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A STUDY OF THE MORPHOLOGICAL VARIABILITY OF *RADIOLITES MARINII* CAFFAU & PLENIČAR (RADIOLITIDAE), LATE CENOMANIAN, KARST OF GORIZIA, ITALY

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ABSTRACT

The species Radiolites marinii Caffau & Pleničar is very abundant in the rudist assemblages of the limestone sequence of the area of "Archi", in the southeastern part of the Karst of Gorizia, from the Upper Cenomanian age.

The good preservation-state of several specimens found separately in the dolonstone allowed to analyse and describe in detail the external morphology of the shell of this species. The main feature of the external morphology is the difference between the upper and the lower part of the shell.

*Taking into account that this feature was observed in all adult specimens, transverse sections were made at the lower, middle (area where there is a change in the ornamentation) and upper part of the shell. Morphometrical values regarding the shell area (**Sa**), the inner area of the shell (**Ia**), the external perimeter (**Ep**) and the internal perimeter (**Ip**) of the shell were obtained from each transverse section by image analysis.*

The analysis of these data indicated that the change in morphology could be due to a strong biological stress that markedly influenced the physiological trend of calcitic secretion for the building up of the shell in individuals of this species.

Key words: rudists, morphological variability, Late Cenomaniana, image analysis

INTRODUCTION

Caffau and Pleničar (1991) described the rudist-rich assemblage of the limestone sequence of the locality of "Archi" in the southeastern part of the Karst of Gorizia. The study of the rudist fauna brought to light the new species *Radiolites marinii* n.sp. (*op. cit.*, pp. 268-269, Pl. 5, Figs. 1-4; Pl. 6, Figs. 1-3). Fossil material was found in dolonstones where specimens were very well preserved. The optimal preservation state of rudist shells allowed to describe in detail the external morphological characters of all rudist specimens found, in particular those of the species *R. marinii*.

The aims of this work are (i) to describe in detail the variations of the external ornamentation of the shell of the lower valve of R. *marinii* (ii) to analyse whether there is a relationship between the morphological variability of the shell of this species and their life environment by morphometrical analysis (iii) to supply further stratigraphic and palaeoenvironmental information of this area of the carbonatic platform.

Stratigraphic setting

Moschenizza is a hill characterised by light and grey fossiliferous limestones and dolonstones.

The sequence is divided in the following three units, from the most ancient to the most recent one:

1. Packstone/grainstone (7.5 m thick) with rare *"bouquets"* of *Praeradiolites fleuriausus* (d'Orbigny), singly specimens of *R. marinii* and *Radiolites radiosus* d'Orbigny.

In addition, abundant specimens of *Chondrodonta joannae* (Choffat) and *Neithea fleuriausiana* (d'Orbigny) are present.

2. Dolonstone (2.5 m thick) characterised by a rudist assemblage of many species, such as *Radiolites carsicus* Caffau & Pleničar, *Radiolites presauvagesi communis* Polsak, *R. radiosus* d'Orbigny, *Eoradiolites zucchii* Caffau & Pleničar, *Eoradiolites adriaticus* Caffau & Pleničar, *P. flueuriausus*, requieniids, *C. joanne* and *N. fleuriausiana*.

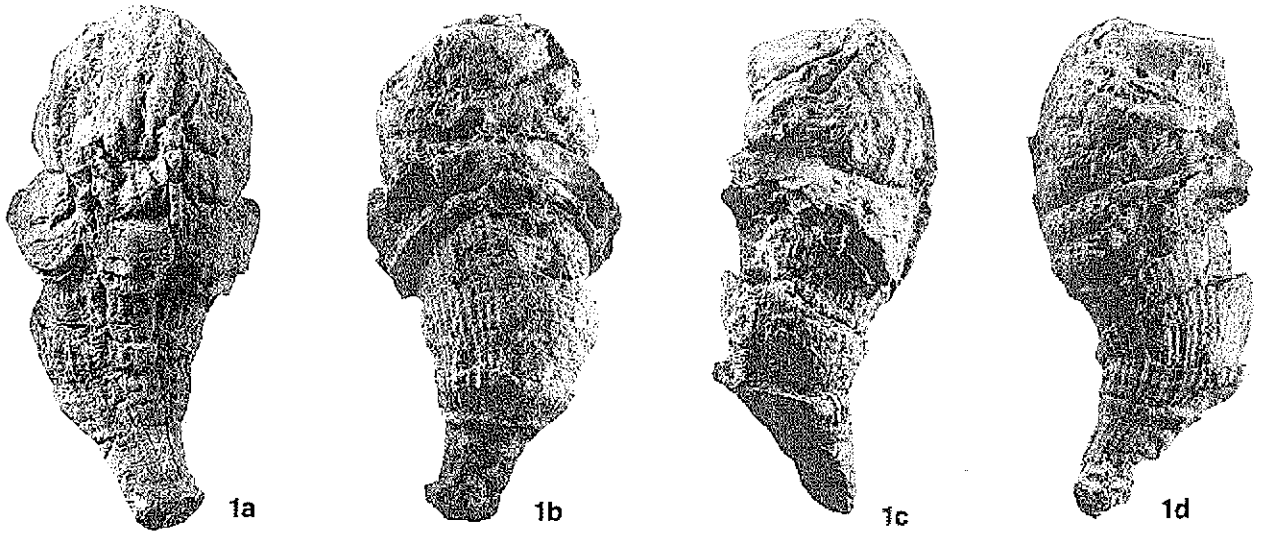
3. Floatstone with a matrix of silty bioclastic packstone (5 m thick) with scarce specimens of *R. carsicus*, *P. flueuriausus* and requieniids.

The bottom of this sequence (unit 1) represents the appearance of the first communities of *C. joannae* and radiolitids that served as a rigid substratum for the subsequent generations of radiolitids and requieniids (unit 2). In this second unit there is the major faunistic diversification of rudists. In unit 3 the rudist fauna progressively diminishes and disappears at the top of the sequence.

The rudist species *P. flueuriausus*, *R. radiosus* and requieniids are always present in all three intervals.

In addition, the micropalaeontological content consists of *Chysalidina gradata* d'Orbigny, *Nezzazata simplex* Omara, *Trochospira avnimelechi* Hamaoui & Saint-Marc, *Biconcava bentori* Hamaoui & Saint-Marc, *Nummofallotia apula* Luperto Sinni, *Cuneolina pavonia* d'Orbigny and *Nezzazatinella picardi* (Henson).

Because of the presence of the foraminifers *C. gradata* and *T. avnimelechi* in addition to *P. fleuriausus* and *C. joannae*, the limestones of the sequence of "Archi" are assigned to the Upper Cenomanian age.



Figs. 1a, b, c, d: Radiolites marinii. Ventral view (a): both radial bands, protruding and rounded in shape, are visible at the middle-upper part of the individual. The area between the radial bands is characterised by large lamae bent towards the bottom in the upper part of the individual, and by tiny lamellae in the lower part. x1. Dorsal view (b): the difference between the ornamentation of the lower and the upper part of the right valve is observed.
View of posterior (c) and anterior (d) sides where the change of the ornamentation between the lower and the upper part of the valve is well visible. x1
Sl. 1a, b, c, d: Radiolites marinii. Prednja stran (a): Obe radialni progi, izbočene in okrogle oblike, sta vidni na prednjem zgornjem delu osebka. Površina med radialnimi progami ima značilne velike lamele, ukrivljene navzdol na zgornjem delu primerka in tanke lamele v spodnjem delu. x1. Zadnja stran (b): razlika v ornamentaciji med spodnjim in zgornjim delom desne lupine.
Zadnja (c) in prednja (d) stran z dobro vidnimi spremembami v ornamentaciji med spodnjim in zgornjim delom lupine. x1

Taphonomy

The rudist fauna consists of oligotypical assemblages of radiolitids and requiniids (Skelton & Gili, 1991). All the species of radiolitids are represented by *elevator* ecological morphotypes. Small *bouquets* of specimens

of *P. fleuriausus* are the only type of aggregation of radiolitids that is present in the sequence of "Archi". The requieniids are represented by large specimens, usually located at the sides of the small *"bouquets"* of *P. fleuriausus* or in thin tabular lithosomes. The requieniids are *frictional clingers* sensu Skelton & Gili (1991) and Gili *et al.* (1995).

Bioturbations are a common feature of the preservation state of most rudists found that, if present, can be observed in the upper part of the right valve. Therefore, and consistent with Philip (1972), it is possible that the lower part of the right valves was buried in the sediment, whereas the upper part was out of the sediment. The lack of bioturbations in the lower part of the right valves could also be attributed to other factors, such as the sedimentation rate and the growing rate of the individuals to avoid being buried in the sediment (Skelton *et al.*, 1995).

MATERIAL AND METHOD

The specimens of *R. marinii* studied in this work belong to the collection of the Dipartimento di Scienze Geologiche, Ambientali e Marine of the University of Trieste and include either adult or young specimens. In a whole, 21 specimens (16 adults and 5 young specimens) of *R. marinii* are studied in this work, with a total of 59 transverse sections. After an accurate observation of the external morphology of the right valves, an initial cut is made where a change in the ornamentation occurs (see description of the morphological variability). Afterwards, other two transverse sections are performed few centimetres below and above the initial cut.

The images of these sections are acquired and processed as follows:

- *Image acquisition:* the acquisition is made in a personal computer by means of a CCD colour camera mounted on an optical mineralogical microscope. The image is then digitised by means of an analogue-to-digital converter, i.e. Matrox Meteor.

- *Image pre-processing and features extraction:* the initial image shows 256 shades of grey in contrast with the background. The contrast is further enhanced through digital filters, thereby resulting in a final image of black objects against a white background. The format used for the images is 512 x 512 pixels. The whole system consists in an automatic programme *(WinMorfo)* that has been appropriately written in C language and Visual Basic running on a personal computer. The programme automatically extracts from each object the formal features that are considered to be characteristic, with precision levels comparable to manual or semi-automatic methods (Protopsalti, 1997).

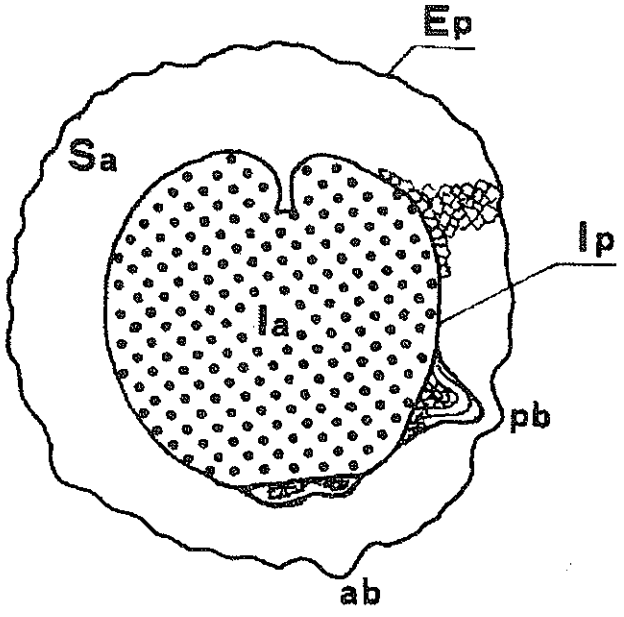


Fig. 2: Transverse section of a right valve of Radiolites marinii, where the measured area (Sa) (Ia) and perimeter (Ep) (Ip) are indicated. Moreover, the structures of the anterior radial band (ab) and the posterior radial band (pb) are pointed out.
Sl. 2: Prečni prerez desne lupine vrste Radiolites marinii z označeno merjeno površino (Sa) (Ia) in perimetrom (Ep) (Ip). Označene so tudi strukture na prednji radialni progi (ab) in zadnji radialni progi (pb).

The parameters **Ia, Sa, Ip** and **Ep** (Fig. 2) are related to the biological functions of the specimens as previously described by Cestari (1992), Reali (1992), Caffau & Pleničar (1994/95) and Caffau & Pleničar (1996). In detail, these parameters are:

- **Sa** (mm^2): shell area or surface of the mantle that is responsible for the incoming water flux and the entrance of nutrients in the inner cavity.

- **Ia** (mm^2): area of the inner cavity that contains the organic tissues involved in the assimilation of nutrients.

- **Ep** (mm): external perimeter that is in close correlation with the external development of the shell. It may change depending on the (kind of) interaction of the individual with the environment *(i.e.* the building up of protruding ribs in order to augment the surface of contact with the substratum) or with other individuals (i.e. in *"bouquets"* or other forms of aggregation).

- **Ip** (mm): perimeter of the inner layer of the shell.

The values of these parameters obtained for all the analysed specimens are plotted in dispersion diagrams (Fig. 3).

The images of the transverse sections of the right valves of *R. marinii* are shown in Plates 1-7 and the morphometrical values are summarised in Table 1.

SIGLA	Ia (mm²)	Sa (mm²)	Ip (mm)	Ep (mm)
A1	0.979	0.965	3.455	5.525
A2	1.386	2.077	4.132	7.877
A3	2.137	3.670	5.159	9.208
B1a	1.307	1.903	4.121	7.595
B1b	1.562	2.990	4.516	8.661
B2a	1.372	2.699	4.306	7.953
B2b	2.221	3.481	5.305	9.963
B3a	1.980	2.102	4.950	7.723
B3b	2.056	2.888	5.065	8.669
B3c	3.334	4.304	6.379	10.280
C1a	0.874	1.219	3.275	5.201
C2a	1.500	2.289	4.346	7.206
C3a	1.519	2.573	4.300	7.257
D1a	0.830	1.157	3.234	5.429
D2a	1.601	3.313	4.432	8.760
D3a	2.569	3965	5.575	9.864
E1a	0.635	1.058	2.763	5.419
E2a	0.762	2.394	3.101	7.536
F1a	1.015	1.860	3.572	6.451
F2a	1.049	3.274	3.659	7.563
F3a	1.781	3.874	4.864	8.748
G1a	1.518	2.214	4.282	6.848
G2a	2.263	5.209	9.190	3.082
I1a	1.606	1.970	4.564	7.172
I2a	1.855	3.464	4.845	8.967
I3a	2.084	3.647	5.100	8.919
T1a	0.851	1.168	3227	5.614
T2a	1.832	1.629	4.763	7.203
T3a	1.943	2.525	4.954	8.419
M1a	0.585	1.590	2.742	5.572
M2a	1.193	2.270	4.096	7.196
M3a	1.305	2.436	4.033	7.495
N1a	1.655	2.637	4.504	7.823
N2a	2.066	2.864	5.042	8.082
N3a	2.535	4.496	5.739	10.028
O1a	0.594	1.604	2.726	6.304
O2a	1.613	2.665	4.448	8.280
O3a	1.711	2.815	4.632	8.181
P1a	0.427	0.687	2.328	4.404
P2a	0.636	1.527	2.774	5.894
P3a	0.701	1.878	2.997	6.492
Q1a	1.346	2.158	4.097	7.790
Q2a	1.664	3.010	4.517	8.321
Q3a	2.991	3.508	6.148	10.062
R1a	0.681	0.822	2.866	4.642
R2a	1.349	1.919	4.065	7.161
R3a	1.572	2.425	4.389	7.810
S1a	1.184	1.544	3.863	7.214
S2a	1.936	1.833	4.938	7.127
S3a	2.118	3.145	5.150	8.572
T1a	0.674	0.931	2.882	5.309
T2a	1.180	2.062	3.948	8.422
T3a	1.290	2.535	4.023	7.666
V1a	0.558	1.443	2.604	5.403
V2a	1.117	2.303	3.684	6.929
V3a	1.663	2.824	4.556	8.398
W1a	0.814	2.004	3.228	7.517
W2a	1.617	3.070	4.567	9.057

Tab. 1: Morphometrical values obtained from transverse sections corresponding to the upper (commisure), middle (ornamentation change) and lower parts of right valves of Radiolites marinii.
Ia inner area (mm²), Sa shell area (mm²), Ip inner perimeter (mm), Ep external perimeter (mm).
Tab. 1: Morfometrične vrednosti prečnih prerezov, ki ustrezajo zgornjim (komizure), srednjim (ornamentacijska sprememba) in spodnjim delom desnih lupin vrste Radiolites marinii.
Ia notranja površina (mm²), Sa površina lupine (mm²), Ip notranji perimeter (mm), Ep zunanji perimeter (mm).

SYSTEMATIC PALAEONTOLOGY

Order HIPPURITOIDA Newell, 1965
Superfamily HIPPURITACEA Gray, 1848
Family RADIOLITIDAE d'Orbigny, 1847
Subfamily RADIOLITINAE d'Orbigny, 1847
Genus ***Radiolites*** Lamarck, 1848

Radiolites marinii CAFFAU & PLENIČAR, 1991
Figs.1a-d; Pls. 1-7

Diagnosis: The right valve of *R. marinii* is conical in shape in young specimens (Pl. 1, Figs. 1a, b, c) and cylindro-conical in adults (Pl. 1, Figs. 4a, b). The ornamentation consists of transverse *lamae* with waving borders and longitudinal rounded ribs. The *lamae* are less prominent at the bottom and become larger, more prominent and waved towards the top of the right valve. Two of the longitudinal ribs are larger than the others and correspond to the anterior and posterior radial bands. The internal structure is a mesh of polygonal cells that is more compact at the radial bands.

The left valve is dome-like shaped and exhibits two flattened ribs that correspond to the anterior and posterior radial bands. The transverse section of the left valve shows a compact mesh of cells.

External morphology: *R. marinii* exhibits a large morphological variability that is clearly observed in the ornamentation of different specimens of this species.

Attached right valve: This valve is conical at the lower part and cylindrical at the upper part in adult specimens (Figstext 1a, b, c, d, Pl. 2, Fig. 2), whereas it is markedly conical in shape with a width aperture in young individuals (Pl. 1, Fig. 1).

The length of these valves varies from 30 to 45 mm and the thickness of the shell is 2mm at the dorsal area and 3.5 mm at the ventral one.

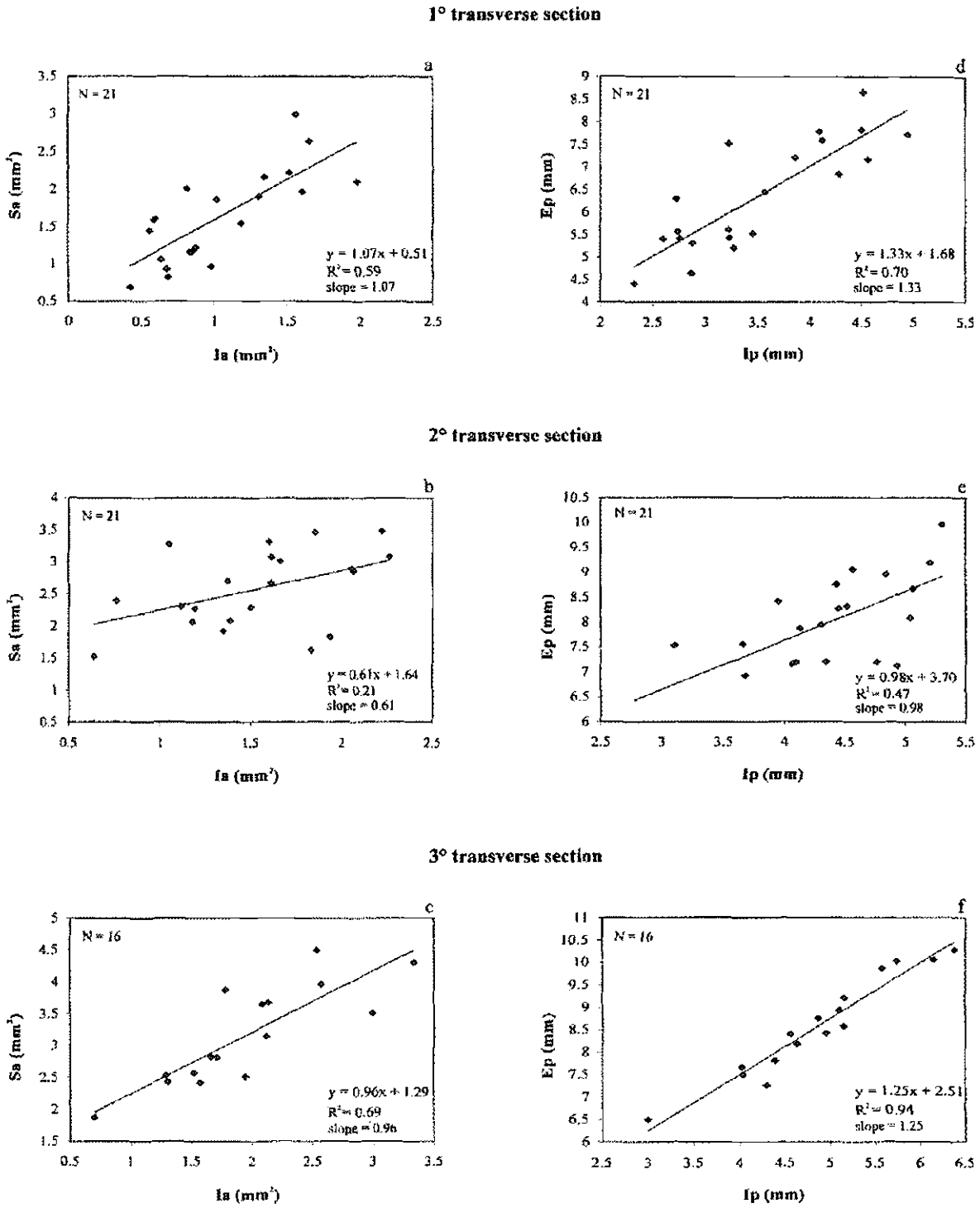


Fig. 3: Shell area (Sa) vs inner area (Ia) (3 a, b, c) and external perimeter (Ep) vs inner perimeter (Ip) (3 d, e, f) correspondig to three transverse sections from the upper (commisure), middle (ornamentation change) and lower parts of right valves of Radiolites marinii. *Regression values and dispersion coefficients are shown for each plot.*
Sl. 3: Površina lupine (Sa) proti notranji površini (Ia) (3 a, b, c) in zunanji perimeter (Ep) proti notranjemu perimetru (Ip) (3 d, e, f), ki ustrezajo trem prečnim prerezom zgornjih (komizure), srednjih (ornamentacijska sprememba) in spodnjih delov desnih lupin vrste Radiolites marinii. *Regresijske vrednosti in disperzijski koeficienti so podani za vsak graf posebej.*

Ornamentation: The right valves of adult specimens always exhibit two different morphologies. The ornamentation in the lower part of these valves consists of longitudinal ribs that are more or less prominent and robust among different specimens whereas in the upper part it is characterised by transverse and concentric *lamae* (Figstext 1a, b, c, d, Pl. 1, Figs. 4a, b).

The ornamentation in young specimens is the same as present in the lower part of the adult right valves (Pl. 1, Figs. 1a, b, Figs. 2a, b).

Posterior and anterior sides (Figstext 1c, d): In adult specimens the ornamentation of these sides consists of concentric *lamae* and robust longitudinal ribs that are badly preserved due to the fact that these are the areas of adherence with other individuals. In detail, thin and delicate *lamellae* alternate with robust and longitudinal ribs in the lower part. The thin *lamellae* become robust and prominent *lamae* with waved borders in the upper part, where the longitudinal ribs are almost absent.

Dorsal side (Figtext 1b): The ligamental groove is hardly visible and the ornamentation is poorly defined. The *lamae* are robust and the longitudinal ribs are scarcely marked. However, the morphological difference in the ornamentation between the lower and the upper part of this side is still evident in all specimens.

Ventral side (Figtext 1a): From the lower part, the apex is cylindrical in shape, up to 15 mm long and 2 to 8 mm in diameter. Afterwards the shell becomes markedly conical. The ornamentation of the apex (Figtext 1a, Pl. 1, Fig. 4) consists in longitudinal and tiny ribs interrupted by *lamae* that testify the presence of megacycles, *sensu* Cestari (1992). The number of megacycles varies from 4 to 7 according to the dimensions of the specimens. The border of the *lamae* between two megacycles is waved.

The *lamae* are more protruding in the upper part than in the lower one. Also in the upper part of the shell, megacycles are hardly seen and actually they are hidden by the well-developed *lamae* that are folded towards the bottom. The longitudinal ribs, which are in the lower part well visible, become hardly distinguishable or even disappear in the upper part of the ventral side.

The anterior radial band (**ab** in Figtext 1a, Pl. 2, Fig. 4) and posterior radial band (**pb** in Figtext 1a, Pl. 2, Fig. 4) form a deep furrow all along the right valve. A very well developed rib, cylindrical in shape, is found along the inner part of each furrow. Both radial bands are 2-3 mm wide at the commisure of the right valve (Figtext 1a). The radial bands are separated by an area with transverse *lamellae*. These *lamellae*, which are thin and very close to each other in the lower part, become more protruding and more folded towards the bottom in the middle-upper part of the valve.

Free left valve (Figstext 1a, b, c, d, Pl. 2, Fig. 4): Convex valve, ornamented by very thin concentric growth lines and tiny radial *costule* that initiate in the cardinal area. In some well-preserved specimens, the border of the free valve can cover the *lamae* at the commisure of the right valve. Moreover, the left valve forms a roof-like structure that protrudes at the radial bands of the right valve. The thickness of the free valve is always less than 0.7 mm and the inner structure of the shell is compact.

Internal characters (Pl. 2, Fig. 1): The section of the mean cavity is circular and exhibits two slight deeps at the radial bands. The ligamental ridge is prominent and robust with a rectangular shape, slightly enlarged towards the end.

Shell structure (Pl. 2, Fig. 1): (a) The inner layer, generally less than 0.5 mm thick, consists of only one row of prismatic cells. (b) The outer layer, formed by two different structures: the first, a mesh of polygonal cells that is located close to the inner layer, and the second that consists of parallel rows of cells that follow a waved trend in correspondence with the external ribs that ornament the right valve.

The internal structure at the radial bands consists of a mesh of very small prismatic cells. The pseudopilar corresponding to the anterior band is represented by a very pronounced sinus, whereas that of the posterior band consists of two sinuses. The latter are characterised by a dual structure, composed of *lamellae* and prismatic small cells.

MEASUREMENTS: DISCUSSION

Areal measurements: For the first and third transverse sections (Figs. 3a, c) there is a good correlation between the parameters **Ia** and **Sa**, as shown by the respective dispersion coefficients (R^2). In addition, for the same group of data, similar values of regression slopes can be observed. On the other hand, the data of the second transverse section (Fig. 3b) give a poor correlation between **Ia** and **Sa** and the regression slope is different from the former.

Perimeter measurements: Regarding the data of the first and third sections (Figs. 3d, f), the values of the dispersion coefficients (R^2) show that there is a good correlation between the parameters **Ip** and **Ep**. There is, however, a poor correlation of these parameters for the second transverse section (Fig. 3e). Still, the values of the regression slopes are similar.

FINAL CONSIDERATIONS AND CONCLUSIONS

The observation of the morphology of this species and the results obtained by morphometrical analysis of 21 specimens led to the following considerations:

- *R.marinii* is characterised by a clear change in the morphology of the shell ornamentation of the right valve of adult individuals.

- Morphological parameters that are involved in biological functions of this species lose their good correlation where there is a change in shell ornamentation.

Therefore, it is clear that the change in the ornamentation of the right valve represents a physiological response of the individual to an important environmental change (*i.e.* an enhanced rate of sedimentation or the fall of the individual from its physiological position). This response may be an abnormal secretion of calcite by the individual that alters some physiological structures (reflected in the morphological parameters) and the external ornamentation of the shell.

The considerable morphological variability of this species gives an idea of how difficult may be in some cases to look for valid features for a proper use in taxonomy.

Finally, according to the microfossil content and the fauna that is present in the sequence of "Archi" it is possible to attribute the species *R. marinii* to the Late Cenomanian.

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ŠTUDIJA O MORFOLOŠKI VARIABILNOSTI *RADIOLITES MARINII* CAFFAU & PLENIČAR (RADIOLITIDAE), VIŠJI CENOMANIJ, GORIŠKI KRAS, ITALIJA

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POVZETEK

*V sukcesiji od apnencev do rudistov, pripadajočih višjemu cenomaniju z območja "Archi" na jugovzhodnem Goriškem Krasu, je vrsta Radiolites marinii Caffau & Pleničar zelo dobro zastopana. Osebke te vrste zaznamujeta dve morfologiji ornamentacije zunanjih površin lupin, ki bistveno ločujeta spodnji del lupine od zgornjega. Za vse odrasle osebke so bili izdelani prečni prerezi v spodnjem (apikalnem), srednjem (kjer je opazen prehod iz prve ornamentacije v drugo) in zgornjem delu (komisura). Iz vsakega prečnega prereza sta avtorja dobila morfometrične vrednosti o površini lupine (**Sa**), površini notranje votline lupine (**Ia**), zunanjega (**Ep**) in notranjega (**Ip**) obsega lupine.*

Analiza morfometričnih podatkov je pokazala, da so osebki pri prehodu iz ene ornamentacije v drugo doživeli močan biološki stres, ki je znatno vplival na normalno izločanje karbonatov.

Ključne besede: rudisti, morfološka variabilnost, višji cenomanij

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PLATE 1

Figs. 1 a, b, c: Radiolites marinii. View of the ventral side (a), posterior side (b) and the commisure (c) of the right valve in which there is no change in the morphology between the lower and the upper part of the valve. x1

Figs. 2 a, b, c: Radiolites marinii. View of the ventral side (a), posterior side (b) and the commisure (c) of the right valve. The change in the morphology between the lower and the upper part of the valve is evident in this specimen. x1

Figs. 3 a, b: Radiolites marinii. View of the ventral side (a) and posterior side (b) of a complete specimen with both valves. x1

Figs. 4 a, b: Radiolites marinii. View of the ventral side (a) and posterior side (b) of the right valve in which the difference in the morphology between the lower and the upper part is clearly evident. x1

TABLA 1

Sl. 1 a, b, c: Radiolites marinii. Prednja stran (a), zadnja stran (b) in komizure (c) desne lupine, kjer ni vidnih morfoloških sprememb med spodnjim in zgornjim delom lupine. x1

Sl. 2 a, b, c: Radiolites marinii. Prednja stran (a), zadnja stran (b) in komizure (c) desne lupine. Morfološke spremembe med spodnjim in zgornjim delom lupine pri tej vrsti so vidne. x1

Sl. 3 a, b: Radiolites marinii. Prednja stran (a) in zadnja stran (b) celotnega osebka z obema lupinama. x1

Sl. 4 a, b: Radiolites marinii. Prednja stran (a) in zadnja stran (b) desne lupine, kjer so dobro vidne morfološke spremembe med spodnjim in zgornjim delom lupine. x1

PLATE 2

Fig. 1: Radiolites marinii. Thin transverse section of the right valve. Structure of polygonal cells that are smaller at the radial bands pb and ab. x3.5

Fig. 2: Radiolites marinii. View of the ventral side of the right valve in which the difference in the morphology between the lower and the upper part is clearly evident. x1

Fig. 3: Radiolites marinii. View of the ventral side of the right valve. x1

Fig. 4: Radiolites marinii. View of the ventral side of the left valve and part of the right valve in which the lamae and the radial bands are well preserved. Note the good preservation state of the area of contact between the right and the left valves. x1

TABLA 2
Sl. 1: Radiolites marinii. Tanek prečni prerez desne lupine. Struktura poligonalnih celic, ki so manjše pri radialnih progah pb in ab. x3.5
Sl. 2: Radiolites marinii. Prednja stran desne lupine, kjer so dobro vidne morfološke razlike med spodnjim in zgornjim delom lupine. x1
Sl. 3: Radiolites marinii. Prednja stran desne lupine. x1
Sl. 4: Radiolites marinii. Prednja stran leve lupine in del desne lupine, pri kateri so lamae in radialne proge dobro ohranjene. Opazna je visoka stopnja ohranjenosti stične površine med desno in levo lupino. x1

PLATE 3
Figs. A1-B3c: Radiolites marinii. Transverse section of the right valves subjected to morphometrical analysis. Scale bar = 1cm.

TABLA 3
Sl. A1-B3c: Radiolites marinii. Prečni prerezi desnih lupin, ki so bili morfometrično obdelani. Merilo = 1cm.

PLATE 4
Figs. C1a-F3a: Radiolites marinii. Transverse section of the right valves subjected to morphometrical analysis. Scale bar = 1cm.

TABLA 4
Sl. C1a-F3a: Radiolites marinii. Prečni prerezi desnih lupin, ki so bili morfometrično obdelani. Merilo = 1cm.

PLATE 5
Figs. G1a-M3a: Radiolites marinii. Transverse section of the right valves subjected to morphometrical analysis. Scale bar = 1cm.

TABLA 5
Sl. G1a-M3a: Radiolites marinii. Prečni prerezi desnih lupin, ki so bili morfometrično obdelani. Merilo = 1cm.

PLATE 6
Figs. N1a-Q3a: Radiolites marinii. Transverse section of the right valves subjected to morphometrical analysis. Scale bar = 1cm.

TABLA 6
Sl. N1a-Q3a: Radiolites marinii. Prečni prerezi desnih lupin, ki so bili morfometrično obdelani. Merilo = 1cm.

PLATE 7
Figs. R1a-W2a: Radiolites marinii. Transverse section of the right valves subjected to morphometrical analysis. Scale bar = 1cm.

TABLA 7
Sl. R1a-W2a: Radiolites marinii. Prečni prerezi desnih lupin, ki so bili morfometrično obdelani. Merilo = 1cm.

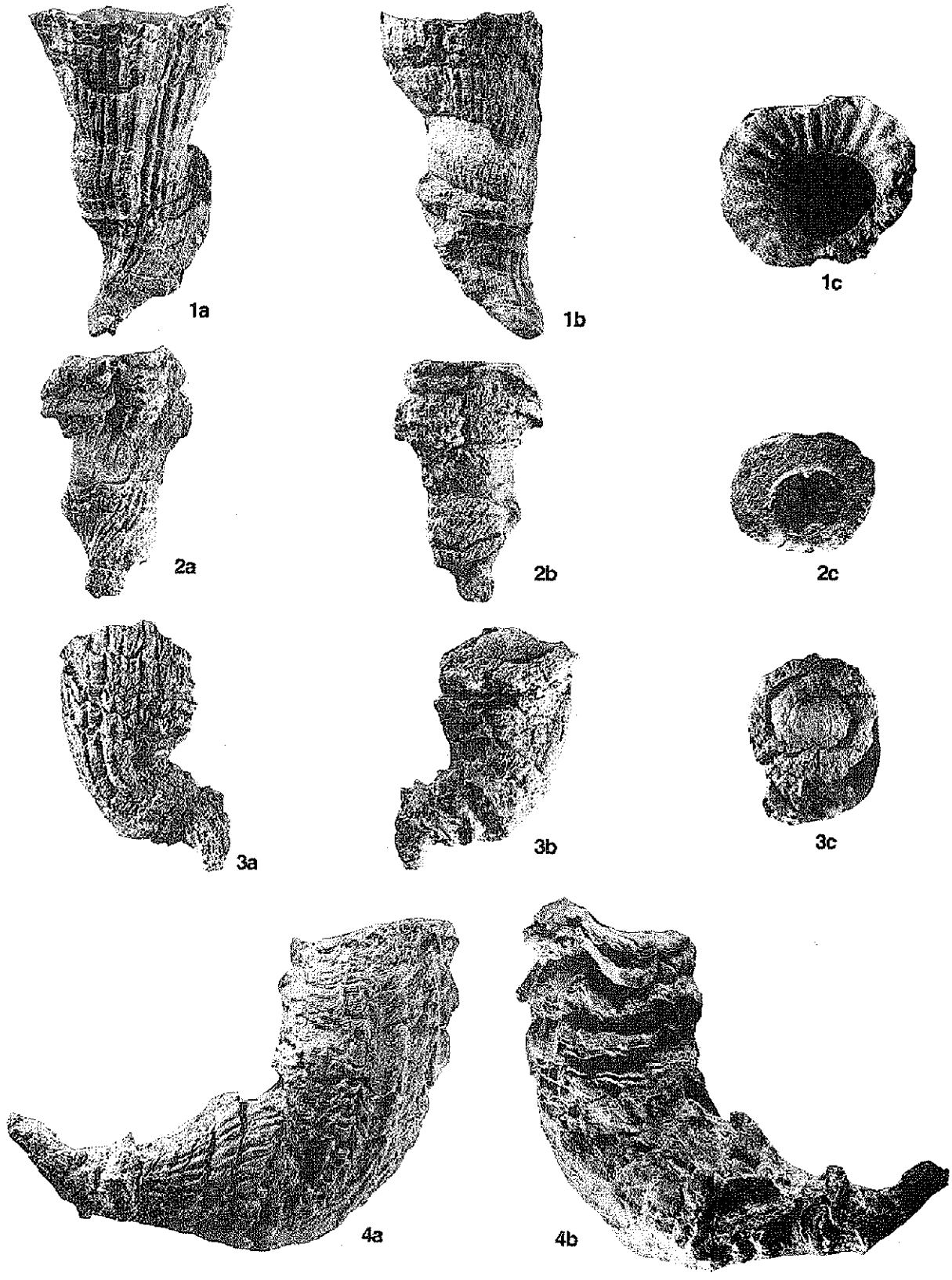

PLATE 1 / TABLA 1

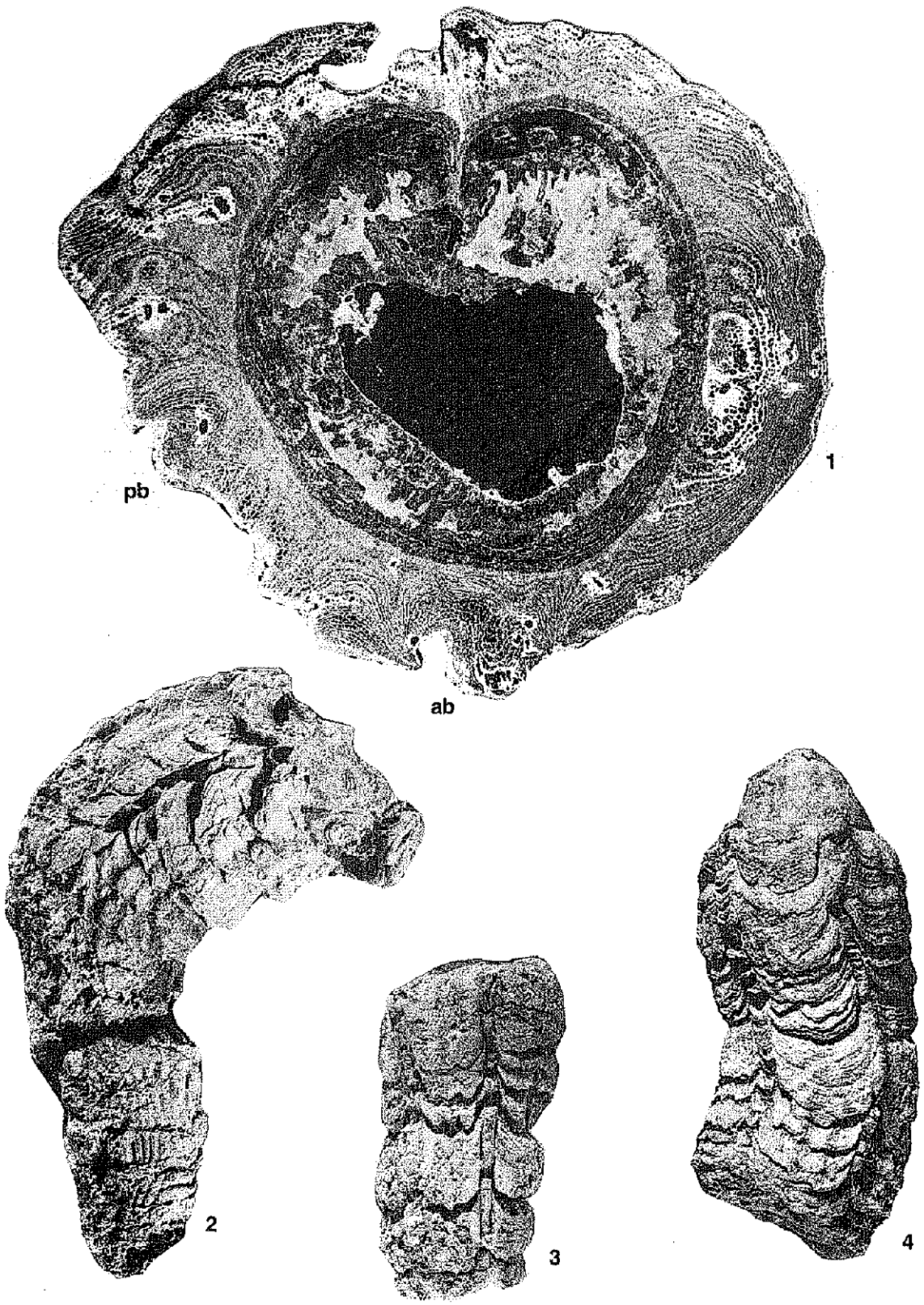

PLATE 2 / TABLA 2

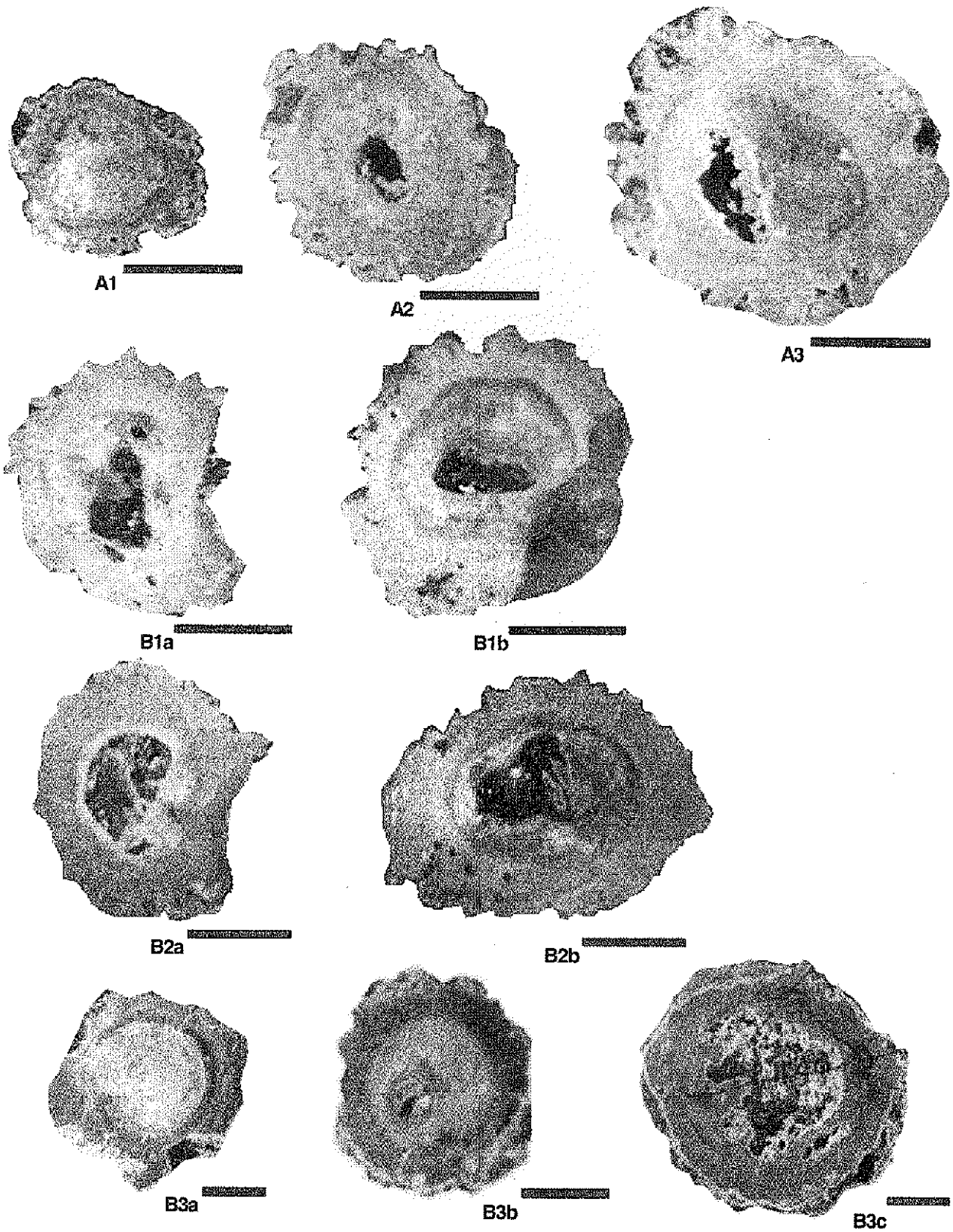

PLATE 3 / TABLA 3

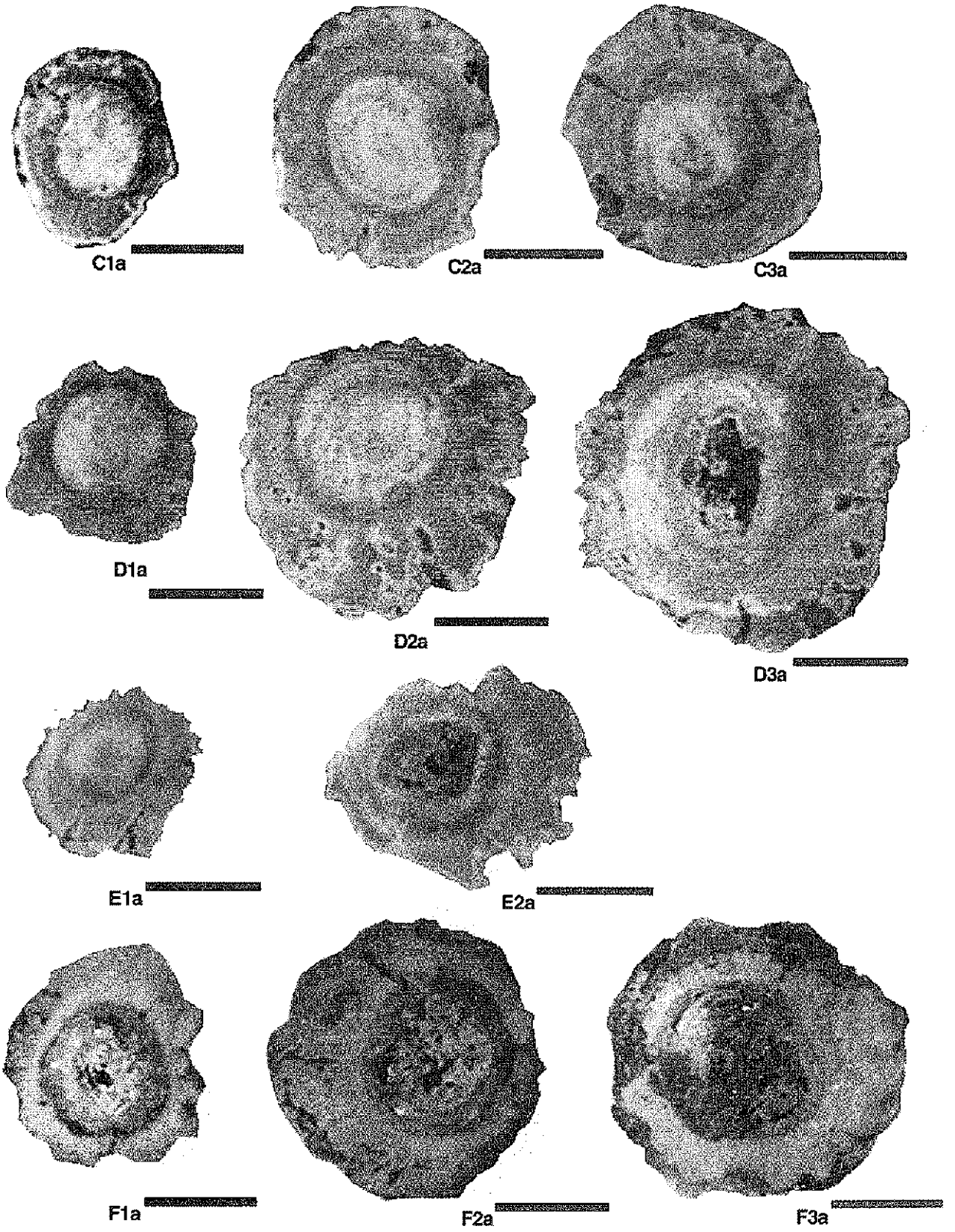

PLATE 4 / TABLA 4

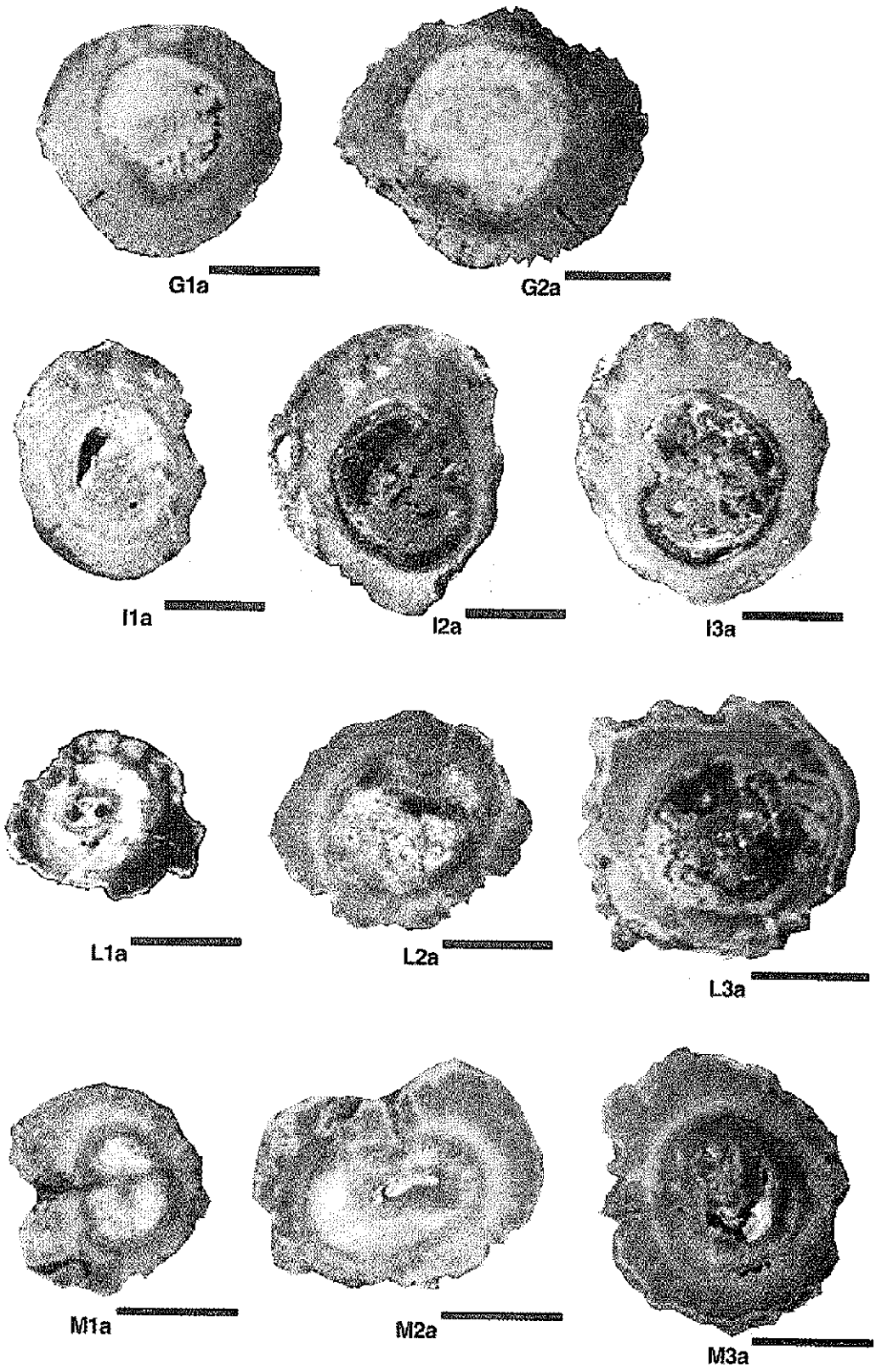

PLATE 5 / TABLA 5

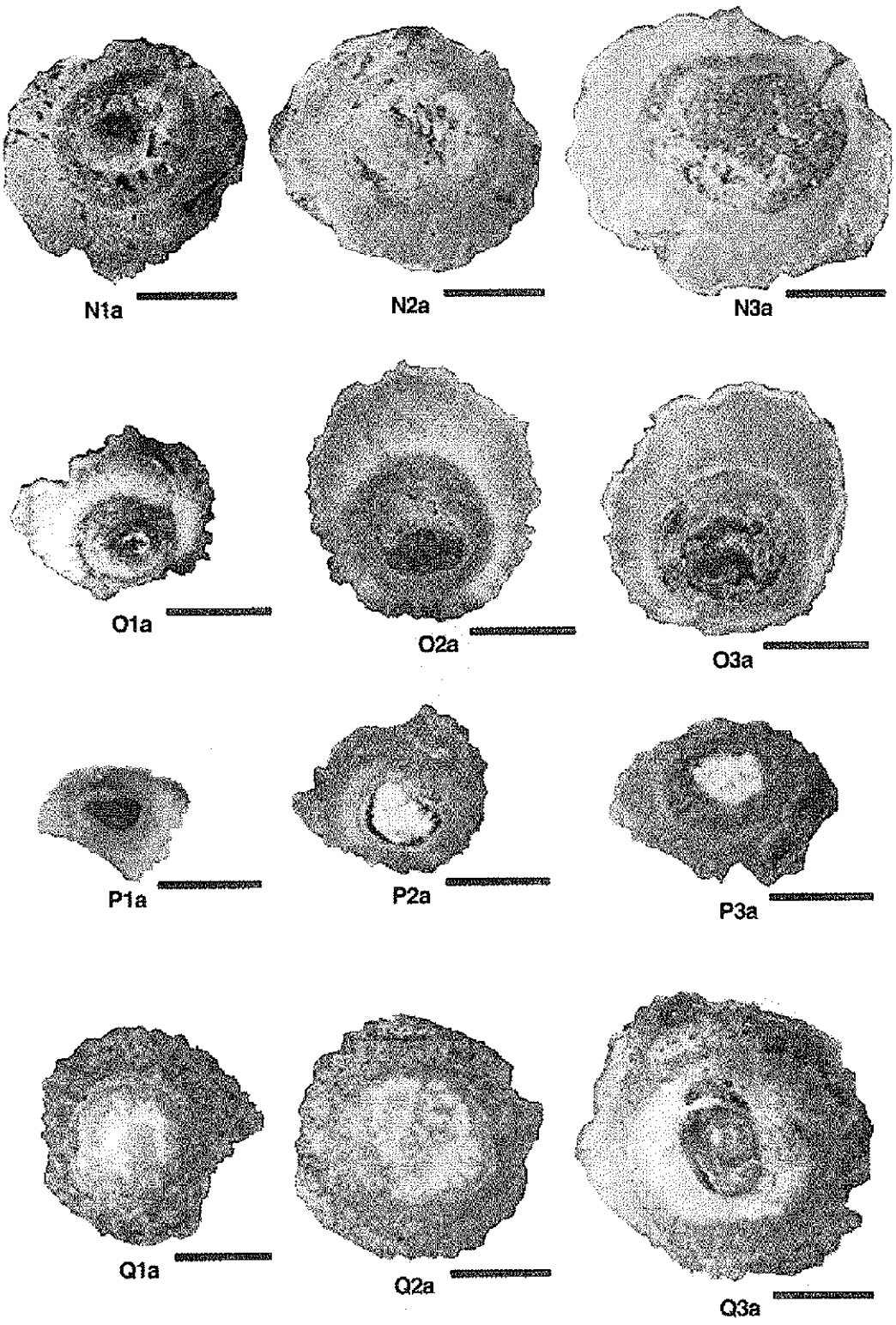

PLATE 6 / TABLA 6

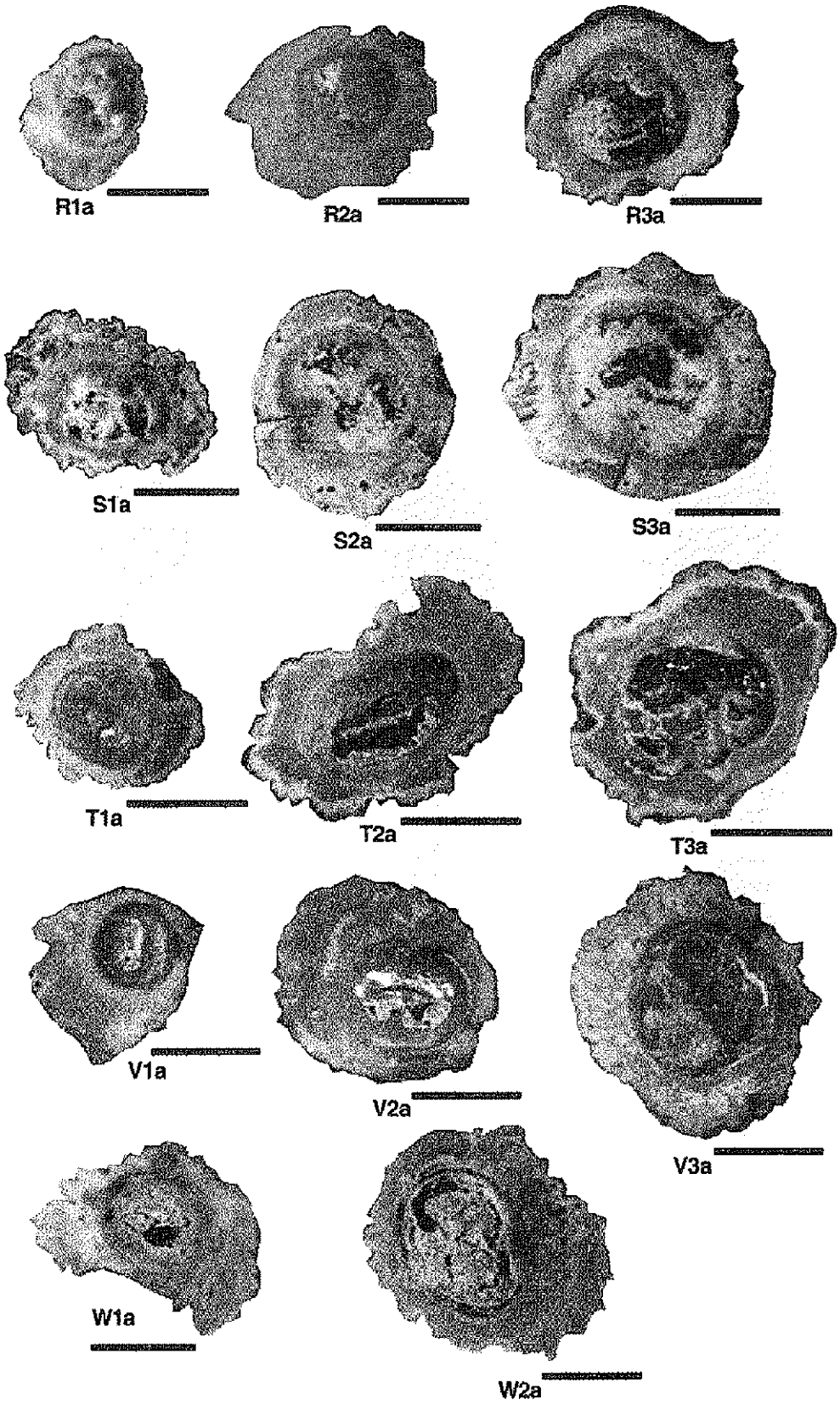

PLATE 7 / TABLA 7