are arranged in tufts originating from the distal end of primary pores (Pl.4, figs. 3-4; pl.5, fig.6). Each tuft consists of 4-8 laterals (Pl.5, figs.5, 7). The proximal diameter of secondary pores is 28-70 μm . The distal diameter of secondary pores is 84-252 μm .

Reconstruction of the thallus - Our reconstruction of *Cylindroporella? liasica* (Text-figs.2-3) is based on some interpretations mainly related to the "primary pores" problem and to the shape and arrangement of the uncalcified distal part of secondary laterals.

The irregular shape of "primary pores" is here interpreted as the result of absence of calcification between the primary lateral and the overlying ampulla. Accordingly, they are drawn very close together. The insertion point of the ampulla is supposed to be in the proximal part of the primary lateral following what happens in some fossil species [*Montiella? elitzae* (Bakalova), etc.]. In our reconstruction we have reproduced the most frequently observed morphology, i.e. relatively thick primary laterals supporting a fertile ampulla. According to our interpretation, the defective calcification of the lateral plus ampulla results into the eight-shaped pores seen in tangential sections of the skeleton (transversal sections of laterals). For sake of simplicity we have not reproduced the case of thin primary laterals observed in some sections.

The secondary laterals of *Cylindroporella? liasica* are grouped into tufts of 4-8 laterals. In the reconstruction we put tufts of 7-8 laterals, the most frequent value in our specimens. The cortical meshes made by the uncalcified outer tips of secondary laterals have been represented as horizontal hexagons: this solution is geometrically consistent given the number of secondary laterals and the outer diameter.

According to evidences observed in thin section (see: *General characters of the calcareous skeleton*), the calcification has been drawn close to, often not touching the central stem. As to the thickness of calcification, several different cases have been observed and, accordingly, represented in the reconstruction, ranging from thin-walled specimens with calcification stopping before the outer end of primary laterals, up



Text-fig. 2 - *Cylindroporella? liasica* nov. comb. Transversal and perspective reconstruction of a whorl. A) Sector of a whorl showing the calcareous skeleton in transversal section. B) Central stem, primary and secondary laterals, gametangia and calcification (black) in transverse perspective view. C) The same as B but without calcification. (Approx. 25 x)

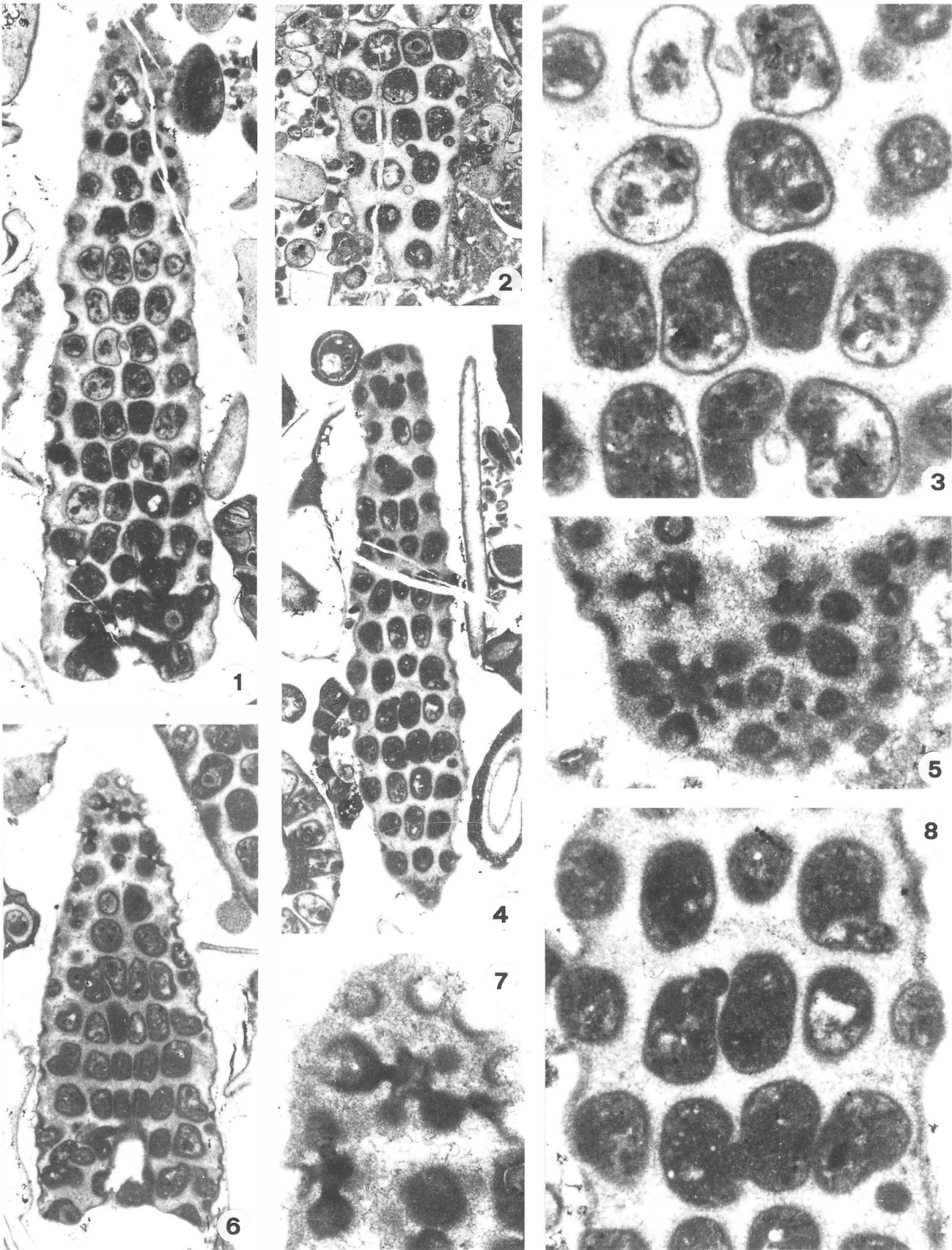
to thick-walled ones with calcification enveloping the proximal part of secondary laterals.

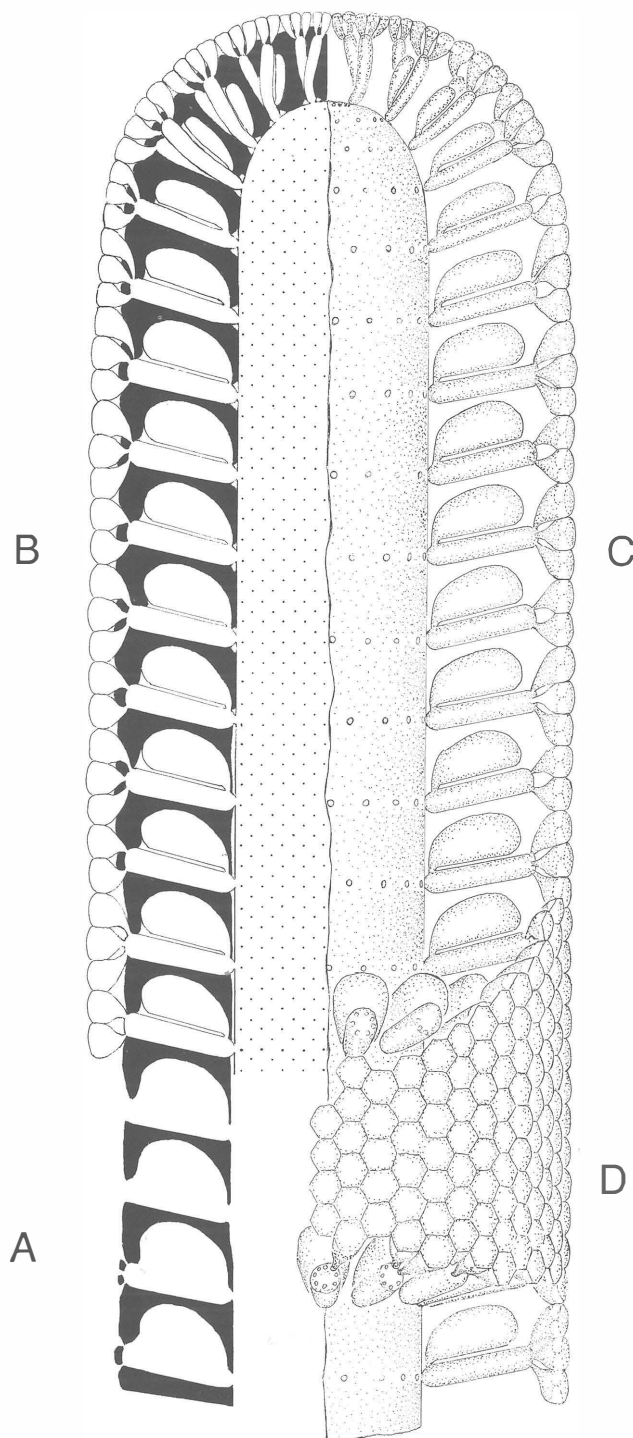
DISCUSSION OF GENERIC ATTRIBUTION

According to our interpretation, *Cylindroporella? liasica* is characterized by a cylindrical, not segmented thallus, with primary laterals bearing a fertile ampulla in proximal-lateral position and a tuft of secondary laterals in terminal position. This morphology, of course, is not compatible with its placement in the genus *Uragiella*. In Text-fig. 4 we have drawn some species belonging to genera showing fertile ampullae either connected in lateral position to primary laterals or directly connected to the central stem. The morphology of *C. ? liasica* does not fit into any of them (Text-fig.4). However, for several reasons discussed below we do not propose a new genus and

EXPLANATION OF PLATE 5

- Figs. 1-8 - *Cylindroporella? liasica* (Lebouchè & Lemoine), type-locality: abandoned quarry north of Canders (Languedoc, France). Lotharingian (Liassic).
 1-2, 4, 6) Tangential sections, x15: 1) thin section BA.579a.5; 2) thin section BA.579b.16; 4) thin section BA.579b.34; 6) thin section BA.579b.9.
 3) Detail of fig.1. Notice two thin pores set between and partly embraced by two stouter ones. Thin section BA.579b.7. x50.
 5) Detail of pl.4, fig.4 showing the tufts of secondary laterals. Thin section BA.579b.7. x50.
 7) Detail of fig.6 showing tufts of secondary laterals. Thin section BA.579b.9. x50.
 8) Detail of fig.4 (middle-lower part) showing thin pores emerging from larger "primary pores". Thin section BA.579b.34. x50.





prefer to attach this species to the genus *Cyliindroporella*, even if in open nomenclature.

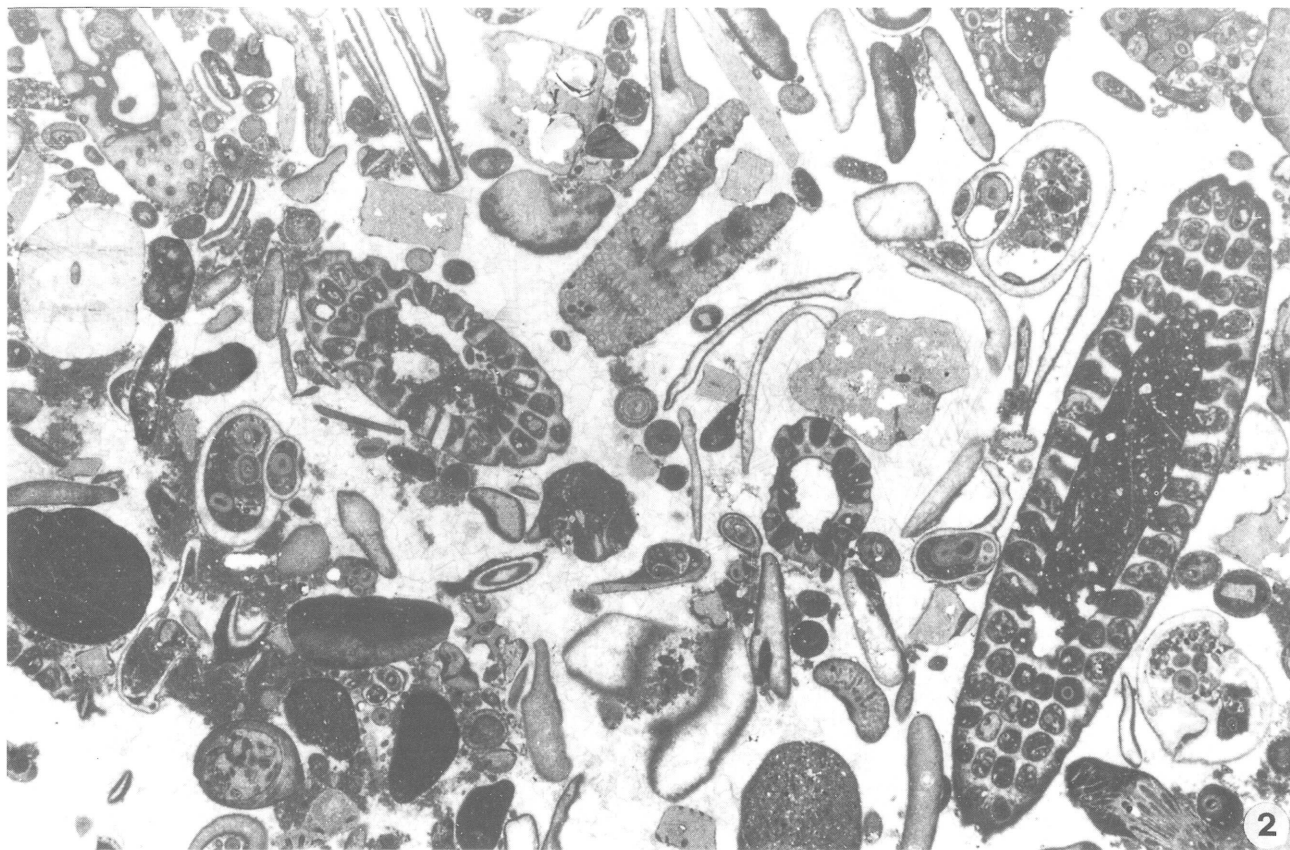
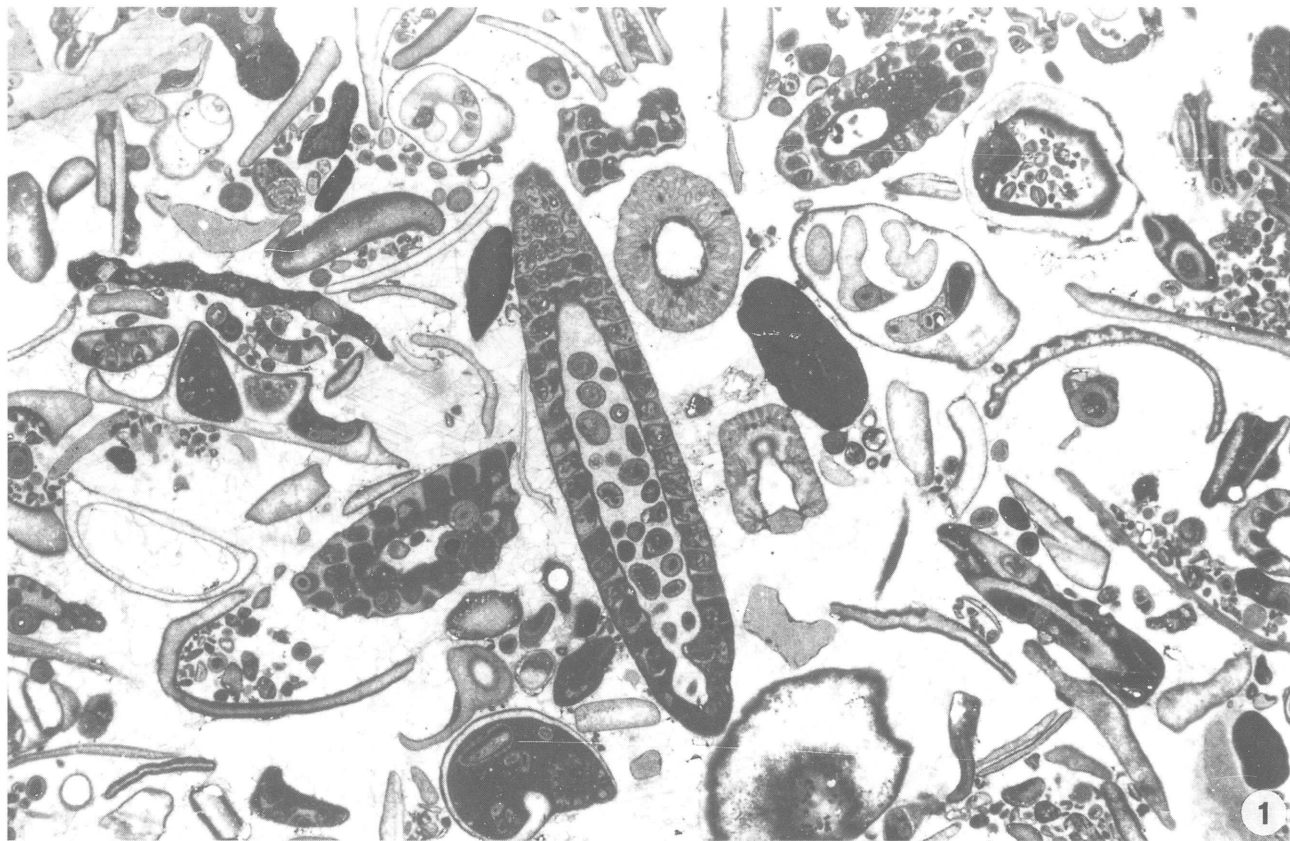
Cyliindroporella Johnson 1954 is commonly accepted to be characterized by fertile ampullae alternating with sterile laterals within the same whorl. Sterile laterals are said to bear a tuft of secondary laterals. It has been already pointed out (Parente, 1997) that this morphology would set apart *Cyliindroporella* from all the other known genera of Dasycladales: none of them shows different morphological elements alternating in the same whorl. Radial symmetry is never violated in Dasycladales having morphologic elements arranged in whorls: a whorl is built by repeating equal elements. In the most recent approaches to the taxonomy of the order Dasycladales discrimination at family level is based either on the arrangement of laterals (Deloffre, 1988) or on a combination of arrangement of laterals and position of reproductive structures (Berger & Kaever, 1992). *Cyliindroporella* is assigned to the family Dasycladaceae by Deloffre (1988), whereas Berger & Kaever (1992) place it into the family Triploporellaceae, which they erected for euspondyl cladospore Dasycladales. The peculiar morphology incorporated in the diagnosis of *Cyliindroporella* would probably deserve at least family status for reason of internal taxonomic consistency. However, this morphology has not been unambiguously demonstrated in the type-species. *Cyliindroporella barnesii* Johnson 1954 is indeed a poorly known species. The figures supplied by Johnson (1954) and partly reproduced in Bassoullet *et al.* (1978) and Conrad (1982) do not allow to confirm the diagnosis and description of the species. In particular, it is by no way possible to demonstrate that fertile ampullae alternate with sterile laterals in the same whorl. Regrettably enough, notwithstanding the poor knowledge of the morphology of *C. barnesii* and the suspicious peculiarity inherent to the diagnosis and alleged morphology of the genus

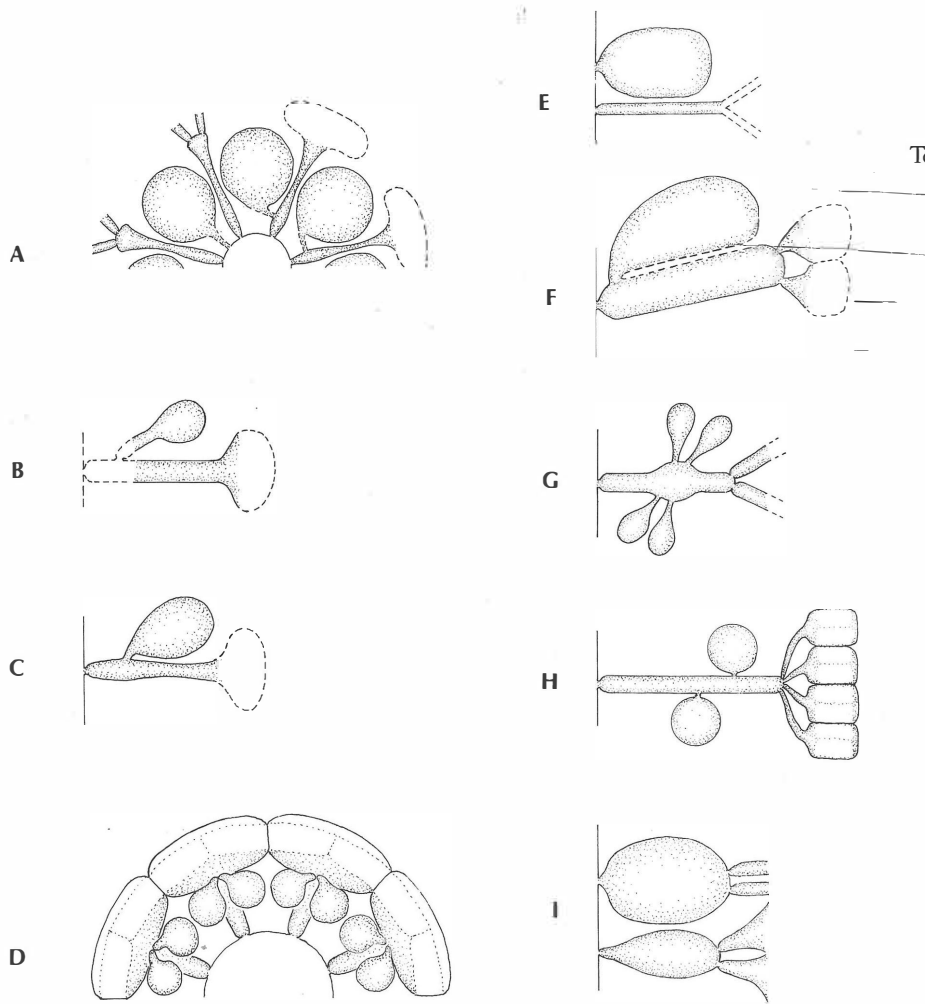
Text-fig. 3 - *Cyliindroporella* ? *liasica* nov. comb. Longitudinal and perspective reconstruction. A) calcareous skeleton in axial section. B) Primary and secondary laterals, gametangia and calcification (black) in axial section. C) Longitudinal view of central stem, branches and gametangia without calcification. D) Perspective view of laterals, gametangia and cortex. (Approx. 25 x).

EXPLANATION OF PLATE 6

Figs. 1-2 - *Cyliindroporella* ? *liasica* (Lebouché & Lemoine), type-locality: abandoned quarry north of Canders (Languedoc, France). Lotharingian (Liassic).

1-2) Microfacies: bioclastic grainstone with dasycladaleans [*Cyliindroporella* ? *liasica* (Lebouché & Lemoine), *Eodasycladus barrabei* (Lebouché & Lemoine), *Tersella* sp.], gastropods (nerineids), pelecypods and crinoids fragments, ooids and micritic lithoclasts. 1) thin section BA.579b.24; 2) thin section BA.579b.23. x8.





Text-fig. 4 - Morphological comparison of dasycladalean genera showing primary laterals and fertile ampullae (with or without secondary laterals). A) *Cylindroporella barnesii* Johnson, transversal view (42x). On the left the ampulla is connected to the central stem according to the diagnosis of the genus *Cylindroporella* currently accepted by most of authors (Berger & Kaever, 1992, Granier *et al.*, 1994); on the right the ampulla is drawn connected to the primary laterals. B) *Montiella munnieri* Morellet & Morellet, axial view (52x). C) *Montiella ? elitzae* (Bakalova), axial view (52x). D) *Microsporangella buseri* Barattolo, transversal view (104x). E) *Otternstella lemmensis* (Bernier), axial view (104x). F) *Cylindroporella ? liasica* (Lebouché & Lemoine), axial view (42x). G) *Jodotella veslensis* Morellet & Morellet, axial view (52x). H) *Bornetella nitida* Harvey, axial view (42x). I) *Chinianella ellenbergeri* (Lebouché & Lemoine), axial view (42x).

Cylindroporella (whorls built out of different, alternating morphological elements, violating the radial symmetry), several species have been referred to this genus. Some of them have been already demonstrated, or at least proposed, to depart from this morphology (Radoicic, 1980; Bucur, 1993; Granier *et al.*, 1994). Radoicic (1980) proposed to include *C. elitzae* in the genus *Montiella* demonstrating that in this species fertile ampullae are not connected to the central stem but to sterile primary laterals. On the basis of the same evidence Bucur (1993) proposed the new genus *Bakalovella*, arguing that in *Montiella* the primary lateral is not preserved and its presence is only speculative. Radoicic (1980) went on suggesting that a careful restudy of other "*Cylindroporella*" species might eventually lead to the same conclusion.

Some other genera show fertile ampullae connected to primary laterals not in terminal position. These genera are also included in Text-fig. 4. None of these genera is found suitable to include *Cylindroporella ? liasica*. *Montiella* and *Bakalovella* do not show secondary laterals (we have included *Bakalovella* Bucur as a separate

genus even if it most probably represents a junior synonym of *Montiella*). *Microsporangella*, *Jodotella* and *Bornetella* have more than one ampulla per lateral.

Granier *et al.* (1994), while not discussing the morphology of the genus *Cylindroporella* (see their fig.2, lowermost drawing), erected two new genera, *Chinianella* and *Otternstella*, based on species formerly described as *Cylindroporella*. Both these genera are characterized by whorls of fertile ampullae alternating with whorls of sterile laterals and accordingly are placed into the family Acetabulariaceae, tribe Uterieae (Granier *et al.*, 1994). In *Chinianella* (type species *Chinianella ellenbergeri* = *Cylindroporella ellenbergeri* Lebouché & Lemoine) both fertile ampullae and sterile laterals bear secondary laterals. In *Otternstella* (type species *Otternstella lemmensis* = *Cylindroporella lemmensis* Bernier) fertile ampullae are closed in their distal part, while sterile laterals bear a further order of laterals.

In our opinion a reassessment of the genus *Cylindroporella*, based on a restudy of its type-species, is necessary. We believe that the alleged morphology of *Cylindroporella*, incorporated in the diagnosis presently

accepted, is at odds with what known on living and fossil representatives of the order Dasycladales. We offer two entirely speculative alternatives:

a) the ampullae in *C. barnesii* are directly connected to the central stem and arranged in whorls alternating with whorls of sterile laterals: in this case *Otternstella* would be a junior synonym of *Cylindroporella*;

b) the ampullae are connected to sterile primary laterals in proximal-lateral position.

Pending this second alternative we prefer at present to place *U. liasica* into the genus *Cylindroporella*, even if in open nomenclature, under the new combination *Cylindroporella ? liasica*.

COMPARISONS

Cylindroporella ? liasica shows some similarities with *Montiella ? elitzae*. Looking at the figures and drawings given in Radoicic (1980), it seems evident that defective calcification of the thin wall separating the ampulla from the sterile lateral would give a complex and irregular "primary" pore very similar to that observed in *Cylindroporella ? liasica*. Apart from this "potential" but unrealized similarity, the two species look quite different. First of all, secondary laterals have never been observed in *M. ? elitzae*. Moreover, this species is considerably smaller than *C. ? liasica* and has fewer laterals per whorl. The presence of few laterals per whorl is a character common to many species placed in the genus *Cylindroporella*. Among those showing more numerous laterals per whorl *C. lyrata* Masse & Luperto Sinni, 1989 looks at a first sight similar to *C. ? liasica*. The overall morphological resemblance is due to the dense crowding and often irregular shape of pores in both species. Apart from the interpreted morphology of pores in *C. ? liasica*, the main differences with *C. lyrata* reside on some important biometric parameters. The ratio between inner and outer diameter of the skeleton is considerably smaller in *C. lyrata*; the different range of d/D is mainly due to smaller values of d; *C. lyrata* has a smaller central cavity and a thicker calcification than *C. ? liasica*.

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