https://doi.org/10.26749/rstpp.110.129

Papers and Proceedings of the Royal Society of Tasmania, Volume 110, 1976

(ms. received 1.3.1976)

CLATHRODICTYON AND *ECCLIMADICTYON* (STROMATOPOROIDEA) FROM THE ORDOVICIAN OF TASMANIA

by B.D. Webby, University of Sydney

and M.R. Banks, University of Tasmania

(with three plates)

ABSTRACT

Five species of late Ordovician clathrodictyid stromatoporoids are described and illustrated from Tasmania. Of these, three are new species of *Clathrodictyon*—*C. idense*, *C. molense* and *C. plicatum*—and a fourth is a new species of *Ecclimadictyon*—*E. undatum*. They come from localities in the Mole Creek, Ida Bay and Florentine Valley areas, from horizons towards the top of the Gordon Limestone Subgroup.

INTRODUCTION

Apart from the early record of the Ordovician stromatoporoid *Stromatocerium* sp. ind. from west Tasmania (Bigsby 1868), there is virtually no further recognition of the group until Banks (1957), and Banks & Johnson (1957) drew attention to stromatoporoids in the 'Gordon Limestone' of the Florentine Valley area, Loongana, Moina and Eugenana. Subsequent records include Banks' (1962; 1965) identification of aulacerids, *Cryptophragmus* and *Thamnobeatricea*-like forms from various localities in the limestone, and Banks' (1971) reference to the 'Chazyan' association of *Stromatocerium* with *Maclurites* and *Girvanella*. Webby (1971, p.13) also mentioned the presence of a cylindrical form having an *Alleynodictyon*-type structure, and Corbett and Banks (1974) listed *'Thamnobeatricea'*, a form close to *Stromatocerium rugosum*, *Aulacera* sp. and a *Clathrodictyon*-like form from the Florentine Valley area, together with providing the first illustration of an Ordovician stromatoporoid (cf. *Thamnobeatricea)* from Tasmania.

The majority of the stromatoporoids in the Gordon Limestone Subgroup of Tasmania are labechiids not clathrodictyids. Only five species of clathrodictyids – those described herein – have so far been recognized. The clathrodictyids are confined to the uppermost part of the Gordon Limestone Subgroup in the Mole Creek area and elsewhere. *Clathrodictyon plicatum* sp. nov., *Clathrodictyon* sp., and *Ecclimadictyon undatum* sp. nov. occur at The Den, 3.5 km west-north-west of Mole Creek (Mersey 1: 100,000 sheet 8114, edit. 1, series R661; Grid ref. DQ483010). *C. plicatum* and *E. undatum* have also been found in the large working quarry farther west (Grid ref. DQ466027), and *C. plicatum* from west of the road leading to the quarry (Grid Ref. DQ463023). Another species, *C. molense* sp. nov., occurs together with *E. undatum* at a locality on the north-east side of the road leading to the quarry (Grid ref. DQ465020). *E. undatum* also comes from the Benjamin Limestone (upper part of Gordon Limestone Subgroup) at a locality east of the Westfield Syncline, approximately 0.8 km south-east of the Westfield Road (co-ordinates 444.650E, 751.330N). A fifth species, *C. idense* sp. nov., has been collected from the Gordon Limestone Subgroup near Ida Bay. Unfortunately the precise horizon and location are unknown. It seems most likely to have come from an horizon high in the limestone, possibly from the site of the main quarry on the north-east slopes of Marble Hill (Tasmania topographic series 1:31,680, Southport sheet no. 8211-II-S; Grid Ref. 764E, 650N).

Most of the Tasmanian species of *Clathrodictyon* and *Ecclimadictyon* are new, and

are distinct from those described from the late Ordovician of New South Wales (Webby 1969). It is difficult therefore, on the basis of these faunas alone, to suggest a likely correlation between the Tasmanian clathrodictyid-bearing limestones and those of New South Wales. In N.S.W. the first clathrodictyids appear at the base of Fauna II and persist through Fauna III. It seems unlikely, however, from other faunal data and correlations that the occurrences, restricted to the top of the respective 'Gordon Limestone' sequences, come from horizons older than Fauna III. Differences between the Tasmanian and N.S.W. clathrodictyid faunas may be accounted for either (1) by the Tasmanian fauna being slightly younger than the N.S.W. Fauna III (perhaps being equivalent to the non-carbonate interval of the Malachi's Hill Beds between Faunas III and IV, or (2) by the differing tectono-environmental settings of the Tasmanian Shelf and the Macquarie Volcanic Belt (Webby 1976) during Fauna III time (i.e., late Eastonian-early Bolindian time).

SYSTEMATIC PALAEONTOLOGY

The registration numbers of specimens in the University of Tasmania, Department of Geology fossil collections have the prefix UTGD.

Family Clathrodictyidae Kühn, 1939
Genus *Clathrodictyon* Nicholson & Murie, 1878

Type species. *C. vesiculosum* Nicholson & Murie, 1878

Clathrodictyon idense sp. nov.
Pl. I, figs. 1-2

Material. Holotype (UTGD 58125) from Gordon Limestone Sub-group south-west of Ida Bay. Precise horizon and location near Ida Bay unknown.

Description. Fragment of massive, sheet-like coenosteum measuring 70 x 15 mm across and 50 mm in height. Laminae are regular, continuous, and only very gently undulating; spaced from 10-12 mm in 2 mm vertically; and of variable thickness, typically from 0.03-0.1 mm. Pillars vertical, and cylindrical to spool shaped, usually extend across interlaminar space; rarely incomplete; only occasionally superposed; vary in diameter from 0.05-0.2 mm; spaced from 0.2-0.5 mm apart laterally. Galleries rounded to elongate, may be up to 0.2 mm high and 0.1-1.0 mm wide, but at certain levels in coenosteum of more closely spaced and thickened laminae, galleries may be constricted or completely infilled; zones of thickening usually laterally continuous but not always. Occasional thin, curved, inclined plates subdivide galleries; these are dissepiments, and they are especially conspicuous in tangential section showing as arcuate lines linking pillars. Astrorhizae not observed. Microstructure compact.

Remarks. No other Australian Ordovician species of *Clathrodictyon* is closely similar to *C. idense*.

Clathrodictyon molense sp. nov.
Pl. I, figs. 3-6.

Material. Holotype (UTGD 94622) from upper part of the Gordon Limestone Sub-group on north-east side of road to limestone quarry, 5 km WNW of Mole Creek.

Description. Coenosteum massive, low conical, 110 x 80 mm across and 40 mm in height; only weakly folded in some parts of this fine textured coenosteum. Laminae minutely crumpled and downwardly deflected at junctions with pillars; identity of individual layers laterally persistent but not individual laminae; spacing of laminae from 14-18 per 2 mm vertically; thickness of laminae 0.03-0.05 mm. At base of coenosteum, first few rows of laminae notably irregular; also a few bands of more closely spaced laminae at intervals through coenosteum. Pillars cylindrical, confined to interlaminar space, not normally superposed; from 0.05-0.1 mm in diameter; spaced from 0.1-0.3 mm apart; isolated crossing galleries, but form incomplete

meshes adjacent to contacts with laminae. Galleries rounded to elongate, up to 0.2 mm high; of variable length, usually 0.1 mm high and about 0.4-0.5 mm long; in extremes up to 1.3 mm long. No astrorhizae. In better preserved parts of coenosteum compact microstructure is shown.

Remarks. *C. molense*, of Ordovician species of *Clathrodictyon*, is quite distinct. It shows a resemblance to the Estonian Llandoverian *C. sulevi* Nestor, 1964, but is much finer textured, having 14-18 laminae per 2 mm, as compared with 10-12 laminae per 2 mm in *C. sulevi*. Also the Estonian species has small astrorhizae.

Clathrodictyon plicatum sp. nov.
Pl. II, figs. 1-5

Material. Four specimens (UTGD 94623-26) from locality west side of road leading to limestone quarry, 5 km WNW of Mole Creek. One specimen (UTGD 94627) from limestone quarry, 5.5 km WNW of Mole Creek. Four specimens (UTGD 94628-29, 94631-32) from The Den, 3.5 km WNW of Mole Creek. Holotype is UTGD 94626; other numbered specimens designated paratypes. All specimens from upper part of Gordon Limestone Sub-group.

Description. Laminar, sheet-like to encrusting; often showing intertonguing relationships with surrounding sediment; largest specimen (UTGD 94624) measures 80 x 70 mm across and 60 mm high. Mamelons prominent, spaced from 2-7 mm apart; of variable height. Latilaminae also conspicuous, vary from 0.5-11 mm high; mamelons may be continuous through more than one latilamina. Laminae mainly regular and laterally continuous; folded evenly across mamelons; usually spaced from 9-14 in 2 mm vertically and vary from 0.02-0.07 mm thick; in a few areas of coenosteum where laminae are more widely spaced than normal, galleries become occupied by dissepiments (or secondary laminae). Within part of laminar, sheet-like coenosteum of UTGD 94631 (Pl. II, fig. 5) there are mamelon-like upgrowths which exhibit an inner, axial core filled with zigzag, secondary laminar tissue and interspersed regular laminae - a *Plexodictyon*-type structure; this grades into regular *Clathrodictyon* form with vertical pillars confined to an interlaminar space in marginal areas. Possibly the inner, axial zone grew more rapidly than the flanking marginal areas. Pillars cylindrical, spindle and inverted conical; these latter spread upwards to meet laminae leaving a triangular space between them; confined to one interlaminar space; rarely superposed; pillars mainly 0.05-0.1 mm in diameter; spaced 0.1-0.3 mm laterally. Occasional astrorhizal tubes associated with mamelons; diameter about 0.2 mm. Also a few rare rounded foreign bodies or tubes, 0.7-1.0 mm across, in positions near base of latilaminae, which have caused laminae to updome over them. Microstructure compact.

Remarks. *C. pilatum* has a similar morphology to *C.* aff. *mammillatum* (Schmidt) from the late Ordovician of New South Wales (Webby, 1969), but has narrower spacing of laminae (9-14 in 2 mm as compared with 6-9 per 2 mm in *C.* aff. *mammillatum*). Compared with the second N.S.W. late Ordovician species, *C.* cf. *microundulatum* Nestor, it has a more markedly mammillated form, and the pillars, usually confined to a single interlaminar space, include inverted conical forms.

Clathrodictyon sp.
Pl. III, figs. 4-5

Material. Three specimens (UTGD 94633-35) from The Den, 3.5 km WNW of Mole Creek; upper part of Gordon Limestone Sub-group.

Description. Coenosteum columnar, comprising a series of interconnected cylinders forming in tangential section branching to chain-like patterns with the sediment. Cylinders probably merely represent extended mamelon columns; spacing usually from 10-35mm laterally, measured between centres of cylinders. Largest specimen (UTGD 94634) measures 100 x 80 mm across, and columns at least 120 mm in height. Axial zone of cylinders destroyed by recrystallization; calcite infilled. Commensal tubes

ramify through coenosteal tissue of middle-outer parts of cylinders; from 0.3-0.6 mm wide and with horizontal to slightly sagging tabulae (spaced about 7 per 2mm). Latilaminae also frequently occur in outer parts of coenosteum; 1-6 mm wide. Laminae most variable; may be evenly spaced and regular at some levels within coenosteum, but in others interlaminar spaces widen and become infilled with irregular, crumpled laminar tissue (dissepiments or secondary laminae); usually 11-13 per 2 mm vertically; thickness of laminae typically from 0.03-0.07 mm. Pillars normally confined to one interlaminar space, cylindrical to spindle shaped; occasionally with upwardly spreading form leaving space between forks and the overlying lamina; usually from 0.03-0.1 mm in diameter, and spaced about 0.1-0.2 mm apart. No astrorhizae seen, but may have been confined originally to centres of cylinders, now recrystallized and calcite infilled. Microstructure compact.

Remarks. Although closely similar to *C. pilatum*, *C.* sp. exhibits a markedly different columnar growth form, and slightly more prominently crumpled or zigzagged laminae.

Genus *Ecclimadictyon* Nestor, 1964
Type species. *Clathrodictyon fastigiatum* Nicholson, 1886

Ecclimadictyon undatum sp. nov.
Pl. III, figs. 1-3

Material. Holotype (UTGD 94636) from north-east side of road to limestone quarry, 5 km WNW of Mole Creek. Paratype UTGD 94637 from limestone quarry, 5.5 km WNW of Mole Creek; and paratype UTGD 90917 from the Den, 3.5 km WNW of Mole Creek, uppermost part of Gordon Limestone Sub-group. Paratype UTGD 94638 from locality off track, south-east of Westfield Rd. and east of Westfield Syncline, Florentine Valley area; Benjamin Limestone of Gordon Limestone Subgroup (Corbett and Banks, 1974).

Description. Coenosteum consists of latilaminate, irregularly undulating sheet-like mass, 130 x 110 mm across, and up to 70 mm in height. Preservation indifferent; structure of parts of coenosteum, especially interiors, has been obliterated, and small areas show tectonic distortion. Laminae zigzag shaped, evenly spaced, from 12-14 per 2 mm vertically; at base of latilaminae laminar tissue shows much irregularity; laminae usually about 0.05-0.08 mm thick. Pillars normally confined to interlaminar space; very rarely superposed; formed from downward inflexions of laminae; about 0.07-0.1 mm in diameter; in tangential sections, pillars appear as isolated dots, and with laminae as bars and open to closed meshes. No astrorhizae seen. Compact microstructure exhibited in a few small areas of good preservation, but usually shows a secondary three-layered structure composed of a central, clear zone with darker granular margins to either side.

Remarks. In comparison with Late Ordovician *E. amzassensis* (Khalfina 1960) from the upper part of the Cliefden Caves Limestone of central New South Wales (Webby 1969), *E. undatum* has less vertically continuous pillars, a closer spacing of laminae (12-14 per 2 mm, as contrasted with 8-12 in *E. amzassensis*), a more undulating, sheet-like, latilaminate form, and no astrorhizae. A second Ordovician species, *E. nestori* Webby 1969, also from the upper part of the Cliefden Caves Limestone, differs in being a finer textured form (15-16 laminae in 2 mm) and showing bunchy astrorhizae. Another N.S.W. species, *E.* sp. nov. (Webby & Morris, in press) from a limestone breccia in the upper part of the Malongulli Formation, has similar spacing of laminae but differs in having more sharply zigzagged laminae with gaps in lateral continuity which suggest they may form, in part, rod-like, as well as sheet-like laminar tissue. Also the coenosteal tissue generally is slightly thicker in *E. undatum* than in this N.S.W. species. The widely distributed type species *E. fastigiatum* (Nicholson 1886) from the Silurian of Britain, Estonia, the Pechora Basin of the U.S.S.R. and North America bears closer similarities to *E. undatum* but it too can be distinguished by having slightly wider spacing of laminae (10-12 in 2mm) and less conspicuous pillars (Nestor, 1964).

ACKNOWLEDGEMENTS

The authors have been aided by funds from the Australian Research Grants Committee (A.R.G.C. Grants No. B65/15286 and E73/15102). Mr. D.G. Morris has assisted in preparation of material and photography.

REFERENCES

Banks, M.R., 1957: The stratigraphy of Tasmanian limestones. *Min. Resour. Tasm.*, 10, 39-85

Banks, M.R., 1962: Ordovician System. The geology of Tasmania. *J. geol. Soc. Aust.*, 9,147-176.

Banks, M.R., 1965: Geology and Mineral Deposits. *In* Davies, J.L. (Ed.) ATLAS OF TASMANIA, pp. 12-17. Dept. Lands and Surveys, Hobart.

_____ , 1971: A preliminary Cambro-Ordovician biostratigraphy of Tasmania. *Abstr. 43rd Congr. Aust. N.Z. Assoc. Adv. Sci., Sect. 3*, 45-46.

Banks, M.R. and Johnson, J.H. 1957: The occurrence of *Maclurites* and *Girvanella* in the Gordon Limestone (Ordovician) of Tasmania. *J. Paleont.*, 31, 632-640.

Bigsby, J.J., 1868: THESAURUS SILURICUS. THE FLORA AND FAUNA OF THE SILURIAN PERIOD. John van Voorst, London. lii + 214 pp.

Corbett, K.D. and Banks, M.R. 1974: Ordovician stratigraphy of the Florentine Synclinorium, southwest Tasmania. *Pap. Proc. R. Soc. Tasm.*, 107, 207-238.

Khalfina, V.K., 1960: Stromatoporoidei. *In* Khalfin, L.L. (Ed.) BIOSTRATIGRAFIYA PALEOZOYA SAYANO-ALTAYSKOY GORNOY OBLASTI. TOM I, NIZHNIY PALEOZOY. *Trudy sib. nauchno-issled. Inst. Geol. Geofiz. miner. Syr. vyp.*, 19, pp. 357-8, 370-3.

Kühn, O., 1939: Eine neue Familie der Stromatoporen. *Zentralbl. Min. Geol. Paläont. 1939*, 338-345.

Nestor, H.E., 1964: Stromatoporoidei Ordovika i Llandoveri Estonii. *Geologia-Inst. Uurim.* 112 pp.

Nicholson, H.A., Murie, J., 1878: On the minute structure of *Stromatopora* and its allies. *J. Linnean Soc., Zool.*, 14, 187-246.

Webby, B.D., 1969: Ordovician stromatoporoids from New South Wales. *Palaeontology*, 12, 637-662.

_____ , 1971: *Alleynodictyon*, a new Ordovician stromatoporoid from New South Wales. *Palaeontology*, 14, 10-15.

_____, 1976: The Ordovician System in South-eastern Australia. *In* Bassett, M.G. (ed). THE ORDOVICIAN SYSTEM: PROCEEDINGS OF A PALAEONTOLOGICAL ASSOCIATION SYMPOSIUM. Uni. Wales Press and Nat. Mus. Wales, Cardiff.

Webby, B.D., Morris, D.G., in press: New stromatoporoids from the Ordovician of New South Wales. *J. Proc. R. Soc. N.S.W.*

EXPLANATION OF PLATES

PLATE 1.

Figs. 1-2. *Clathrodictyon idense* sp. nov.; holotype (UTGD 58125) from Ida Bay, X10. 1, longitudinal section. 2, tangential section.

Figs. 3-6. *Clathrodictyon molense* sp. nov.; holotype (UTGD 94622) from locality on roadside leading to quarry, west of The Den, Mole Creek. 3-4, longitudinal sections X10. 5, logitudinal sections showing detail of part of fig. 4, X20. 6, tangential section, X10.

PLATE 2.

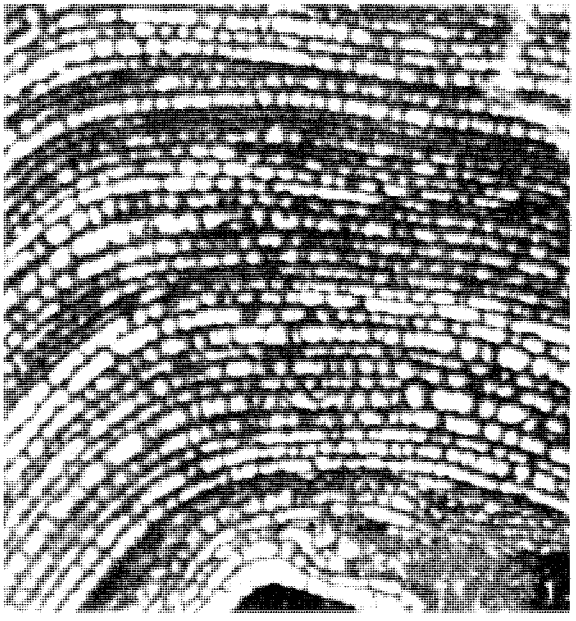
Figs. 1-5 *Clathrodictyon plicatum* sp. nov. X10. 1, vertical section of paratype UTGD 94623. 2, vertical section of paratype UTGD 94631, showing latilaminae with closed spaced laminae. Note possible foreign body around which new laminae are draped in the upper part of coenosteum. 3, vertical section of holotype UTGD 94626. Note dissepiments in areas of coenosteum showing widely spaced laminae. 4, tangential section of holotype UTGD 94626. 5, vertical-oblique section of paratype UTGD 94631 exhibiting in axial part of 'bulge' a *Plexodictyon*-like structure. Figs. 1, 3 and 4 are from an area just off the road near quarry west of The Den, and Figs. 2 and 5, from The Den, Mole Creek area.

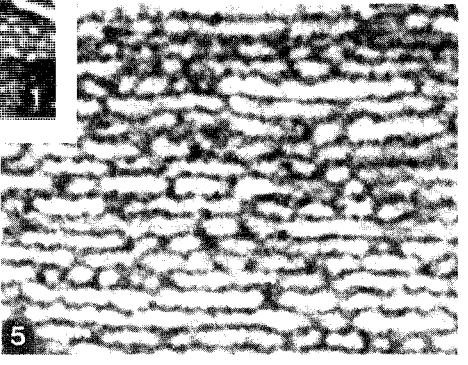
PLATE 3.

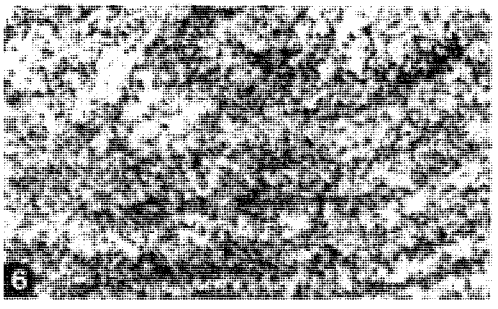
All figures X10.

Figs. 1-3 *Ecclimadictyon undatum* sp. nov. 1-2, vertical and tangential sections of holotype UTGD 94636, off road near quarry, west of The Den, Mole Creek area. 3, vertical section of paratype UTGD 94638 south-east of Westfield Rd., Florentine Valley area. Note patches of coenosteum are destroyed or silicified.

Figs. 4-5 *Clathrodictyon* sp., vertical and tangential sections of UTGD 94633 from The Den, Mole Creek area. Note latilaminae and tabulated caunopore tubes.







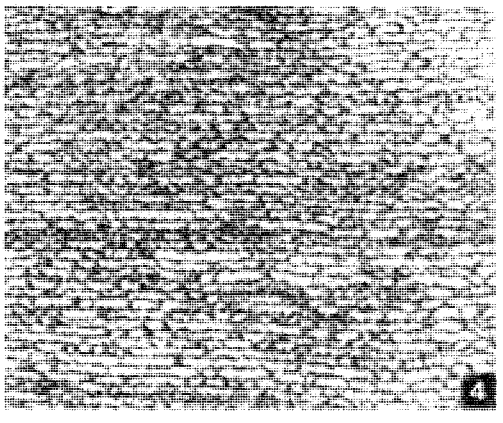


PLATE 1

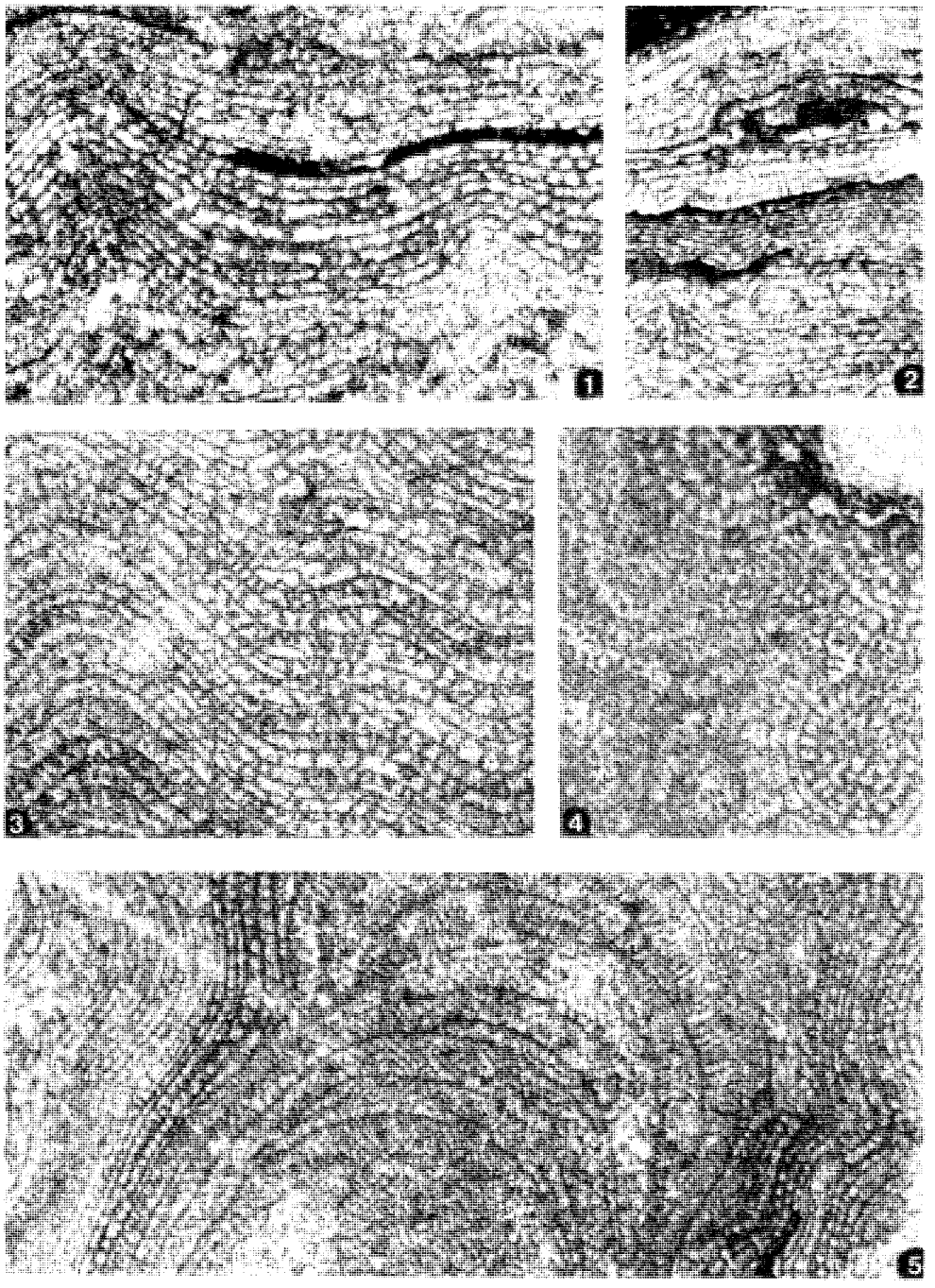


PLATE 2

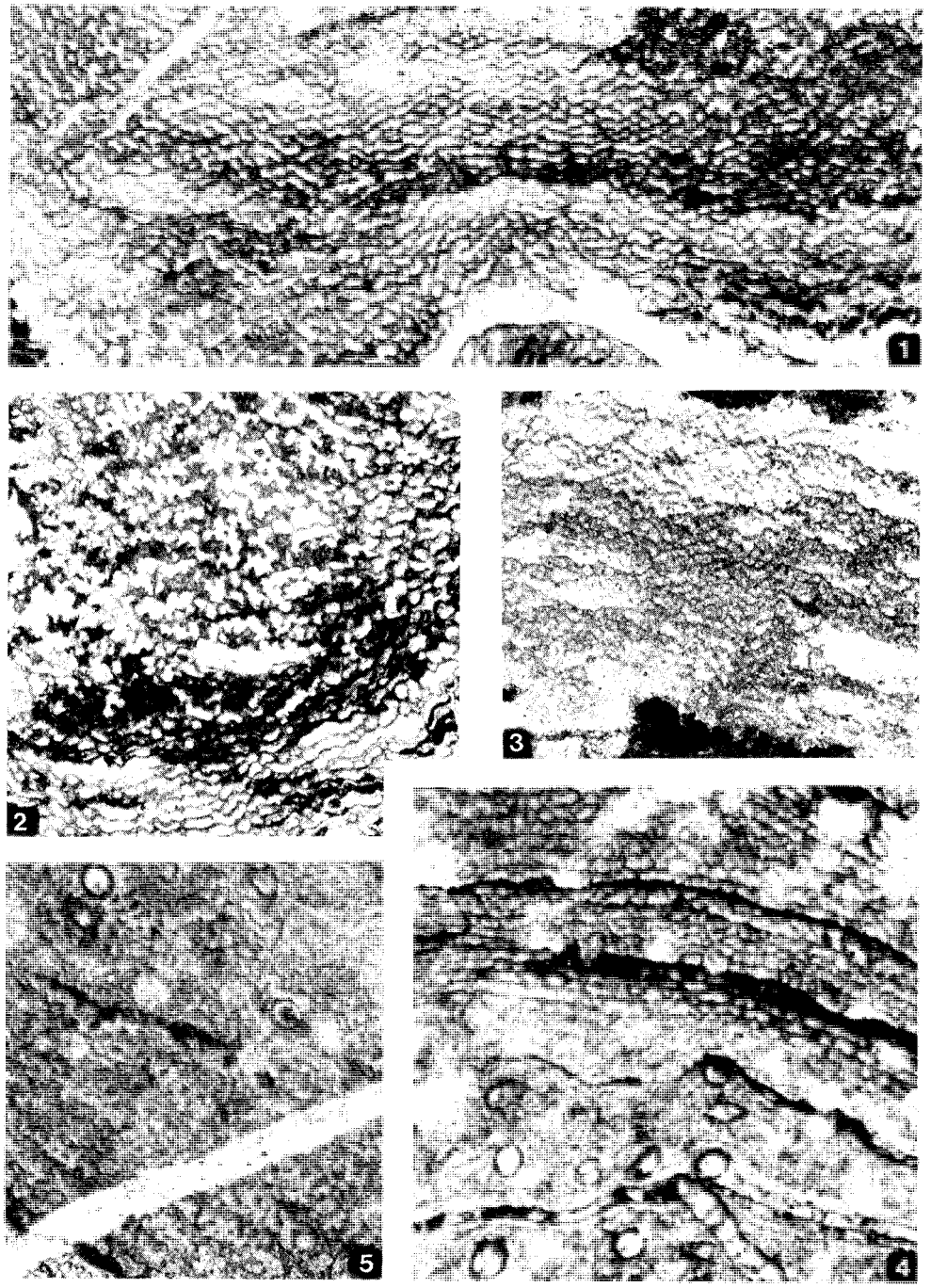


PLATE 3