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Revision of the Jesse Harlan JOHNSON Collection. Part 1. Some fossil Dasycladales from Guatemala

Bruno GRANIER ¹

Rajka RADOIČIĆ ²

Katica DROBNE ³

Abstract: This first report is a revision of fossil calcareous green algae (Dasycladales) described from the Upper Cretaceous and Paleocene series of Guatemala. Among other things in their 1965 paper J.H. JOHNSON and H.V. KASKA introduced three new species originally referred to the genera *Acroporella*, *Cylindroporella*, and *Cymopolia*. One species, which has previously been referred to the genus *Cylindroporella*, is a foraminifer.

Key Words: Paleocene; Upper Cretaceous; Guatemala; Dasycladales.

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Résumé : Révision de la Collection Jesse Harlan JOHNSON. Première partie. Quelques Dasycladales fossiles du Guatemala.- Ce premier rapporte traite de la révision de quelques algues calcaires vertes fossiles (Dasycladales), ou supposées telles (dans les faits un de ces taxons attribué au genre *Cylindroporella* est un foraminifère), décrites de terrains crétacés et paléocènes du Guatemala. Dans leur papier de 1965 J.H. JOHNSON and H.V. KASKA avaient entre autres choses introduit trois nouvelles espèces attribuée à l'origine aux genres *Acroporella*, *Cylindroporella* et *Cymopolia*.

Mots-clefs : Paléocène ; Crétacé supérieur ; Guatemala ; Dasycladales.

1) Introduction

Jesse Harlan JOHNSON (1892-1974) was a prolific American paleophycologist (WRAY, 1977, 1985; anonymous, last consulted 2013-09-24) who described a number of fossil algal taxa, both red and green "calcareous algae", including mostly new species, but less commonly new genera. Several years after his death part of his collection, which was then located at the Colorado School of Mines in Golden, was transferred to the University of Kansas at Lawrence. Another significant part of his collection, *i.e.*, the specimens bearing U.S. National Museum labels in his publications, is stored at the Smithsonian Institution in Washington D.C.. One cannot exclude the possibility that further speci-

mens might be in some geological survey, but the core of the collection (the potential "types") was sent to the Smithsonian awaiting paleophycologists to check this reference material. During the course of a short-term visit the first author (B.G.) was given the opportunity to access this collection and to study part of this material. The following report is the first of a forthcoming series dedicated to Jesse Harlan JOHNSON's fossil calcareous algae. It deals with three "species" described in JOHNSON and KASKA (1965): "*Acroporella occidentalis*", a *nomen nudum* (see discussion in DELOFFRE & GRANIER, 1992, and herein), *Cymopolia mayaense* JOHNSON & KASKA, 1965, and *Cylindroporella elassonnos* JOHNSON & KASKA, 1965.

¹ Department of Ecology and Evolutionary Biology, The University of Kansas, 1200 Sunnyside Avenue, Lawrence, Kansas 66045 (USA)
bgranier@ku.edu

² Kralja Petra I, 38, 11000, Beograd (Serbia)

³ Ivan Rakovec Paleontological Institute, ZRC SAZU, Novi trg 2, 1000 Ljubljana (Slovenia)

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2) Material and method (Fig. 1)

With respect to these taxa, JOHNSON and KASKA (1965) list four thin sections with an USNM registration number (No. 42499, 42500, 42504, and 42524, ink writing, which correspond respectively to locality numbers 4819, 4819(2), 7747, and 10029, glass engraving). However the thin section 42500 is probably lost as there is no record for it in the Smithsonian Institution's inventory. The quality of the remaining thin sections varies significantly: the color of the Canada balsam has locally turned from light yellow to dark brown; the rock slices themselves have different thicknesses; the sections of the fossil specimens are random; etc.

The microfacies of slide 42499 is bioturbated bioclastic wackestone with benthic foraminifers and calcareous green algae. Slide 42524 is also a bioturbated foraminiferal wackestone, but it has suffered some diagenetic alteration. The last slide, *i.e.*, No. 42504, consists of a chloralgal grainstone with the typical circumgranular fibrous cementation that characterizes submarine hardground formation (the remaining intergranular pore space is occluded by a late phreatic drusy cement).

3) "*Acroporella occidentalis*" (Fig. 2) [BG & RR]

According to DELOFFRE & GRANIER (1992), this taxon is a *nomen nudum* because its type was not properly identified. Actually, JOHNSON & KASKA (1965, p. 78) clearly state that the type slide is "4819 = U.S.N.M. No. 42499" and illustrate two sections of the algal thallus ("Plate 7, figures 1, 2"; herein Fig. 2). In the figure caption of their Plate 7, none of the sections is explicitly defined as the type-specimen (holotype or type) or even referred to the type slice.



Figure 1: The three (remaining) thin sections studied.

We found that none of these figured algal sections occurs in the type slice. Accordingly, none can be considered as a potential candidate to be selected as the lectotype. None of them are visible on the second thin section, even though JOHNSON & KASKA (1965, p. 78) state that slide "7747 = U.S.N.M. No. 42504" was also figured. In conclusion, both illustrated sections probably come from a third slide, labelled "4819(2) = U.S.N.M. No. 42500". Because this last slice is lost, this material (corresponding to the printed photomicrographs), which otherwise could have been considered as syntypes, cannot be used to define a lectotype. At this stage there are two options remaining:

1) we select a neotype from the type slice and therefore we keep the original specific epithet, *i.e.*, "*occidentalis*";

2) alternatively we could select an holotype (and paratypes) and give a brand new name to these specimens. In the same paper, JOHNSON & KASKA (1965) have already introduced three new species all bearing "*occidentalis*" as a specific epithet (one *Jania*, one *Larvaria* and the "*Acroporella*").

We retained the first option in order to avoid further confusion. This option implies that both the date of valid publication (2013 in lieu of 1965) and the authorship of the species change. Following RADOIČIĆ (1990) we shall not refer the species to the Triploporellacean genus *Acroporella* PRATURLON, 1964, but to the Polyphysacean genus *Clypeina* (MICHELIN, 1845), that already includes more than 40 species (see DELOFFRE & GRANIER, 1992; GRANIER & DELOFFRE, 1993, 1994; and GRANIER, 2013, for a recent addition to the list).

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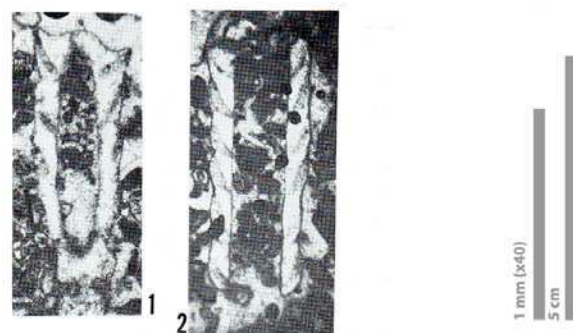


PLATE 7. Cretaceous Algae

FIGURES 1-2.—*Acroporella occidentalis* n. sp. (x40). Lower Eocene with reworked Cretaceous.

Figure 2: Duplicate of "Plate 7, figures 1, 2" in JOHNSON & KASKA (1965) with "*Acroporella occidentalis*". Some rights reserved.

Phylum Chlorophyta**Class Dasycladophyceae HOEK *et al.*,
1995****Order Dasycladales PASCHER, 1931****Family Polyphysaceae (KÜTZING, 1841)****Tribe Clypeineae (ELLIOTT, 1968)****Genus *Clypeina* (MICHELIN, 1845)*****Clypeina occidentalis*****GRANIER & RADOICIC
in GRANIER et al., 2013**[= *Clypeina occidentalis***JOHNSON & KASKA *ex GRANIER & RADOICIC*
in GRANIER et al., 2013, non 1965]**(Fig. 2; Pl. 1, figs. a-f;
Pl. 2, figs. a-l; Pl. 3, figs. a-j;
Pl. 4, figs. a-c; Pl. 8, fig. d)**Neotype** (selected herein): Pl. 2, fig. b. This specimen is an oblique section with three successive verticils. Thin section USNM 42499 (=4819, see Fig. 1).**Paratypes**: all the accompanying sections from the same material (Pl. 1, figs. a-f; Pl. 2, figs. a-l; Pl. 3, fig. a)**Measurements**: The new measurements for the external diameter of the calcareous coating (D), the internal diameter (d) and their relative ratio (d/D) are displayed in the table below. Blue (cyan) cells for data measured on slide 42499, green (lime) cells for slide 42504, yellow cells for the combination of both slides.

<i>Clypeina occidentalis</i>	D μm	d μm	d/D %
42499 (=4819)	438	171	39%
42499 (=4819)	400	210	52%
42499 (=4819)	476	210	44%
42499 (=4819)	571	286	50%
42499 (=4819)	495	200	40%
42499 (=4819)	571	190	33%
42499 (=4819)	476	171	36%
42499 (=4819)	429	190	44%
42499 (=4819)	524	162	31%
42504 (=7747)	381	190	50%
42504 (=7747)	571	324	57%
average ALL (11 measur.)	485	210	43%
standard deviation (σ)	66	50	8%
average 42499 (9 measur.)	487	199	41%
standard deviation (σ)	66	50	7%

In the type slide, D = ca. 490 +/- ca. 65 μ m and d = ca. 200 +/- ca. 50 μ m for a ratio d/D = 41 +/- 7%. The maximum length is 2.0mm (Pl. 1, fig. a) and the spacing of the whorls (including the height of a whorl) is quite variable, ranging from 190 to 380 μ m. The "pores" (laterals) gradually increase in diameter from 50 μ m in the proximal part to 80 μ m in the distal part. There are usually 12 laterals per verticil (but this number may vary from ten to twenty). These laterals arise at steep angle (ca. 30°) along the main axis. Because they are commonly abraded distally, they are in average 170 μ m in length but, in better preserved specimens (Pl. 1, fig. f; Pl. 2, fig. b), they may reach 350 μ m.

Discussion: The general morphological features, the measurements, and last, but not least, both their stratigraphic ranges ^[1] and their geographic locations ^[2] point to synonymize this species (now validly published) with *Clypeina ellioti* J.-P. & R. BECKMANN, 1966 (*op. cit.*, Pl. 11, figs. 155-159). When writing their manuscript the latter authors were unaware of the existence of a "competitor". Later, in a post-script note (BECKMANN J.-P. & R., 1966, p. 41), they acknowledge the contribution newly published by JOHNSON & KASKA (September 1965). We understand that, on the basis of the poor illustration of "*Acroporella occidentalis*" (JOHNSON & KASKA, 1965, Pl. 7, figs. 1-2; herein Fig. 2), they could not considered a possible synonymy with their new species.

**4) *Cymopolia mayaense*
JOHNSON & KASKA, 1965
(Fig. 3.1-4) [BG]**

According to JOHNSON & KASKA (1965, p. 85), the type slide is "4819 = U.S.N.M. No. 42499" but none of their illustrated specimens (*op. cit.*, Pl. 18, figs. 1-4; herein Fig. 3.1-4) occurs precisely in this thin section. They say they "also figured slide" (..) "4819(2) = U.S.N.M. No. 42500" but one should not forget that this last slice is lost. Fortunately, we identified one photomicrograph (JOHNSON & KASKA, 1965, Pl. 18, fig. 3) as originating from a capture of slide "7747 = U.S.N.M. No. 42504". It includes several sections, which can be treated as syntypes, and one of them will be selected as the lectotype.

[1] "Lower Eocene" for *Clypeina occidentalis* versus "Paleocene (or lower Eocene ?)" for *Clypeina ellioti*.

[2] Guatemala for *Clypeina occidentalis* versus Cuba for *Clypeina ellioti*.

Phylum Chlorophyta
Class Dasycladophyceae
HOEK *et al.*, 1995
Order Dasycladales PASCHER, 1931
Family Dasycladaceae KÜTZING, 1843
Tribe Dasycladeae PIA, 1920
Sub-Tribe Cymopoliinae (PIA, 1931)
Genus *Cymopolia*
J.V. LAMOUREUX, 1816
Cymopolia mayaense
JOHNSON & KASKA, 1965

(Fig. 3.1-4; Pl. 4, figs. d-f;
 Pl. 5, figs. a-i; Pl. 6, figs. a-c;
 Pl. 7, figs. a-f; Pl. 8, fig. e)

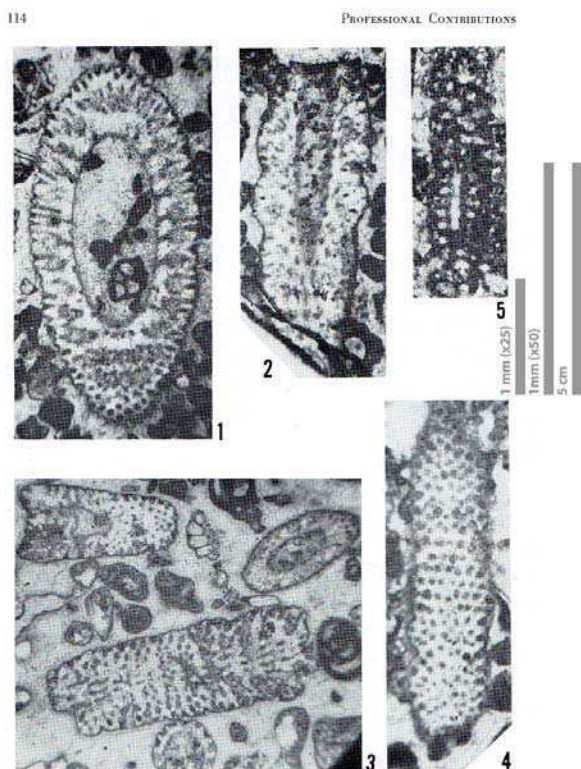


PLATE 18. Cretaceous and Tertiary Algae
 FIGURES 1-4.—*Cymopolia mayaense* n. sp.
 1. Slightly oblique longitudinal sections (type) (x25).
 2-4. Vertical sections near margins (x25). Lower Eocene.
 FIGURE 5.—*Cylindroporella elassonos* n. sp. Oblique vertical section near center
 (x50). (Type) Upper Cretaceous.

Figure 3: Duplicate of "Plate 18" in JOHNSON & KASKA (1965) with *Cymopolia mayaense* and "*Cylindroporella elassonos*". Some rights reserved.

Synonymy list:

- 1965** *Cymopolia mayaense* n.sp.- JOHNSON & KASKA, p. 83-85, Pl. 18, figs. 1-4 ("type": Pl. 18, fig. 1; herein Fig. 3.1);
- 1966** *Cymopolia* cf. *kurdistanensis* ELLIOTT.- J.-P. & R. BECKMANN, p. 38, Pl. 11, figs. 165-167;
- non **1968** *Cymopolia mayaense*.- SEGONZAC, p. 385, Pl. (3) [Pl. h.-t. XVIII], fig. 5;
- non **1978** *Cymopolia mayaense*.- DELOFFRE & RADOIČIĆ, p. 71-72, Pl. 7, figs. 3-4;
- 1982** *Cymopolia mayaense*.- DELOFFRE & GÉNOT, p. 68-69, Pl. 5, fig. 3 (= Pl. 18, fig. 1 in JOHNSON & KASKA, 1965);
- 1992** *Cymopolia mayaense*.- DELOFFRE & GRANIER, p. 344 (not illustrated);
- 1998** *Cymopolia mayaense*.- BARATTOLO, p. 76-77, Pl. 11, figs. 1-6; Pl. 12, figs. 1-2; Pl. 13, fig. 1

Lectotype (selected herein): Pl. 6, fig. b *pars*. This is the tangential section at the bottom of the figure, which shows (?) 12 successive verticils, already illustrated by JOHNSON & KASKA (1965, Pl. 18, fig. 3 *pars*; herein Fig. 3.3 *pars*). Thin section USNM 42504 (=7747, see Fig. 1).

Paratypes: Pl. 6, fig. b *pars*, the accompanying random sections from the same photomicrograph, already illustrated by JOHNSON & KASKA (1965, Pl. 18, fig. 3 *pars*; herein Fig. 3.3 *pars*). Thin section USNM 42504 (=7747).

Measurements: The new measurements for D, d and d/D are given in the table below. Blue (cyan) cells for data measured on slide 42499, green (lime) cells for slide 42504, yellow cells for the combination of both slides.

<i>Cymopolia mayaense</i>	D μm	d μm	d/D (%)
42499 (=4819)	381	171	45%
42499 (=4819)	876	371	42%
42499 (=4819)	676	305	45%
42504 (=7747)	705	295	42%
42504 (=7747)	381	124	33%
42504 (=7747)	714	248	35%
42504 (=7747)	724	248	34%
42504 (=7747)	619	286	46%
42504 (=7747)	762	381	50%
42504 (=7747)	905	381	42%
42504 (=7747)	457	171	38%
average ALL (11 measur.)	655	271	41%
standard deviation (σ)	180	89	6%
average 42504 (8 measur.)	658	267	40%
standard deviation (σ)	169	91	6%

In the slide 42504, $D = \text{ca. } 660 \pm \text{ca. } 170\mu\text{m}$ and $d = \text{ca. } 270 \pm \text{ca. } 90\mu\text{m}$ for a ratio $d/D = 40 \pm 6\%$. The maximum length is 2.4mm (Pl. 5, fig. b) and the interwhorl spacing (including the height of a whorl) ranges from 120 to 170 μm . There are some 20 laterals per verticil. The sterile primary or secondary orders of the laterals rarely exceed 40 μm in diameter. The subspherical fertile ampulla (they are ovoidal to ellipsoidal in *Cymopolia heraki* Gušić, 1967: see Pl. II, fig. 10 *op. cit.*, for instance) in terminal position on a primary and surrounded by 4 to 6 secondaries reaches 100 μm in diameter.

Discussion: With an outer diameter $D = \text{ca. } 660 \pm \text{ca. } 170\mu\text{m}$ and an inner diameter $d = \text{ca. } 270 \pm \text{ca. } 90\mu\text{m}$ (in the slide 42504), this species is by far the smallest of all the Cenozoic representatives of the genus *Cymopolia*. Being the smallest, it also has proportionally a lesser number of laterals per verticil than the larger *Cymopolia elongata* (DEFrance, 1825), for instance (see DELOFFRE & GÉNOT, 1982). Again, material described from Cuba by J.-P. & R. BECKMANN (1966, Pl. 11, figs. 165-167) as "*Cymopolia cf. kurdistanensis* ELLIOTT" is very similar, if not identical, to the material from Guatemala.

5) *Cylindroporella elassonos* JOHNSON & KASKA, 1965 (Fig. 3.1-4) [BG & RR]

JOHNSON & KASKA (1965) illustrated under their "Plate 18, figure 5" (Fig. 3.5) the "Type" of their "*Cylindroporella elassonos* n.sp.". They give a perplexing and puzzling "Description" (*op. cit.*, p. 82) and also refer to a type "Slide 10029 = U.S.N.M. No. 42524" (Fig. 1). There are no bioclasts referable to algae in this slide. We examined it and were able to capture a new image (Pl. 8, fig. a). The so-called "*Cylindroporella*" is a foraminifer, probably a *Dicyclina* sp. (or a *Cuneolina* sp.), but not an alga. The thin section includes more specimens (Pl. 8, figs. b-c) of these agglutinated foraminifers, which are rather common in Upper Cretaceous shallow-water carbonate facies.

6) Conclusions

Among the three taxa introduced by JOHNSON & KASKA (1965), **1)** only one species, *i.e.*, *Cymopolia mayaense*, passed the re-evaluation. We selected a lectotype out of the syntypes to replace its original holotype, which is lost. **2)** Another species, *i.e.*, "*Acroporella occidentalis*", was not validly published by lack of a correct definition of its holotype. We selected a neotype for the combination *Clypeina occidentalis*, but because the year of reference is 2013 (not 1965) it now proves to be a junior synonym of *Clypeina elliotti* J.-P. & R. BECKMANN, 1966. **3)** The last one, *i.e.*, "*Cylindroporella elassonos*", is actually not an alga but a foraminifer.

The stratigraphic range of the Cenozoic species, *i.e.*, *Clypeina occidentalis* and *Cymopolia mayaense*, is restricted to the Paleocene on the basis of the foraminiferal assemblage that includes: **1)** *Pseudorhapydionina moulladei* PÉCHEUX, 1995 (quoted as "*Rhapydionina*" by JOHNSON & KASKA, 1965), in both thin sections [Pl. 2, fig. f; Pl. 4, figs. d & f; Pl. 5, fig. f; Pl. 8, figs. g & j]; **2)** "*Quasiborelis floridanus* (COLE) [Pl. 4, fig. f] and *Kayseriella cf. decastroi* SIREL [Pl. 8, fig. i] in thin section 42504; **3)** *Idalina cf. sinjarica* GRIMSDALE and *Haymanella* sp. in thin section 42499.

This first contribution to the revision of the Jesse Harlan JOHNSON Collection demonstrates the necessity to maintain palaeophycological reference collections, primarily as reference material, but also because of the increase in our knowledge, to re-examine these algal microfossils.

Acknowledgements

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Plates

Plate 1: Figures a-f: *Clypeina occidentalis* GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013 [= *Clypeina occidentalis* JOHNSON & KASKA ex GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013, non 1965], thin section 42499. a) axial section; b) long oblique section; c) short oblique (above) and tangential (below) sections; d) axial section; e) deep tangential section (to compare with J.-P. & R. BECKMANN, 1966: Pl. 11, figs. 155-156); f) tangential section (to compare with RADOIČIĆ, 1991: Pl. 4, fig. 2).

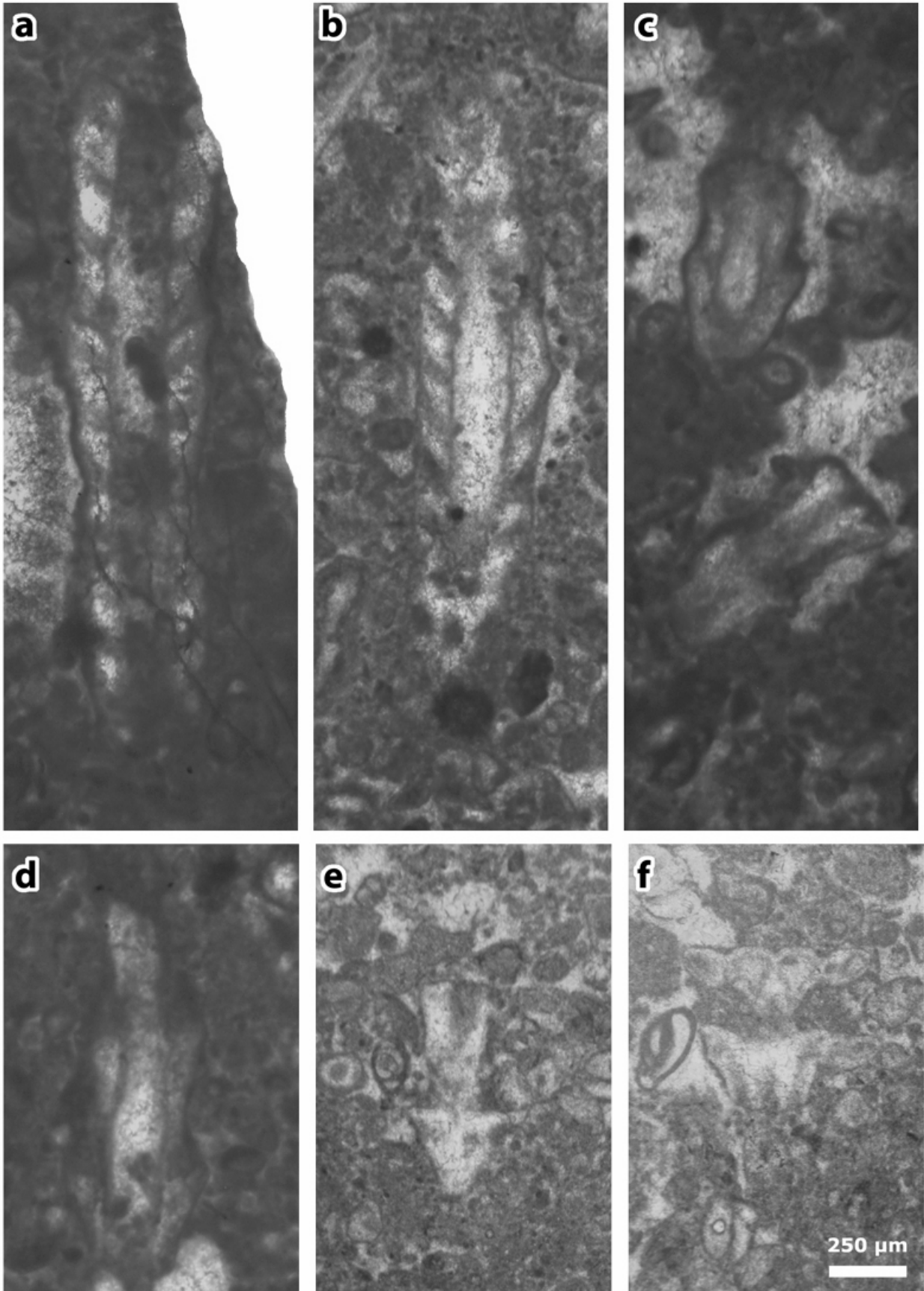


Plate 2: Figures a-l: *Clypeina occidentalis* GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013 [= *Clypeina occidentalis* JOHNSON & KASKA ex GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013, non 1965], thin section 42499. a) axial section; b) the neotype, an oblique section; c) tangential section; d) tangential section of two (?) laterals (above) and oblique section of a single whorl (below); e) oblique (above) and tangential (below) sections; f) oblique section (with *Pseudorhapydionina moulladei* PÉCHEUX, 1995); g) subtransverse section; h) oblique section of a single whorl; i) oblique section; j) subtransverse section; k) subtransverse section; l) subtransverse section.

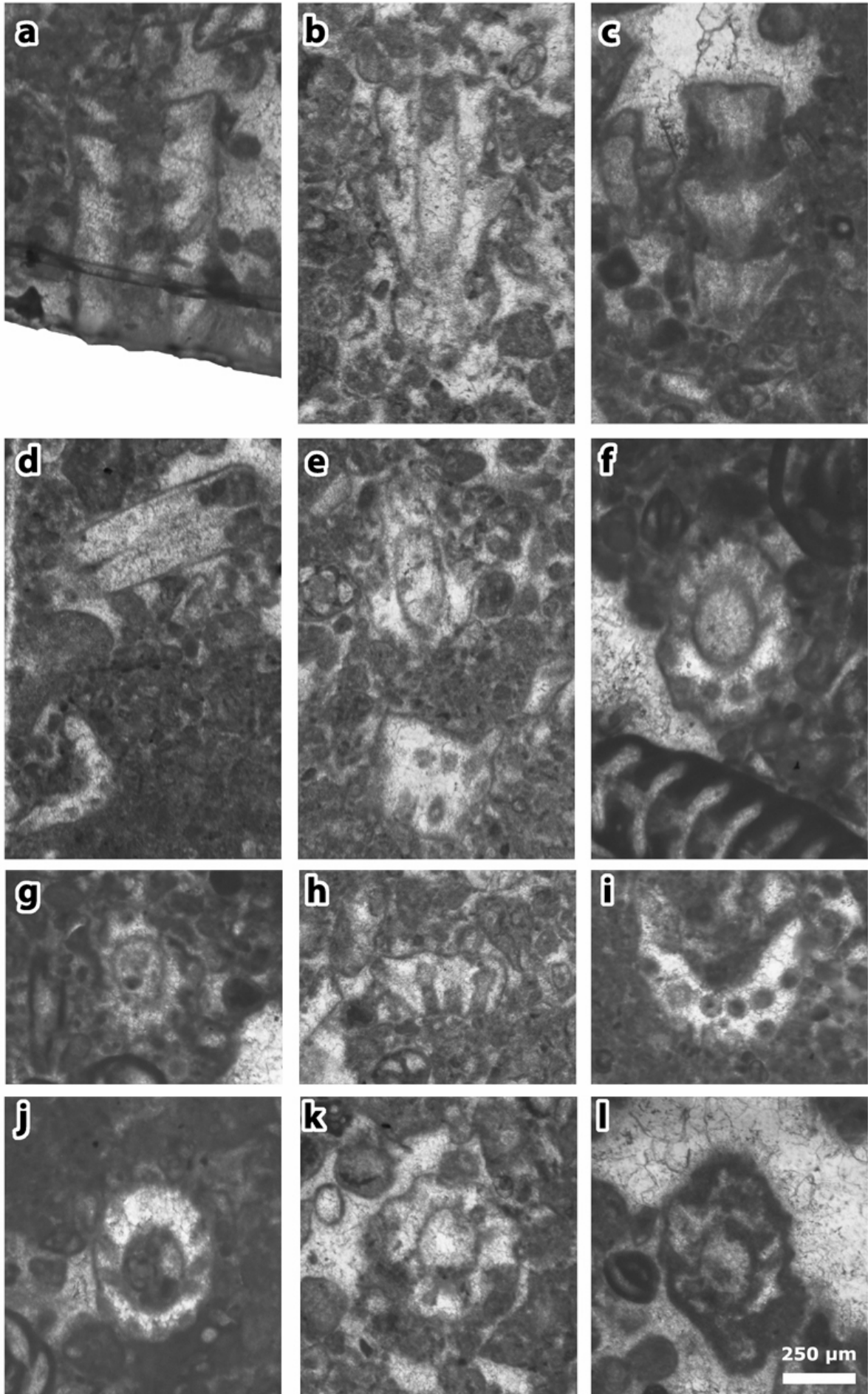


Plate 3: Figures a-j: *Clypeina occidentalis* GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013 [= *Clypeina occidentalis* JOHNSON & KASKA *ex* GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013, non 1965], thin sections 42499 (a) and 42504 (b-j). a) subaxial section; b) oblique section; c) oblique section; d) tangential section; e) oblique section; f) two oblique sections; g) tangential section; h) oblique section; i) subtransverse section; j) subtransverse section (this section is at the bottom of figure 3 of Plate 18 of JOHNSON & KASKA, 1965).

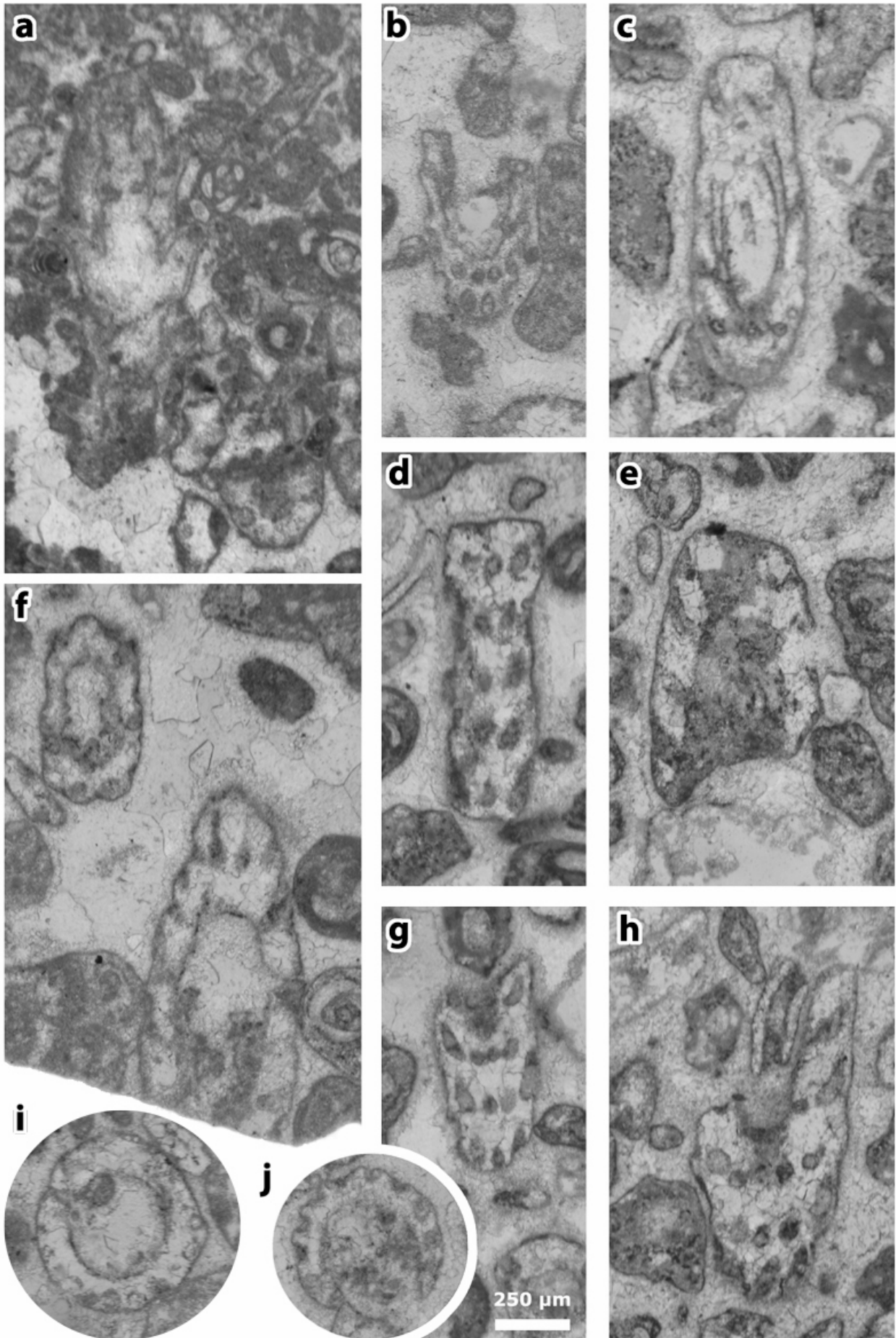


Plate 4: Figures a-c: *Clypeina occidentalis* GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013 [= *Clypeina occidentalis* JOHNSON & KASKA ex GRANIER & RADOIČIĆ in GRANIER *et al.*, 2013, non 1965], thin section 42504. a) tangential section; b) tangential section; c) tangential (above) and oblique (below) sections.

Figures d-f: *Cymopolia mayaense* JOHNSON & KASKA, 1965, thin section 42504. d) oblique (subtransverse) section, with *Pseudorhapydionina moulladei* PÉCHEUX, 1995; e) tangential section; f) oblique (subaxial) section, with *Pseudorhapydionina moulladei* PÉCHEUX, 1995, and "*Quasiborelis*" *floridanus* (COLE).

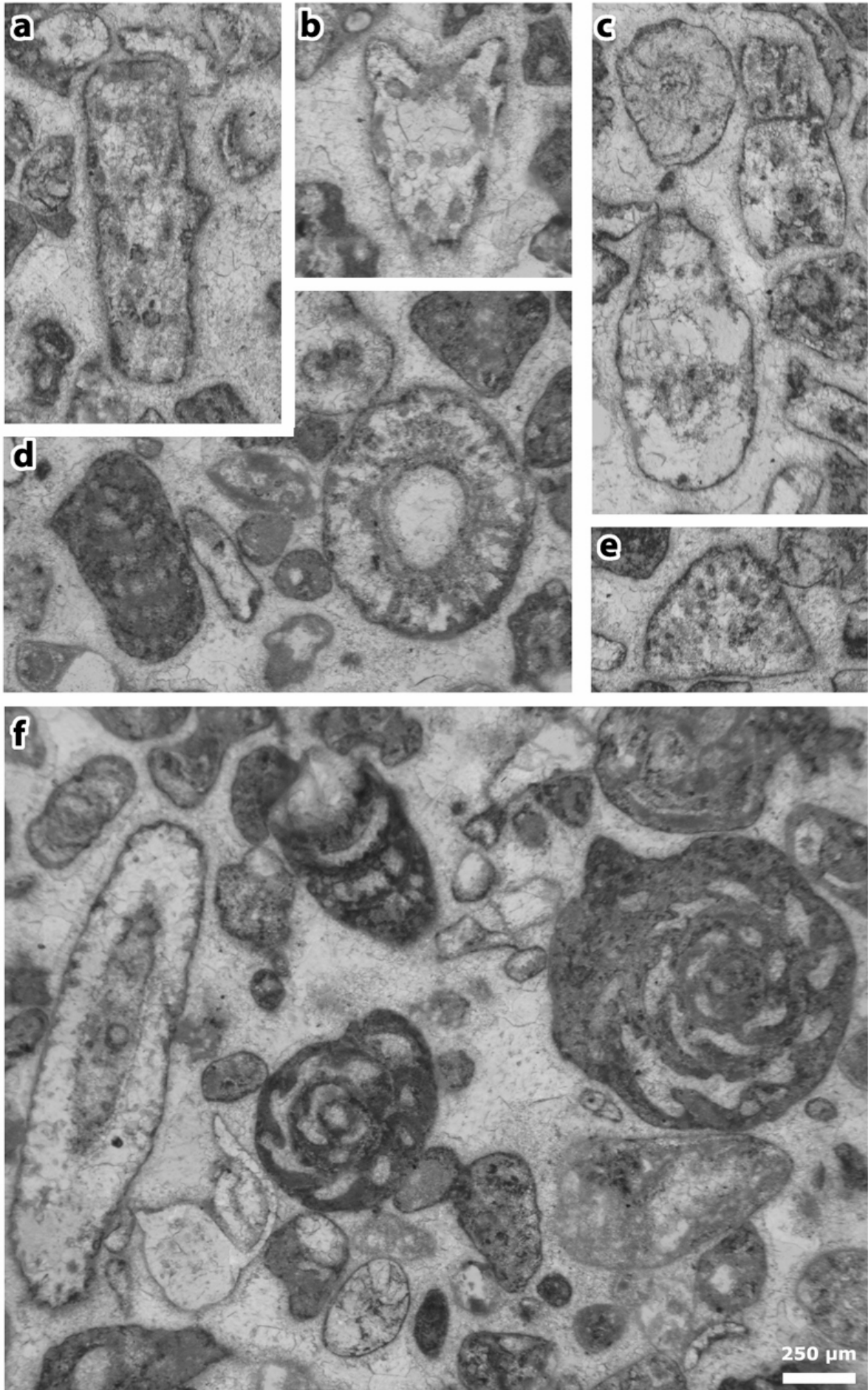


Plate 5: Figures a-i: *Cymopolia mayaense* JOHNSON & KASKA, 1965, thin sections 42499 (a-c, e & h-i) and 42504 (d & f-g). a) subaxial section; b) deep tangential section; c) oblique section; d) oblique section; e) oblique section; f) partial oblique section, with *Pseudorhapydionina moulladei* PÉCHEUX, 1995; g) oblique section; h) tangential section; i) tangential section.

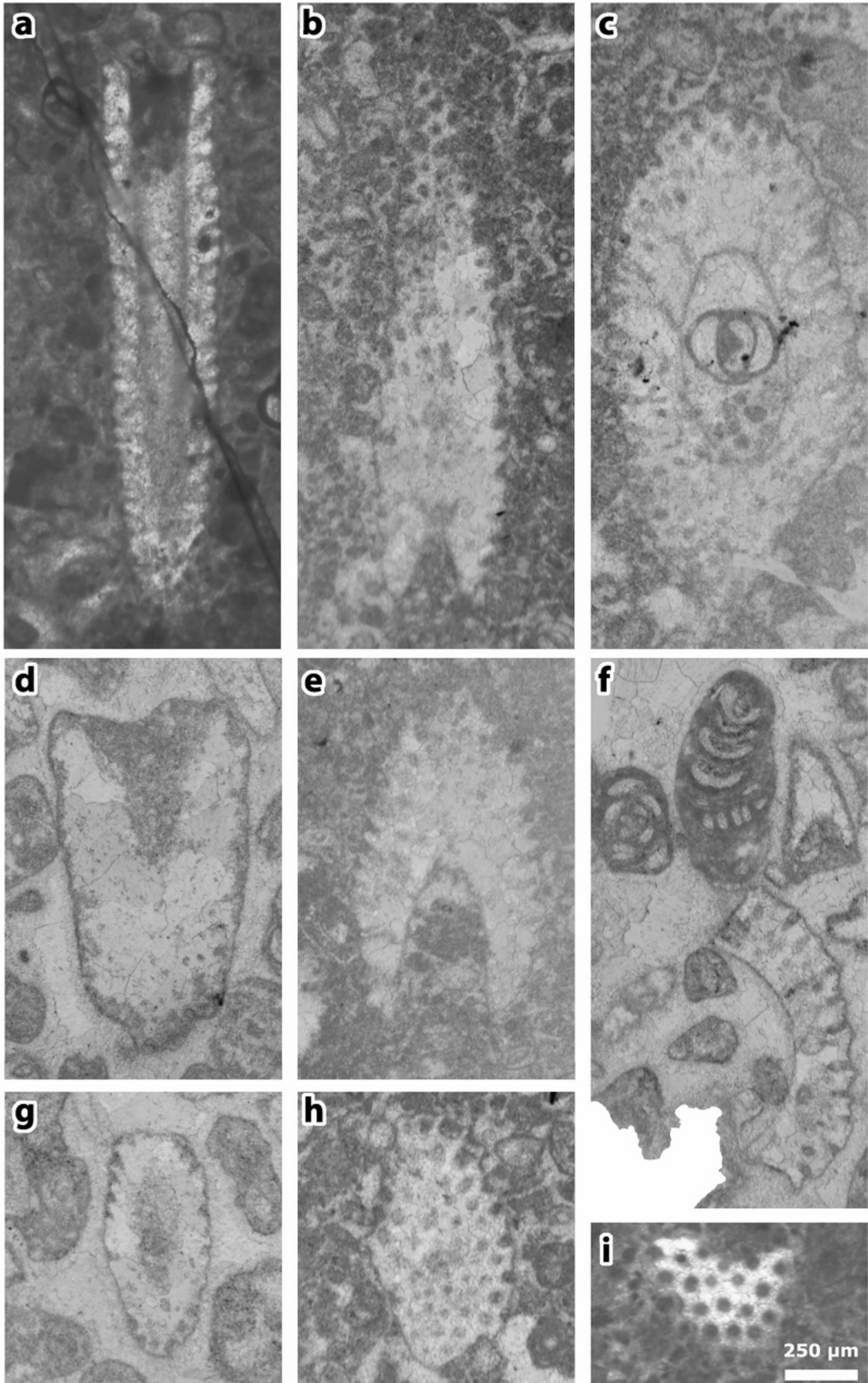


Plate 6: Figures a-c: *Cymopolia mayaense* JOHNSON & KASKA, 1965, thin section 42504. a) random sections (the axial section to the right might not belong to *Cymopolia*); b) random sections, mostly oblique and one tangential. This last section at the bottom is herein selected as a lectotype (actually these specimens are those illustrated on figure 3 of Plate 18 of JOHNSON & KASKA, 1965); c) oblique section.

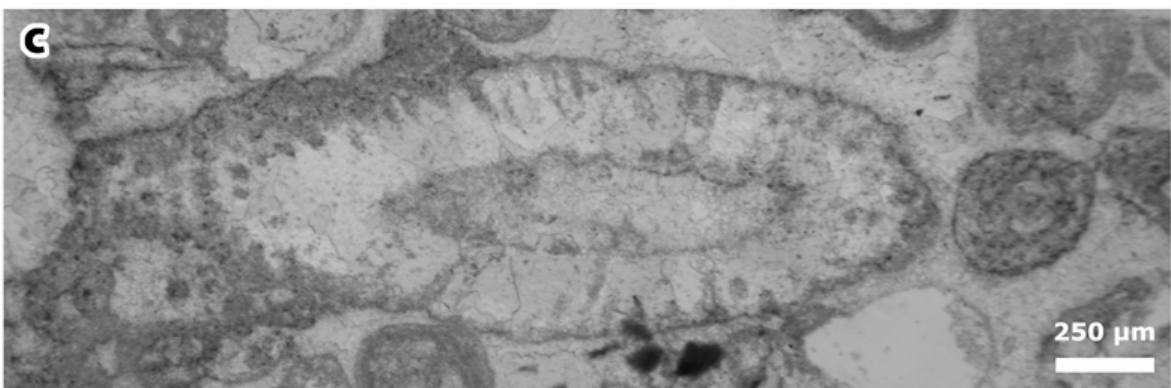
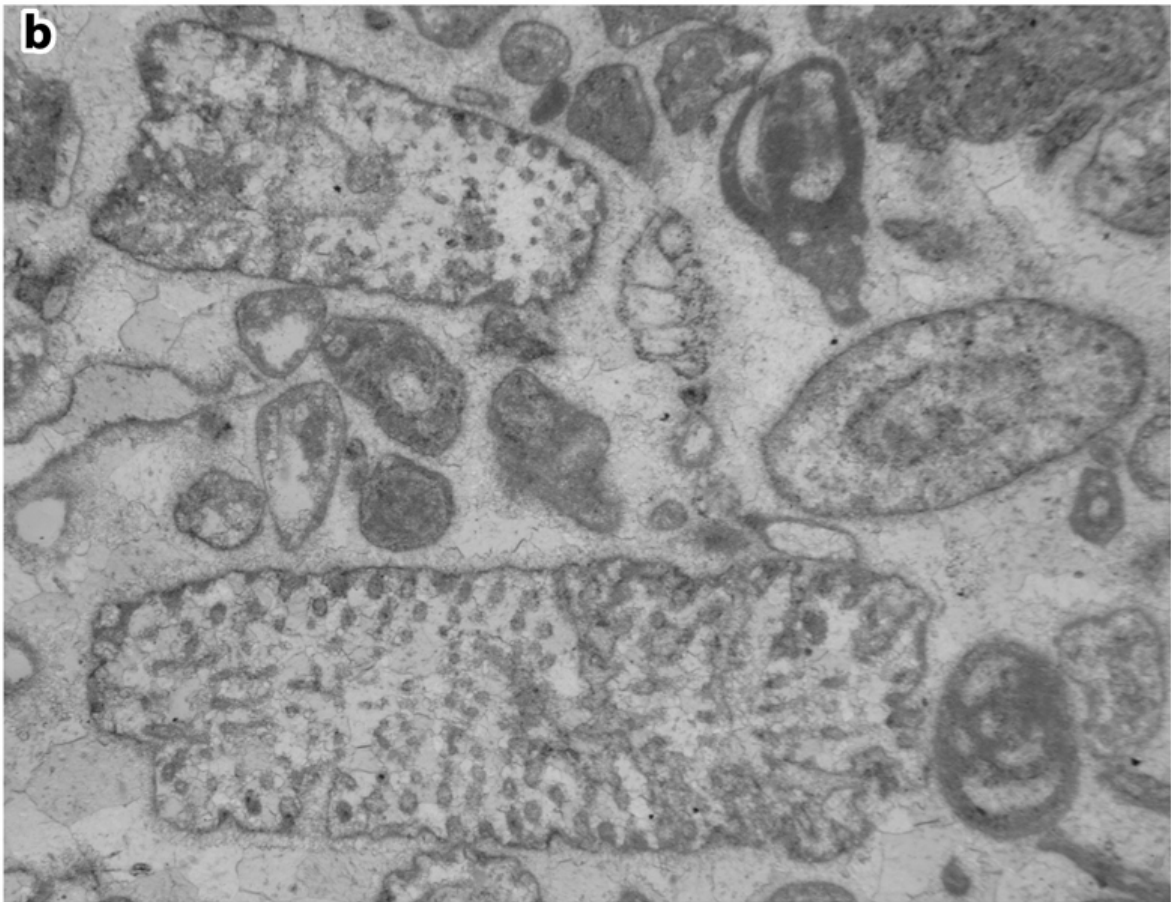
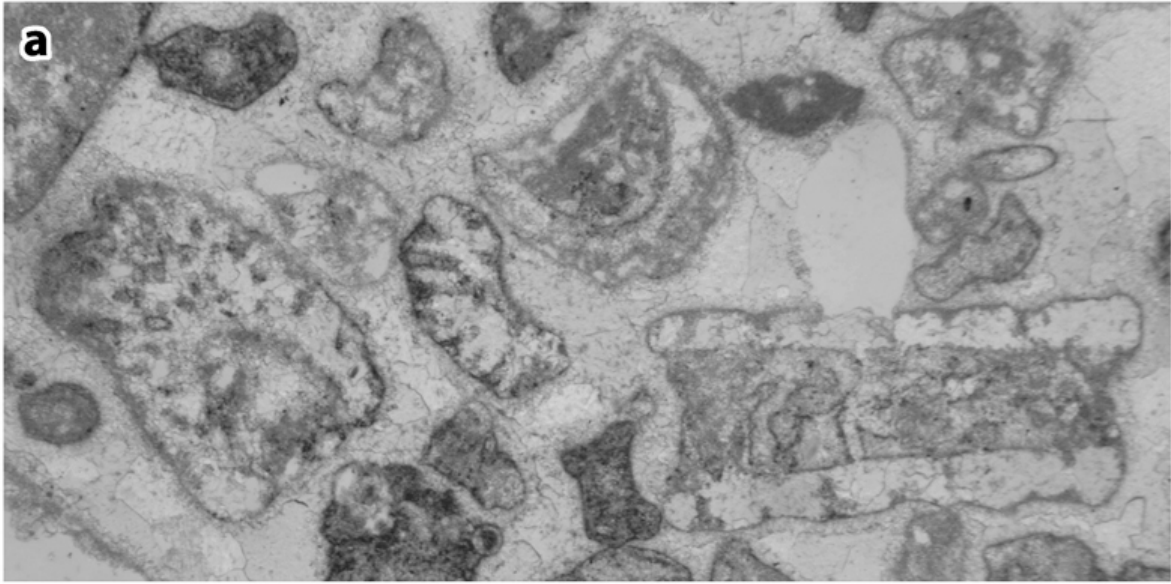


Plate 7: Figures a-f: *Cymopolia mayaense* JOHNSON & KASKA, 1965, thin section 42504. a) oblique section; b) sub-axial section; c) oblique section; d) axial section; e) oblique section; f) oblique section.

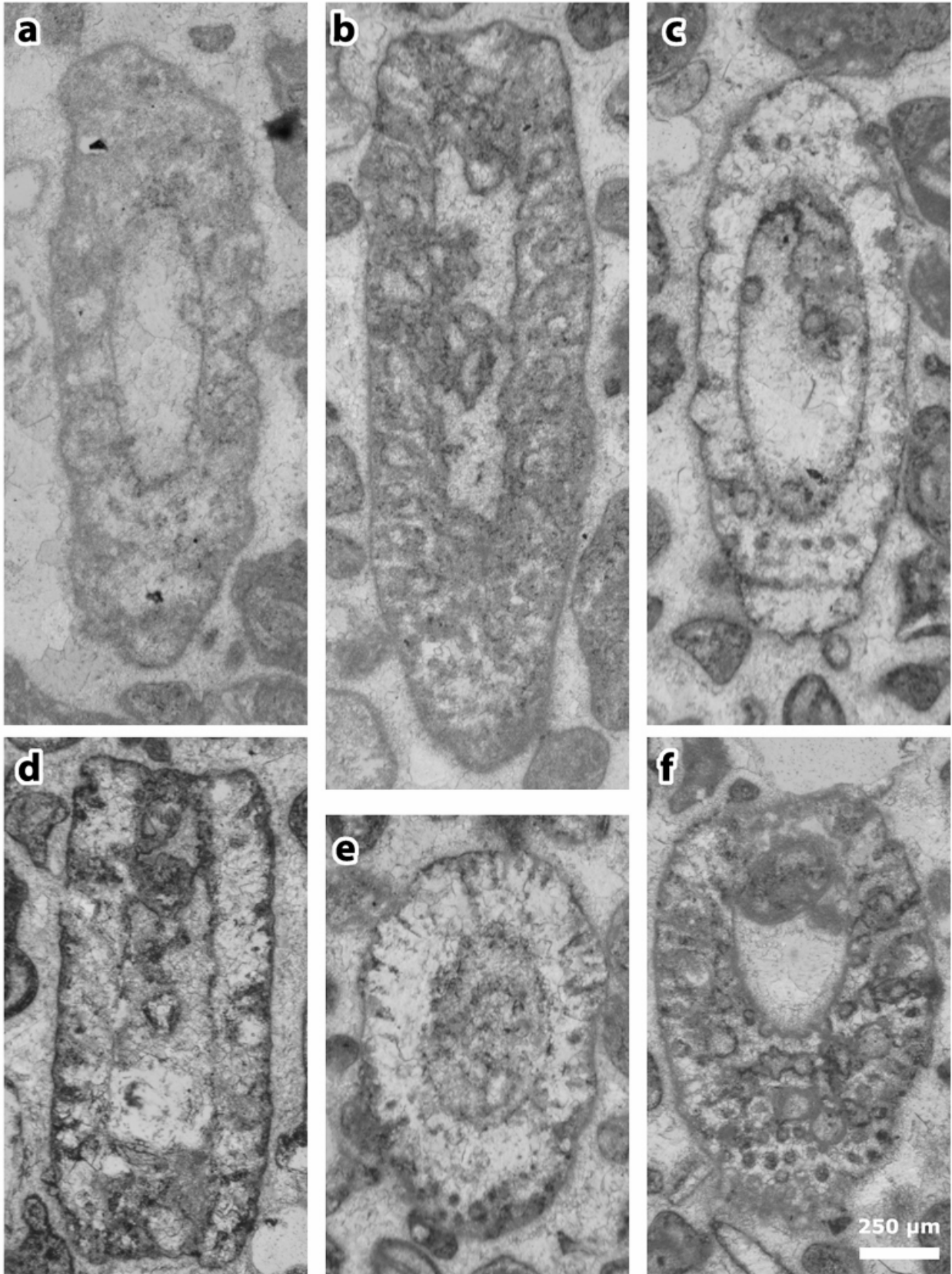


Plate 8: Figures a-c: thin section 42524. a) *Cylindroporella elassonos* JOHNSON & KASKA, 1965. The fossil pointed by the white arrows (actually the "Type" illustrated on figure 5 of Plate 18 of JOHNSON & KASKA, 1965) is a foraminifer, *i.e.*, a representative either of the genus *Dicyclina* or of the genus *Cuneolina*; b) random section of a similar foraminifer; c) assemblage with Ostracoda and Foraminifera, including *Dicyclina* sp., *Nezzazatinella picardi* (HENSON) and miliolids.

Figures d & f-i: thin section 42504. d) *Clypeina occidentalis* GRANIER & RADOIČIĆ *in* GRANIER *et al.*, 2013 [= *Clypeina occidentalis* JOHNSON & KASKA *ex* GRANIER & RADOIČIĆ *in* GRANIER *et al.*, 2013, non 1965], axial section; f) indetermined foraminifer (Valvulinid); g) *Pseudorhapydionina moulladei* PÉCHEUX, 1995, transverse section; h) *Jodotella* sp., axial section; i) *Kayseriella* cf. *decastroi* STREL; j) *Pseudorhapydionina moulladei* PÉCHEUX, 1995, oblique section.

Figure e: thin section 42499. *Cymopolia mayaense* JOHNSON & KASKA, 1965, oblique section.

