THE BIOSTRATIGRAPHY AND PALAEOECOLOGY OF SOUTH AUSTRALIAN PRECAMBRIAN STROMATOLITES

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GLOSSARY*

Acicular: A texture in which the mineral grains are strongly elongated and aligned parallel.

Axis: The centre-line of a column.

Banded microstructure: One in which the laminae are very continuous and have abrupt, distinct, more or less parallel boundaries.

Bioherm: A circumscribed organo-sedimentary structure whose minimum width is less than or equal to one hundred times its maximum thickness, embedded in rocks of different lithology.

Biostrome: A stratiform organo-sedimentary structure whose minimum width is more than one hundred times its maximum thickness. Note: when the dimensions are unknown, the term "stromatolitic bed" may be used.

Branching: The division of a column into new, discrete columns. The columns become discrete when they are first separated by an interspace.

Parallel branching: branching in which the axes of the new columns are parallel (most commonly they are also parallel to the axis of the original column).

Alpha-parallel branching: parallel branching in which the width of the individual remains constant.

Beta-parallel branching: parallel branching in which the original column widens gradually before branching.

Gamma-parallel branching: parallel branching in which the original column widens abruptly before branching.

Slightly divergent branching: branching in which the axes of the new columns diverge at less than 45°.

Markedly divergent branching: branching in which the axes of the new columns diverge at more than 45°.

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* This glossary was compiled in cooperation with Dr M. R. Walter. Most of the terms are illustrated in Fig.4.

Multiple branching: branching into more than two columns at approximately one level.

Bridge: A stromatolitic lamina or set of laminae linking adjacent columns.

Bump: A low, rounded protrusion on the side of a column.

Catagraphia: Unlaminated microscopic carbonate problematica (many may be of inorganic origin).

Coalescing columns: Adjacent columns which join and continue growth as one column.

Clot: A microscopic segregation of pigment.

Column: A discrete stromatolitic structure, with the dimension in the direction of growth greater than at least one of the transverse dimensions.

Columnar-layered stromatolite: A stromatolite in which short columnar and laterally linked (usually pseudocolumnar) portions alternate.

Cornice: Overhanging lamina or set of laminae, elongated transversely to the column axis.

Crest: The summit of an upward-convex lamina.

Crestal line: Line joining the crests of successive laminae.

Crestal zone: The environs of the crestal line. In Conophyton, the crestal zone is specifically the zone of thickening and contortion of laminae; the width of the crestal zone is the width of the thickened and/or contorted portions of laminae.

Cumulate stromatolite: A rounded, protruding, non-columnar stromatolite.

Dichotomous branching: Branching into two new columns.

Domed: With approximately constant radius of curvature.

Drusy: A texture in which mineral grains line a cavity.

Flat-laminated stromatolite: Non-columnar stromatolite with flat, continuous laminae (Cryptalgalaminate of Aitken, 1967).

Gently convex lamina: A lamina whose ratio of height to diameter is less than or equal to 0.5.

Gnarled column: A column with large bumps.

Grainstone: A mud-free, grain-supported carbonate rock.

Grumous: A mineral texture in which fine-grained patches are surrounded by coarser grains.

Hypidiotopic: A mineral texture intermediate between xenotopic and idiotopic.

Idiotopic texture: A texture in which the mineral grains are bounded by crystal faces.

Individual: A group of columns arising from a single basal column, or a discrete stromatolite in which the laminae are continuous.

Interlobate texture: A texture in which the mineral grain boundaries are wrinkled.

Interspace: The space between columns, usually filled with sediment.

Intraclast: A reworked, partly lithified carbonate clast derived from within the basin of deposition.

Intramicrite: A carbonate rock consisting of intraclasts and a micrite matrix.

Intrasparite: A carbonate rock consisting of intraclasts and sparry cement.

Lamina: The smallest unit of layering in a stromatolite.

Lanceolate: An elongate transverse section of a column, tapering at both ends.

Laterally linked stromatolite: Stromatolite with wavy laminae which are continuous between crests.

Macrolamina: A set of laminae.

Microphytoliths: Oncolites and catagraphia (microscopic carbonate problematica).

Micro-unconformity: Surface of lamination discordance due to penecontemporaneous erosion, within a stromatolite.

Niche: A deep indentation in the side of a column.

Oncolites: Carbonate problematica with concentrically laminated microstructure, analogous to stromatolites, but unattached. (Many of the described Russian forms may in fact be of inorganic origin).

Ooid: Spherical or subspherical accretionary grain, usually of sand size, with concentric and sometimes radial microstructure. Superficial ooids are ooids in which the thickness of the accretionary coating is less than the radius of the ooid.

Oomicrite: A carbonate rock composed of ooids and a micrite matrix.

Oosparite: A carbonate rock composed of ooids and a sparry cement.

Packstone: A grain-supported carbonate rock in which some mud matrix is present.

Parabolic lamina: A lamina whose axial longitudinal section approximates a parabola.

Peak: Overhanging lamina or set of laminae with a small dimension transverse to the column.

Pellet: Ovoid to sub-ovoid grain of micritic carbonate of silt or sand size, lacking internal structure.

Pelmicrite: A carbonate rock composed of pellets and a micrite matrix.

Pelsparite: A carbonate rock composed of pellets and a sparry cement.

Pigment: Organic or inorganic colouring matter.

Platy column: A column in which one transverse dimension is much larger than the other.

Projection: A small columnar or conical outgrowth from the side of a column.

Pseudocolumnar stromatolite: Laterally linked stromatolite in which successive crests are superimposed forming column-like structures (pseudocolumns).

Rectangular lamina: Lamina which in a longitudinal section of a column is flat-topped with edges deflexed at about 90^{o}.

Rhombic lamina: Lamina which in a longitudinal section of a column is flat-topped but has subparallel edges not perpendicular to the top.

Rib: A rounded protrusion which is elongated transversely to the column on which it occurs.

Selvage: An unlaminated coating on column margins.

Steeply convex lamina: A lamina whose ratio of height to diameter is greater than 0.5.

Streaky microstructure: One in which the laminae vary in thickness and are moderately distinct and continuous, but frequently grade into one another. The darker laminae are usually the more distinct.

Striated microstructure: One in which the laminae originally formed as chains of lenses. (This excludes those cases where originally continuous laminae are disrupted by recrystallization).

Tabular bioherm: Bioherm with parallel upper and lower surfaces.

Tabular biostrome: Biostrome with parallel upper and lower surfaces.

Tonguing bioherm: A bioherm which intertongues at its margins with the surrounding sediment.

Trichotomous branching: Branching into three new columns.

Tuberous column: A column having prominent expansions and constrictions.

Vermiform microstructure: One in which narrow, sinuous, pale coloured areas (usually sparry carbonate) are surrounded by darker, usually finer grained areas.

Wackestone: A mud-supported carbonate rock with more than 10% grains.

Wall: Structure at the margin of a column formed by one or more laminae from within the column bending down and coating the margin for at least a short distance.

Wavy lamina: A lamina with flexures of wavelength greater than 2 mm.

Wrinkled lamina: A lamina with flexures of wavelength less than 2 mm.

Undulatory stromatolite: Laterally linked stromatolite in which successive crests are not superimposed.

Xenotopic texture: A texture in which the mineral grains are anhedral or irregularly shaped, i.e. not bounded by crystal faces.

APPENDIX II

STRATIGRAPHIC SECTIONS MEASURED IN THE FLINDERS RANGES

The following sections were measured in the course of field work for the collection of stromatolites and environmental study.

1. Section of part of the Skillogalee Dolomite, Depot Creek

	Upper Member: Dark grey shaly and laminated dolomites, black cherts and magnesite conglomerates (not measured)
	Lower Member:
5'	Sandstone, coarse, pale grey, with dolomitic matrix. Interbeds of dolomite, dark grey, flaggy, with large dolomite clasts
4'	Dolomite, dark grey, shaly or laminated
12'	Dolomite, medium to dark grey, flaggy. Bands with dolomite clasts. Chert lenses and blebs
4'	Dolomite, stromatolitic, laterally linked to broad, expanding columns
24'	Sandstone, medium to coarse grained, pale grey, felspathic, thick bedded. In part quartzitic
22'	Interbedded shale, blue-grey, laminated and sandstone, coarse, grey, medium to flaggy bedded
16'	Shale and siltstone, blue-grey, laminated
5'	Shale, blue-grey, dolomitic
10'	Interbedded dolomite, pale to medium grey, flaggy to medium bedded and shale, blue-grey
12'	Shale, blue-grey
-	(Apparent thickness here increased slightly by flexuring)
8'	Shale, blue-grey
1'	Dolomite, pink, medium bedded
2'	Shale, green-grey, laminated
2'	Dolomite, pink, medium bedded, with Tungussia wilkatanna
3'	Shale, green-grey, laminated
-	(Erosional hiatus)
17'	Dolomite, pink, massive, fine grained, with Tungussia wilkatanna
6'	Shale, grey-green, laminated
2'	Dolomite, pink, with Tungussia wilkatanna
7'	Shale, grey-green, laminated
4'	Dolomite, pink, with Tungussia wilkatanna, overlying laminated dolomite
14'	Shale, green-grey, laminated
6'	Dolomite, pink, massive, with Tungussia wilkatanna
9'	Dolomite, pink, medium-bedded, with LLH stromatolites
14'	Interbedded shale, grey-green, and dolomite, pink, flaggy
10'	Interbedded shale, grey-green, and dolomite, pink, with possible Tungussia wilkatanna
4'	Dolomite, pink, flaggy, wavy-laminated

5'	Shale, purple and green laminated
7'	Sandstone, medium-grained, arkosic, with coarse laminae
4'	Shale, purple and green laminated
4'	Dolomite, pink, with large Tungussia wilkatanna
5'	Shale, purple and green laminated
4'	Dolomite, pink, flaggy, with wavy, partly disrupted bedding
8'	Shale, purple and green laminated
8'	Interbedded shale, purple and green laminated, and dolomite, pink, laminated
32'	Shale, purple and green laminated
25'	Interbedded shale, purple and green laminated, and dolomite, pink to pale grey, flaggy to massive, laminated
20'	Shale, green, laminated
17'	Interbedded shale, green, laminated and dolomite, blue-grey, laminated. Some broad columns of Tungussia wilkatanna
13'	As above, with thin sandy dolomite interbeds
4'	Sandstone, arkosic, with heavy mineral lamination
2'	Dolomite, medium grey, with Tungussia wilkatanna
3'	Dolomite, blue-grey, flaggy, partly sandy
5'	Dolomite, blue-grey, flaggy and shaly, with minor chert
3'	Dolomite, flaggy, sandy, coarsely crystalline
16'	Dolomite, blue-grey, flaggy, wavy-bedded, with chert lenses common at the top
15'	No outcrop
11'	Dolomite, medium-dark grey, flaggy, laminated. Partly cross-bedded, partly wavy-bedded
6'	Dolomite, dark grey, with broad, cumulate stromatolites
14'	Interbedded dolomite, blue-grey, flaggy, cross-laminated and dolomite, medium bedded to flaggy, sandy, with intraclasts
2'	Dolomite, medium-grey, with Tungussia wilkatanna
20'	Interbedded shale, grey, laminated, and dolomite, medium-grey, flaggy
3'	Dolomite, sandy, fine intraformational conglomerate
2'	Dolomite, buff, massive, brecciated
10'	Shale, red and green laminated
12'	Interbedded dolomite, pale grey, flaggy, and shale, red and green laminated
2'	Dolomite, sandy, crystalline, with intraclasts
5'	Shale, red and green laminated
	Transition:
2'	Sandstone, pink-grey, felspathic, poorly sorted
2'	Dolomite, medium-grey, with disrupted laminae
11'	Sandstone, flaggy, poorly sorted, with red shale partings
18'	Sandstone, pink-grey, medium to coarse grained, medium bedded, well sorted
5'	Sandstone, coarse grained, medium bedded, with red, mud-cracked shale partings with current ripples
21'	Sandstone, pink, coarse, felspathic, medium bedded
44'	Sandstone and quartzite, pink to grey, medium grained, medium bedded
8'	Dolomite, pink to pale grey, flaggy, wavy-bedded, with possible solution vughs

Emeroo Quartzite: Sandstone, medium bedded, medium grained (grading to coarse), partly felspathic

2. Section of the Brighton Limestone equivalent, Depot Creek (generalized for the area shown in Fig.24)

Umberatana Group:
Lower Willochra Formation: (not measured)
Siltstone, thinly bedded, grey, with very fine scale cross-bedding, purple ripple-marked and frequently mud-cracked shale laminae
Brighton Limestone:

48'	Purple shale, as above, with thin interbeds dolomite, pink, thinly bedded, partly with upward concave structures. Dolomite predominates near base
9'	Dolomite, pink, sandy, in part oolitic, massive. Crystalline pink dolomite at base
10'	Sandstone, dolomitic, purple-grey, cross-bedded, with quartz grit and red granules. Lenticular beds, probably channel fills
12'	Dolomite, stromatolitic, with bioherms of Katavia costata.
variable	Limestone, pale grey, silty. Variable thickness. Lenses of dolomitic sandstone
160' approx.	Limestone, grey, crystalline, oolitic, with large, randomly oriented oolitic intraclasts. Bioherms of Acaciella augusta and Inzeria conjuncta, of variable thickness

Transition:

100'	Interbedded siltstone, grey, calcareous, thinly laminated, and limestone, pale grey, with stromatolitic (Omachtenia utschurica) bioherms and small channel fills of flat-pebble breccia

Tapley Hill Formation:
Siltstone, grey, very thinly laminated, calcareous

3. Section of the Brighton Limestone equivalent, Mundallio Creek

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple and grey, ripple-marked
Brighton Limestone:

3'	Thinly interbedded dolomite and purple shale
18'	Dolomite, pink, sandy, thick-bedded. Upper part with thin purple shale interbeds, and concave-upward structures
46'	Limestone, stromatolitic, with green and grey lamination. Cleaved in part. Acaciella augusta
43'	Limestone, medium to thick bedded, with stylolites, mud-flake breccia
40'	Limestone, pale grey, stromatolitic, laterally linked and pseudocolumnar; may include Omachtenia utschurica

Transition:

100'	Siltstone, grey, thinly laminated, with 1' to 2' lenticular stromatolitic limestone interbeds

Tapley Hill Formation:
Siltstone, thinly bedded, cleaved, slightly calcareous

4. Section of the Brighton Limestone equivalent, Buckaringa Hill

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple, with a few very thin dolomite interbeds
Transition:

38'	Interbedded shale, purple, ripple-marked, 2" arkosic sandstone bands with red granules, and dolomite, pink-buff, very thinly bedded, partly with disrupted bedding and concave-upward structures

Brighton Limestone:

11'	Dolomite, pink, oolitic
6'	Dolomite, massive, sandy
13'	Limestone, stromatolitic, highly cleaved
13'	Limestone, oolitic, weathered
3'	Dolomite, massive, possibly oolitic
21'	Limestone, oolitic, weathered
6'	Limestone, massive, grey, with partly dolomitized ooids and oolitic intraclasts
14'	Limestone, stromatolitic, highly cleaved
46'	Limestone, stromatolitic, deeply weathered
18'	Limestone, including three 2' thick bioherms, possibly Acaciella augusta, but columns not entirely discrete

Transition:

22'	Interbedded limestone, massive, pale grey, and green slate
34'	Siltstone, flaggy, laminated, calcareous
29'	Limestone, medium bedded, stromatolitic, pseudocolumnar
16'	Siltstone
2'	Limestone, flat-pebble breccia
33'	Siltstone
2'	Limestone, flat-pebble breccia

Tapley Hill Formation:
Siltstone, flaggy, calcareous, finely laminated

5. Section of the Brighton Limestone, Melrose Township
(Thicknesses uncertain due to poor outcrop and faulting)

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple, oscillation ripple-marked, with thin interbeds gritty sandstone. Current direction consistently E-W on 3 bedding planes
Brighton Limestone:

58'	No outcrop
57'	Patchy outcrops of dolomite, buff, brecciated
44'	Poorly outcropping grey dolomite; bioherm of Boxonia melrosa
70'	Dolomite, pale grey, pseudocolumnar stromatolitic
7'	Dolomite, pale buff, with bioherm of Boxonia melrosa; columns are inclined at the bioherm margins
8'	Limestone, medium bedded, structureless

Tapley Hill Formation:
Siltstone, very thinly laminated, grey

6. Section of the Brighton Limestone, Pichi Richi Pass

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple, highly cleaved
Brighton Limestone:

6'	Dolomite, buff, massive, sandy, with intraclasts
20'	Siltstone, calcareous, laminated
19'	Dolomite, buff, massive, sandy, with intraclasts
25'	Siltstone, calcareous, laminated
20'	Dolomite, buff, massive, sandy, with intraclasts

Tapley Hill Formation:
Slate, calcareous, thinly laminated

7. Section of the Brighton Limestone, Horrocks Pass

Umberatana Group:
Lower Willochra Formation: (not measured)
Shale, purple, ripple-marked, with siltstone interbeds
Brighton Limestone:

9'	Limestone, grey, massive, sandy
16'	Limestone, grey, sandy, poorly outcropping
55'	Limestone, grey, sandy and gritty, cross-bedded

Transition:

101'	Limestone, medium grey, medium bedded, wrinkly-laminated, with very fine intraclasts, interbedded in calcareous siltstone
57'	Siltstone, very calcareous, and silty limestone, flaggy
17'	Limestone, sandy, and calcareous sandstone, filling a channel

Tapley Hill Formation:
Siltstone, calcareous, thinly laminated, flaggy

8. Section of part of the Umberatana Group, east of Yednalue (at 138° 46'E, 32°02'S)

Umberatana Group:
Tarcowie Siltstone:
Upper part of the formation not measured

22'	Sandstone, grey, silty, very fine grained
54'	Slate, grey
24'	Sandstone, grey, calcareous, medium bedded
135'	Slate, grey, calcareous

Etina Formation:

38'	Limestone, stromatolitic, of wavy-laminated bioherms, 20' long, separated by sandy limestone
431'	Shale and slate, grey, laminated
136'	No outcrop
71'	Limestone, massive, sandy
68'	Limestone, sandy, wrinkly-laminated, in part with deformed stromatolite columns
165'	Limestone, thick-bedded, sandy and gritty
50'	Limestone, sandy, poorly outcropping
314'	Limestone, pale grey, sandy, flaggy to massive

Tarcowie Siltstone:

123' Shale, thinly bedded, weathered
717' Siltstone, pale green-grey, fine sandy
254' Siltstone, green-grey, medium bedded
143' Siltstone, green-grey, thinly bedded

Brighton Limestone equivalent:

144' Limestone, grey, oolitic, with large oolitic intraclasts, slightly rounded. Possible stromatolite bed (Inzeria multiplex) not located in situ
125' Poor outcrop
124' Limestone, pale grey, sandy, with large intraclasts
296' Limestone, pink, poorly outcropping, cleaved. May be in part
approx stromatolitic
204' Limestone, pink, fractured
20' Limestone, stromatolitic, with columns very closely spaced; Inzeria multiplex, with sandy interspaces
172' Limestone, pink, flaggy, fractured
38' Limestone, pale buff-grey, finely crystalline. Fractured
84' Limestone, oolitic, pale grey, massive
32' Limestone, oolitic, with fine mud-flake breccias
204' Limestone, dark grey, oolitic, medium-bedded, irregularly laminated, sandy. Partly cross-bedded. Massive in upper part

Tapley Hill Formation:

Siltstone, calcareous, grey, laminated, flaggy

9. Section of part of the Umberatana Group, 2 miles east of Warcowie

Wilpena Group: (not measured)

Nuccaleena Formation:

Dolomite, pink, flaggy

Umberatana Group:

Elatina Formation:

63' Sandstone, red, fine grained, cross-bedded, heavy mineral laminated
96' Sandstone, brick-red, soft, silty, gritty

Trezona Formation:

173' Shale, greenish- to purplish-grey
17' Three thin lenticular beds limestone, pink, laminated
100' Shale, greenish- to purplish-grey
28' Shale, purple-grey
4' Limestone, pink, mud-flake breccia

Enorama Formation:

645' Shale, green and grey
100' Shale, chocolate, very thinly bedded
99' Shale, calcareous, very thinly bedded
98' Shale, deeply weathered
198' Shale, olive-green weathering
97' No outcrop

Etina Formation:

99' Shale, calcareous, grey, with thin 1" silty limestone interbeds
225' No outcrop
300' Limestone, medium bedded to massive, sandy, grey but pinkish at base

Unnamed siltstones:

131'	No outcrop
212'	Shale, brownish grey, thinly, evenly laminated
210'	No outcrop
196'	Shale, grey, laminated
98'	Sandstone, fine grained, calcareous, buff weathered
100'	No outcrop
99'	Siltstone, grey, calcareous, laminated, flaggy
	Unmeasured: Siltstone, finely laminated, with a few massive siltstone interbeds

10. Section of part of the Etina Formation, east of Blinman

Uppermost approx. 400' of section were not measured

65'	Limestone, flaggy, irregularly wavy-laminated
28'	Limestone, sandy, with thin pebbly bands
123'	Limestone, sandy, banded
50'	Limestone, sandy, wavy-laminated
33'	Limestone, massive, gritty, cross-bedded
48'	Limestone, sandy, flaggy, with oscillation ripple marks (direction 130^{0}- 310^{0})
57'	Limestone, massive, sandy and gritty, cross-bedded
51'	Limestone, silty, medium bedded, with gritty limestone interbeds
91'	Siltstone, calcareous, thinly bedded
154'	No outcrop
25'	Shale, chocolate, very thinly bedded
56'	No outcrop
29'	Limestone, sandy, with interbeds angular breccia
23'	Limestone, stromatolitic, irregularly pseudocolumnar, with interbeds sandy limestone
28'	Limestone, medium-bedded, sandy and pebbly
236'	Interbedded limestone, sandy, and siltstone, calcareous
72'	Limestone, with irregularly wavy-laminated stromatolites
77'	Limestone, pale grey, medium-bedded
66'	Limestone, with irregularly wavy-laminated stromatolites
110'	Limestone, pale grey, medium-bedded
42'	No outcrop
57'	Limestone, medium-bedded, silty
52'	Limestone, stromatolitic, with broad pseudocolumns, overlying massive flat-pebble breccia
28'	Interbedded limestone, silty, and irregularly wavy-laminated stromatolites. Sandy limestone at top
38'	Limestone, silty, thinly bedded
97'	Interbedded limestone, massive, gritty, cross-bedded, and irregularly wavy-laminated silty limestone
20'	Limestone, silty, pale grey, banded
5'	Limestone, massive, gritty
82'	Limestone, silty, poorly outcropping
114'	Shale, calcareous, with 6" interbeds calcareous siltstone
101'	Shale, chocolate-grey, very thinly bedded, with a few 4" interbeds limestone

135'	Shale, grey, calcareous, thinly bedded
67'	Limestone, sandy, massive, with intraclasts
41'	Limestone, stromatolitic, irregularly wavy-laminated, with interbeds of gritty limestone
19'	Limestone, gritty, massive
10'	Siltstone, calcareous, banded
23'	Limestone, gritty and sandy, with stylolites. Large-scale cross-bedding (current direction 225°)
3'	Limestone, massive, sandy, irregularly wavy-laminated
70'	Shale, green-grey calcareous
5'	Limestone, dark grey, massive, oolitic, with intraclasts
28'	Shale, green-grey, calcareous
3'	Siltstone, pale grey, massive, calcareous
27'	Interbedded siltstone, flaggy, and sandy limestone
6'	Limestone, massive, dark grey, oolitic, with intraclasts
40'	Limestone, pale grey, sandy, flaggy, with interbedded calcareous sandstone and siltstone
23'	Limestone, thinly bedded, oolitic, with intraclasts. Thin flaggy dolomite interbeds
16'	Limestone, medium bedded, sandy, with intraclasts
9'	Limestone, pale grey, massive, sandy, with irregular stylolites, and interbeds fine calcareous sandstone
24'	Sandstone, calcareous, massive, buff, very fine grained
18'	Sandstone, calcareous, buff-weathered, flaggy. (Base of the lowest limestone)
	Siltstone, grey, calcareous, very thick bedded

11. Section of part of the Umberatana Group, Big Ben Bore

	Wilpena Group:
	Nuccaleena Formation:
	Dolomite, pink, laminated, flaggy
	Umberatana Group:
	Elatina Formation:
6'	Quartzite, purple-grey, medium-bedded, with heavy mineral lamination
77'	Siltstone, red, poorly bedded, with gritty and conglomeratic bands, boulders up to 1' diameter
	Trezona Formation:
128'	Poor outcrop
47'	Shale, purple
51'	Interbedded shale, purple, sandstone, brown, fine grained, and limestone, pink, laminated, lenticular
40'	Shale, purple-grey
7'	Limestone, pink to grey, medium-bedded, wrinkly-laminated
	Enorama Formation:
1198'	Shale, pale green, with interbeds siltstone, medium bedded. Minor purplish-grey shales
	Wundowie Limestone: Upper Member:
12'	Dolomite, buff, crystalline
76'	Shale, reddish, poorly outcropping

	Wundowie Limestone: Middle Member:
6'	Dolomite, buff, medium-bedded
236'	Shale, reddish-brown at top, grading to greenish-grey at base
	Wundowie Limestone: Lower Member:
61'	Dolomite, pink, irregularly wavy bedded, grading down into stromatolitic bed of sloping pseudocolumns
28'	Dolomite, buff, sandy, medium-bedded. In part pebbly
	Amberoona Formation:
418'	Siltstone and shale, greenish-grey, poorly outcropping at base
	Balcanoona Formation: (thickness not measured accurately)
1500'	Dolomite, pure, pink to buff at top
approx.	Interbeds dolomite, buff, irregularly wavy-laminated, rarely with preserved pseudocolumns
	Dolomite, buff to brown, sandy, with a few interbeds calcareous shale

12. Section of part of the Umberatana Group, Roebuck Bore

	Wilpena Group:
	Ulupa Siltstone equivalent: (not measured)
	Shale, greenish weathering
	Nuccaleena Formation:
23'	Dolomite, buff, flaggy, with limonite pseudomorphs after pyrite
	Umberatana Group:
	Elatina Formation:
75'	Sandstone, pale brown, massive, in part gritty, felspathic, in part quartzitic
	Enorama Formation:
450'	Shale, green-grey, poorly outcropping at top; grading to purplish-grey at the base
	Wundowie Limestone: Upper Member:
6'	Limestone, pale grey, irregularly wavy-laminated
3'	Limestone, flat-pebble breccia
18'	Shale, greenish-grey, very fissile
16'	Shale, reddish-brown, very fissile
	Wundowie Limestone: Middle Member:
10'	Limestone, pink-grey, irregularly wavy-laminated
4'	Limestone, pale grey, sandy
2'	Limestone, contiguous low-domed bioherms, Linella munyallina
143'	Shale, greenish-grey, silty, with calcareous siltstone interbeds
	Wundowie Limestone: Lower Member:
11'	Limestone, pale grey, massive, with irregularly wavy stromatolites
20'	As above, but with distinct pseudocolumns
11'	Limestone, gritty, cross-bedded, with intraclasts. Channel cross-beds
48'	Limestone, thinly bedded, with disrupted laminae
	Amberoona Formation:
411'	Shale, olive-green
	Balcanoona Formation:
9'	Limestone, pale grey, with intraclasts
9'	Limestone or dolomite, red, crystalline

9'	Limestone, pale grey, with intraclasts
108'	Shale, green
47'	Limestone, grey-buff, irregularly, finely laminated
85'	Limestone, grey-buff, with laterally linked and small bulbous stromatolites
116'	Limestone, sandy, massive and thinly bedded
81'	Dolomite, buff, crystalline, fine sandy
130'	Limestone, blue-grey, thinly, in part wavy-laminated, with micro-unconformities. Top 6' dolomitized
16'	Limestone, blue-grey, with irregularly wavy-laminated stromatolites
22'	Limestone, brown, silty, flaggy, with interbedded shale
	Yankaninna Formation:
87'	Siltstone, brown weathering, calcareous, thinly laminated
10'	Dolomite, poorly laminated, yellow weathering
13'	Siltstone, brown weathering, calcareous, thinly laminated
19'	Interbedded limestone, sandy, massive, and limestone, wavy-bedded
81'	Shale and siltstone, calcareous, with laterally linked stromatolitic limestone interbeds

(Section discontinued)

13. Section of part of the Umberatana Group, near Teatree O.S.

	Umberatana Group:
	Angepena Formation: (not measured)
	Shale, dark purplish-brown, with thin interbeds siltstone
	Wundowie Limestone: Upper Member:
8'	Dolomite, buff, finely crystalline, sandy, with relict ooids, intraclasts
	Angepena Formation:
151'	Shale, chocolate to purple (Section may be disturbed by faulting)
	Wundowie Limestone: Middle Member:
15'	Limestone, pale brownish-grey, with irregular, wavy stromatolites
	Angepena Formation:
129'	Shale, greenish-grey, poorly laminated, grading to reddish at base. 2" interbeds of calcareous siltstone
	Wundowie Limestone: Lower Member:
25'	Limestone, pale grey, with Tungussia etina, including parallel-branching columns. Bioherms overlie and interfinger with sandy and oolitic limestone
12'	Limestone, oolitic, with intraclasts
	Amberoona Formation: (not measured)
	Shale, greenish-grey

14. Section of part of the Umberatana Group, 4½ miles west of Angepena

	Wilpena Group:
	Purple micaceous shale
	Umberatana Group:
	Elatina Formation:
37'	Sandstone, flaggy, soft, gritty
14'	Quartzite, medium-bedded, medium-grained, arkosic

36'	Greywacke, purplish-grey, gritty, with angular rock fragments up to 2 cm
13'	Sandstone, purplish-grey, silty, with rounded red granules
-	(Possible erosional contact)
	Enorama Formation:
5'	Siltstone, calcareous, purplish grey
172'	Slate, greenish-grey, laminated
200'	Shale, greenish-grey, laminated
103'	Poor outcrop; some purple shale exposed
30'	Shale, purple-grey
	Wundowie Limestone: Upper Member:
17'	Limestone, grey-brown, cleaved
(5'	Quartz-calcite vein)
24'	Shale, purplish-grey
	Wundowie Limestone: Middle Member:
3'	Limestone, pale grey, irregularly laminated
4'	Limestone, sandy, gritty, flaggy
3'	Limestone, pale brown-grey, with chloritic partings
87'	Shale, pale blue-grey
	Wundowie Limestone: Lower Member:
20'	Limestone, pink-grey, finely crystalline, cleaved
2'	Limestone, sandy
	Angepena Formation:
106'	Shale, greenish-grey, with minor calcareous interbeds
98'	Shale, purplish-grey, laminated
49'	Shale, brown, dolomitic
8'	Poor outcrop: dolomite, brecciated, gossanous
23'	Shale, buff weathered
	Balcanoona Formation:
59'	Dolomite, ferruginous
84'	No outcrop
66'	Dolomite, buff, silicified and ferruginous
604'	Dolomite, pale buff, laminated, finely crystalline. Small-scale slump structures in lower part
196'	Dolomite, buff, massive, crystalline
10'	Dolomite, buff, massive. Stromatolite bioherm of indeterminate boundaries, poorly preserved
248'	Dolomite, buff, massive
	Yankaninna Formation: (not measured)
	Siltstone, grey, calcareous, deeply weathered

15. Section of part of the Umberatana Group, Maynards Well

	Wilpena Group:
	Nuccaleena Formation: (not measured)
	Dolomite, pink, flaggy
	Umberatana Group:
	Elatina Formation:
28'	Sandstone, coarse, partly gritty, arkosic, medium-bedded
5'	Siltstone, grey-green, massive, partly gritty
	Trezona Formation:
7'	Shale, grey-green

16'	Shale and siltstone, grey-green, with three 1' bands of limestone mud-flake breccia, pink-grey
26'	Siltstone, green, with limonite pseudomorphs after pyrite
2'	Limestone mud-flake breccia
	Enorama Formation:
34'	Siltstone, calcareous, grey, flaggy to massive
1788'	Siltstone, greenish-grey, flaggy, with occasional interference ripples near top
	Wundowie Limestone: Upper Member:
3'	Limestone, pale grey, massive, crystalline, irregularly wavy bedded
4'	Dolomite, buff, irregularly wavy bedded; contiguous bioherms
35'	Poor outcrop
	Wundowie Limestone: (Middle and Lower Members not differentiated)
153'	Limestone, pale grey, wavy bedded, with shale interbeds poorly exposed
	Amberoona Formation:
85'	Siltstone and shale, green-grey
	Balcanoona Formation:
24'	Limestone, pale grey, irregularly wavy bedded
25'	Limestone, grey, flaggy, flat-laminated
37'	Limestone, massive, irregularly wavy-laminated
45'	Limestone, massive, dark grey, oolitic, with fine intraclasts
44'	Limestone, dark grey, irregularly wavy-laminated, with inter-bedded small cumulate and laterally linked stromatolites
	Yankaninna Formation: (not measured)
	Limestone, pale grey, silty, and calcareous siltstone. Current ripples of 6" wavelength

16. Section of part of the Umberatana Group, near Wundowie Bore

	Wilpena Group:
	Nuccaleena Formation:
42'	Dolomite, pink, flaggy, with purple shale interbeds at the top
	Umberatana Group:
	Elatina Formation:
17'	Grit, pink, calcareous, and fine pebbly conglomerate
13'	Sandstone, purple-grey, gritty, with trough cross-bedding
4'	Sandstone, purple, massive, fine grained, passing laterally into calcareous grits
38'	Siltstone, purple-grey, flaggy
2'	Sandstone, calcareous, gritty, lensing out to the west (may be filling an erosional channel)
	Trezona Formation:
3'	Limestone, pink, mud-flake breccia
2'	Siltstone, green, calcareous, with mud-flake breccia limestone at base
61'	Shale, silty, green-grey, laminated
21'	Limestone, pink, mud-flake breccia limestone interbeds in green shale
85'	Shale, grey-green, silty, with several 1' interbeds of stromatolitic or mud-flake breccia limestone

Enorama Formation:

1000' Shales, greenish-grey, with minor siltstone interbeds, grading to purplish-grey at the base

Wundowie Limestone: Upper Member:

21' Limestone, pale grey, stromatolitic, irregularly wavy-laminated, with numerous concordant stylolites. Domed biostrome

39' Shale, purplish-grey

Wundowie Limestone: Middle Member:

13' Limestone, stromatolitic, irregularly wavy-laminated. Domed biostrome. In part sandy

110' Shale, greenish-grey, partly calcareous

Wundowie Limestone: Lower Member:

14' Limestone, irregularly wavy-laminated

8' Limestone, stromatolitic, with long straight columns (possibly altered Linella munyallina). Domed biostrome

Amberoona Formation:

538' Siltstone, blue-grey, poorly outcropping

Balcanoona Formation:

47' Limestone, dark grey, with wavy stylolites

32' Limestone, dark grey, massive, in part stromatolitic

Dolomite, buff, massive

(section continued 2 miles to the west on Patsy Springs-Wundowie Bore Road)

66' Shale, purple-grey

77' Limestone, dark grey, oolitic, with intraclasts, with large-scale cross-cutting dolomitization

67' Limestone, massive, oolitic, with wavy-laminated stromatolite interbeds

82' Limestone, oolitic, massive

191' Dolomite, buff to pale grey, massive. No internal structures preserved. Locally brecciated and veined

194' Dolomite marble, coarsely crystalline

134' Dolomite, pale grey, massive

Dolomite, pale grey, massive, in part with broad wavy lamination

(section not measured below this point, but massive dolomites extend down for at least 800')

17. Section of part of the Umberatana Group, Burr Well

Enorama Formation: (not measured)

Siltstone, flaggy, laminated, partly oscillation ripple-marked, greenish to purplish-grey, grading down into shale

Wundowie Limestone: Upper Member:

9' Limestone, consisting of 6' spherical bioherms, contiguous, of Jurusania burrensis, capped by domed biostrome, same stromatolite

326' Shale, silty, grey-green

Wundowie Limestone: Middle Member:

5' Limestone, stromatolitic, flat-laminated to cumulate at base, and Inzeria cf. tjomusi above a stylolitic zone. Capped by sandy limestone

61'	Siltstone and shale, flaggy, calcareous, minor interbeds limestone, flaggy. Sandy limestones in channel fills at base
	Wundowie Limestone: Lower Member:
4'	Limestone, gritty, massive
3'	Shale, silty and calcareous, containing both contigubus and isolated bioherms of Linella munyallina
23'	Shale, calcareous, with interbeds flaggy limestone
7'	Limestone, sandy, with thin interbeds of calcareous siltstone
	Amberoona Formation:
154'	Shale, greenish-grey, laminated
	Balcanoona Formation:
33'	Limestone, silty, banded
14'	Limestone, dark grey, thinly laminated
5'	Limestone, medium-bedded, oolitic, with fine intraclasts
4'	Limestone, stromatolitic, laterally linked
3'	Limestone, dark grey, oolitic
2'	Limestone, dark grey, stromatolitic, probably Linella ukka
13'	Limestone, massive, oolitic, patchily dolomitized
2'	Limestone, dark grey, with Linella ukka
23'	Limestone, dark grey, oolitic, with rounded intraclasts
1'	Limestone, silty, banded
56'	Shale, green-grey, silty
1'	Limestone, silty, banded
1'	Limestone, stromatolitic, with Linella ukka
2'	Shale, green-grey
4'	Limestone, with Linella ukka
6'	Limestone, massive, dark grey, with rounded intraclasts
4'	Shale, green-grey, calcareous
2'	Limestone, with Linella ukka, bridged at the top
38'	Shale, green-grey, calcareous, with thin interbeds silty limestone. Limestone, dark grey, thick-bedded, banded, silty. Extensively dolomitized along strike

Section of the Balcanoona Formation, approximately 100 yds to the east

	Amberoona Formation:
	Balcanoona Formation:
98'	Limestone, blue-grey, oolitic
98'	Siltstone, grey, flaggy, passing up into silty, banded limestone
97'	Limestone, blue-grey, oolitic and with rounded intraclasts
156'	Limestone, buff-grey, massive. Largely replaced by dolomite
125'	Limestone, buff-grey, massive, coarsely oolitic, sandy
15'	Dolomite, buff, massive, finely crystalline
164'	Limestone, blue-grey, oolitic
75'	Limestone, dark grey, oolitic, with silty, cross-bedded interbeds. Numerous beds with dolomitic intraclasts
87'	Dolomite, pink, medium to thick-bedded, with interbeds silty or gritty, cross-bedded
23'	Dolomite, pink, thinly lamihated, cross-bedded
71'	Dolomite, pink, massive, with sandy and silty bands
93'	Dolomite, pink, massive to medium-bedded
123'	Dolomite, buff, massive

150'	Limestone, with irregularly columnar stromatolites, interspaces dolomitized
97'	Limestone, dark grey, partly dolomitized, with irregular stromatolites, and well-bedded fine, flat-pebble breccia beds
	Yankaninna Formation: (not measured)
	Limestone, flaggy, silty, grading down into calcareous siltstone

18. Section of the Wundowie Limestone, 1 mile south of the Arkaroola Airstrip

	Angepena Formation:
	Shale, reddish-brown
	Wundowie Limestone: Upper Member:
6'	Limestone, with irregularly wavy laterally linked stromatolites
8'	Limestone, with bioherms of variable size, Linella munyallina, overlying flat-pebble breccia
4'	Limestone, sandy, irregularly laminated
56'	Shale, chocolate, with 2' interbeds limestone, flaggy, silty, grey
	Wundowie Limestone: Middle Member:
19'	Limestone, pale grey, stromatolitic, mainly laterally linked, but with minor columnar intercalations
110'	Shale, purplish-grey, calcareous, with interbeds siltstone, grey, flaggy
	Wundowie Limestone: Lower Member:
11'	Limestone, pale grey, with laterally linked stromatolites
	Angepena Formation:
	Siltstone, dark brown, calcareous, flaggy

19. Section of part of the Umberatana Group, near Myrtle Springs

	Umberatana Group:
	?Trezona Formation:
	Slate, purple
17'	Limestone, pink, stromatolitic, highly cleaved, recrystallized
305'	Slate, purple, weathered
29'	Limestone, pink, partly stromatolitic and partly mud-flake breccia, cleaved
	Enorama Formation:
764'	Slate, grey, calcareous, laminated
	Wundowie Limestone: Upper Member:
20'	Limestone, pale grey, sandy
32'	No outcrop
	Wundowie Limestone: Middle Member:
28'	Limestone, dark grey, stromatolitic
12'	Limestone, gritty, felspathic, containing 5 m bioherms of Linella munyallina
7'	Limestone, gritty
7'	Smaller bioherms Linella munyallina
11'	Limestone, pale pink-grey, with wavy-laminated stromatolites
29'	Limestone, pale grey, sandy, with intraclasts
41'	Shale, poorly outcropping

	Wundowie Limestone: Lower Member:
25'	Shale, poorly outcropping, with thin limestone interbeds
10'	Limestone, pale grey, mottled, possibly with small recrystallized columnar stromatolites and larger, cumulate stromatolites
	Amberoona Formation:
215'	Shale, deeply weathered
	Balcanoona Formation:
4'	Limestone, irregularly wavy-laminated
12'	No outcrop
34'	Limestone, medium-grey, irregularly laminated, with numerous stylolites. Interbeds of contiguous stromatolitic bioherms, oolitic limestone and intraclast limestone
4'	Limestone, pale grey, sandy, massive
23'	Limestone, medium grey, irregularly mottled, with some irregular stromatolites
43'	Limestone, silty, massive, thinly banded, in part slightly cross-beddéd
	Yankaninna Formation:
97'	Siltstone, calcareous, thinly laminated, with interbeds silty limestone
33'	Siltstone, thinly laminated, calcareous, with thin interbeds limestone, dark grey, stromatolitic and partly with curled intraclasts
53'	No outcrop
7'	Limestone, dark grey, with small cumulate stromatolites
23'	Limestone, medium grey, laminated, with flaggy, silty interbeds
24'	Limestone, dark grey, intraformational breccia
	Tapley Hill Formation:
	Siltstone, dark grey, very thinly laminated

TABLE VI

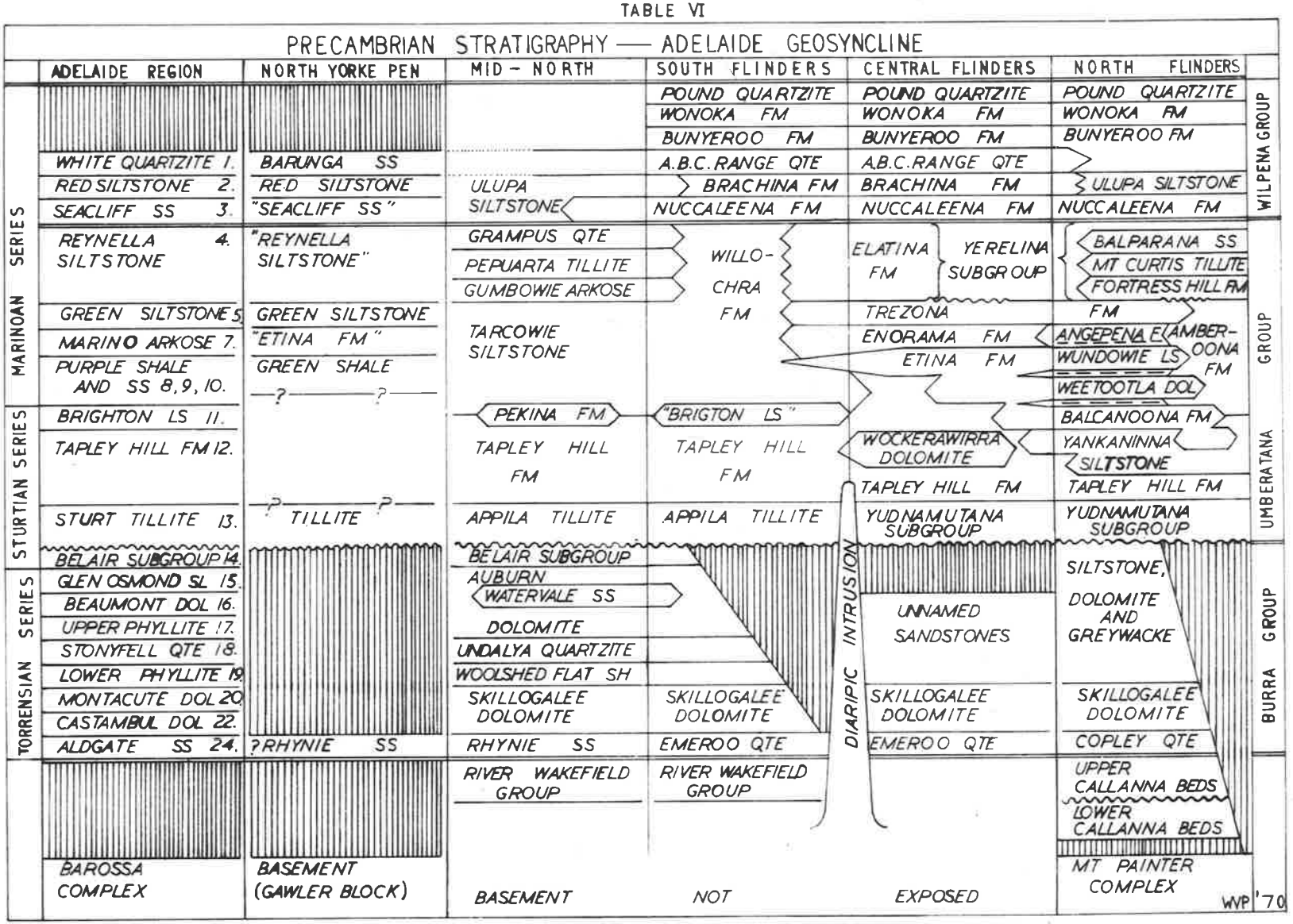

PRECAMBRIAN STRATIGRAPHY — ADELAIDE GEOSYNCLINE
ADELAIDE REGION
NORTH YORKE PEN
MID - NORTH
SOUTH FLINDERS
CENTRAL FLINDERS
NORTH FLINDERS
MARINOAN SERIES
STURTIAN SERIES
TORRENSIAN SERIES
WILPENA GROUP
UMBERATANA GROUP
BURRA GROUP
POUND QUARTZITE
WONOKA FM
BUNYEROO FM
A.B.C. RANGE QTE
BRACHINA FM
NUCCALEENA FM
ULUPA SILTSTONE
WHITE QUARTZITE 1.
RED SILTSTONE 2.
SEACLIFF SS 3.
BARUNGA SS
RED SILTSTONE
"SEACLIFF SS"
REYNELLA SILTSTONE 4.
"REYNELLA SILTSTONE"
GRAMPUS QTE
PEPUARTA TILLITE
GUMBOWIE ARKOSE
WILLO-CHRA FM
ELATINA FM
YERELINA SUBGROUP
BALPARANA SS
MT CURTIS TILLITE
FORTRESS HILL FM
GREEN SILTSTONE 5.
GREEN SILTSTONE
TREZONA FM
MARINO ARKOSE 7.
"ETINA FM"
TARCOWIE SILTSTONE
ENORAMA FM
ANGEPENA FM
AMBER-OONA FM
PURPLE SHALE AND SS 8, 9, 10.
GREEN SHALE
ETINA FM
WUNDOWIE LS
WEETOOTLA DOL
BRIGHTON LS 11.
PEKINA FM
"BRIGTON LS"
BALCANOONA FM
TAPLEY HILL FM 12.
TAPLEY HILL FM
WOCKERAWIRRA DOLOMITE
YANKANINNA SILTSTONE
TAPLEY HILL FM
STURT TILLITE 13.
TILLITE
APPILA TILLITE
YUDNAMUTANA SUBGROUP
BELAIR SUBGROUP 14.
GLEN OSMOND SL 15.
BEAUMONT DOL 16.
UPPER PHYLLITE 17.
STONYFELL QTE 18.
LOWER PHYLLITE 19.
MONTACUTE DOL 20.
CASTAMBUL DOL 22.
ALDGATE SS 24.
BELAIR SUBGROUP
AUBURN
WATERVALE SS
DOLOMITE
UNDALYA QUARTZITE
WOOLSHED FLAT SH
SKILLOGALEE DOLOMITE
RHYNIE SS
EMEROO QTE
DIAPIRIC INTRUSION
UNNAMED SANDSTONES
SILTSTONE, DOLOMITE AND GREYWACKE
COPLEY QTE
UPPER CALLANNA BEDS
LOWER CALLANNA BEDS
RIVER WAKEFIELD GROUP
BAROSSA COMPLEX
BASEMENT (GAWLER BLOCK)
MT PAINTER COMPLEX
BASEMENT
NOT EXPOSED
WVP '70

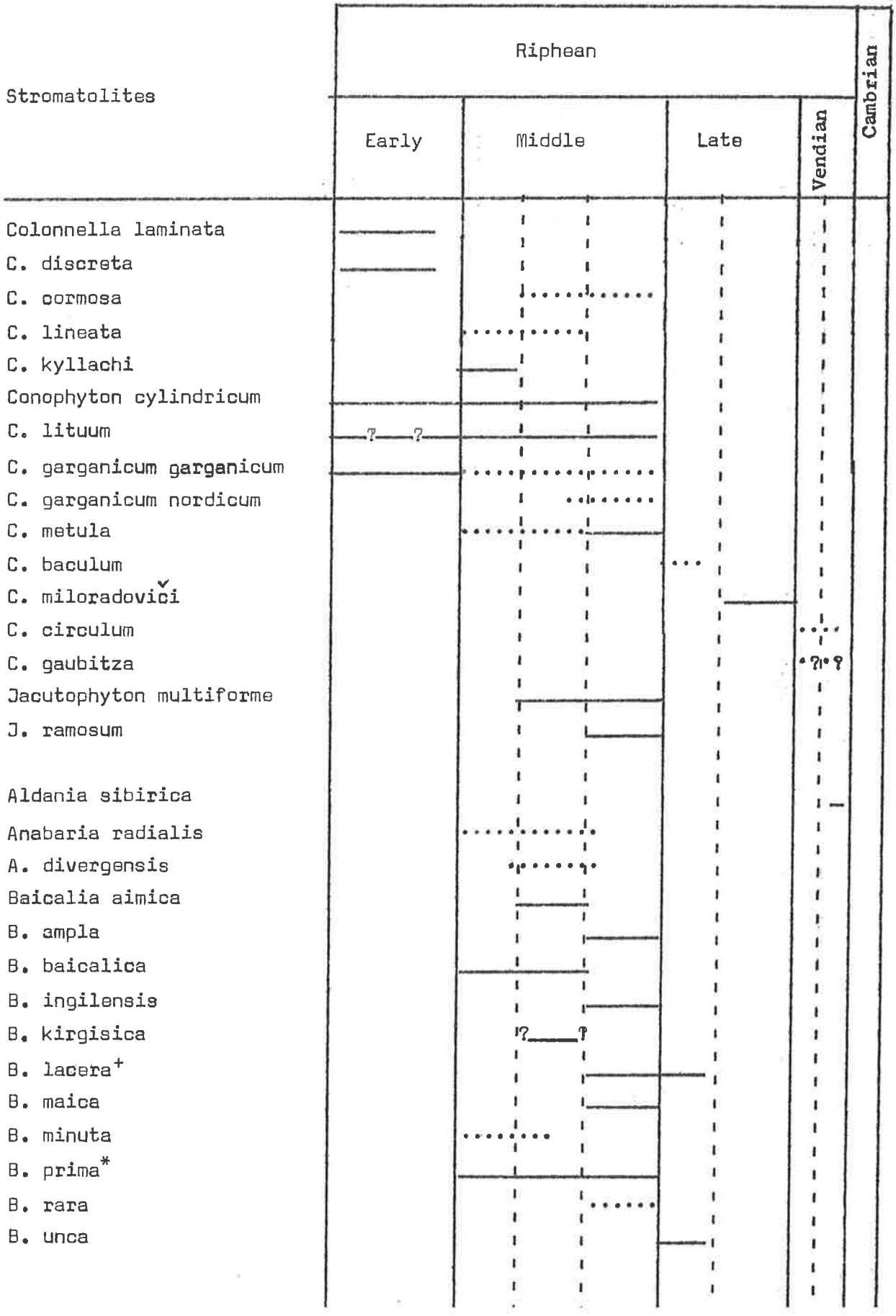
Table IX: Slightly modified from Walter (1970, Table 6)

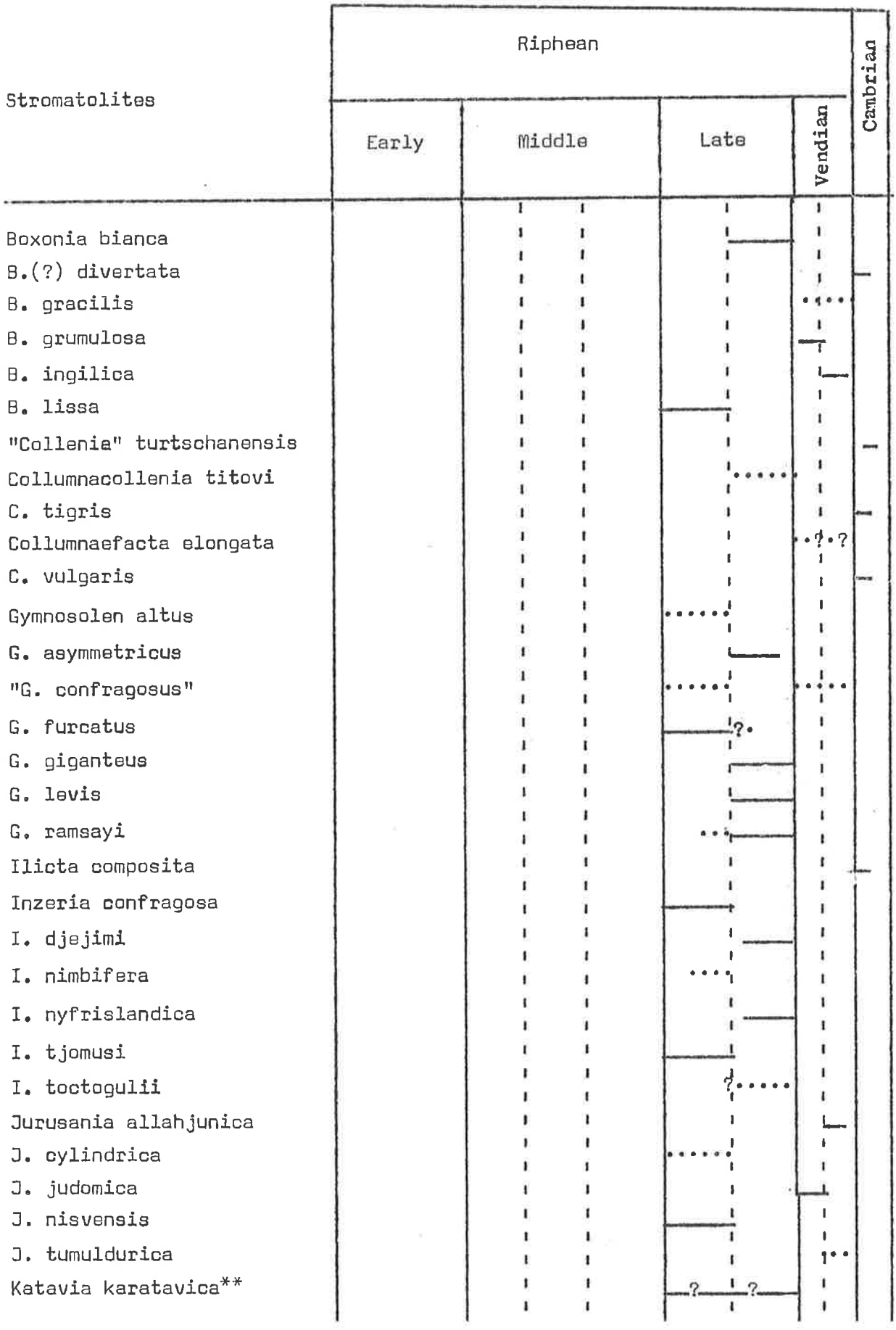
The time ranges of stromatolites in the USSR. The non-branching columnar groups Colonnella and Conophyton are placed first, then the branching conophyton-like group Jacutophyton, followed by columnar branching and then non-columnar stromatolites. The widths of the columns in the table representing the Early, Middle and Late Riphean, Vendian and Cambrian are proportional to the time spans of these units; this is not so for the smaller subdivisions of the Middle and Late Riphean and Vendian, which are not yet widely accepted. A time range is represented by a dotted line (.....) if it is not known precisely relative to these subdivisions. Doubts expressed in the Russian literature about the time ranges are marked with queries (?). Taxa of doubtful validity are indicated by quotation marks ("), while a query (?) indicates doubt about the classification of a taxon. The limits of the time ranges are not precise

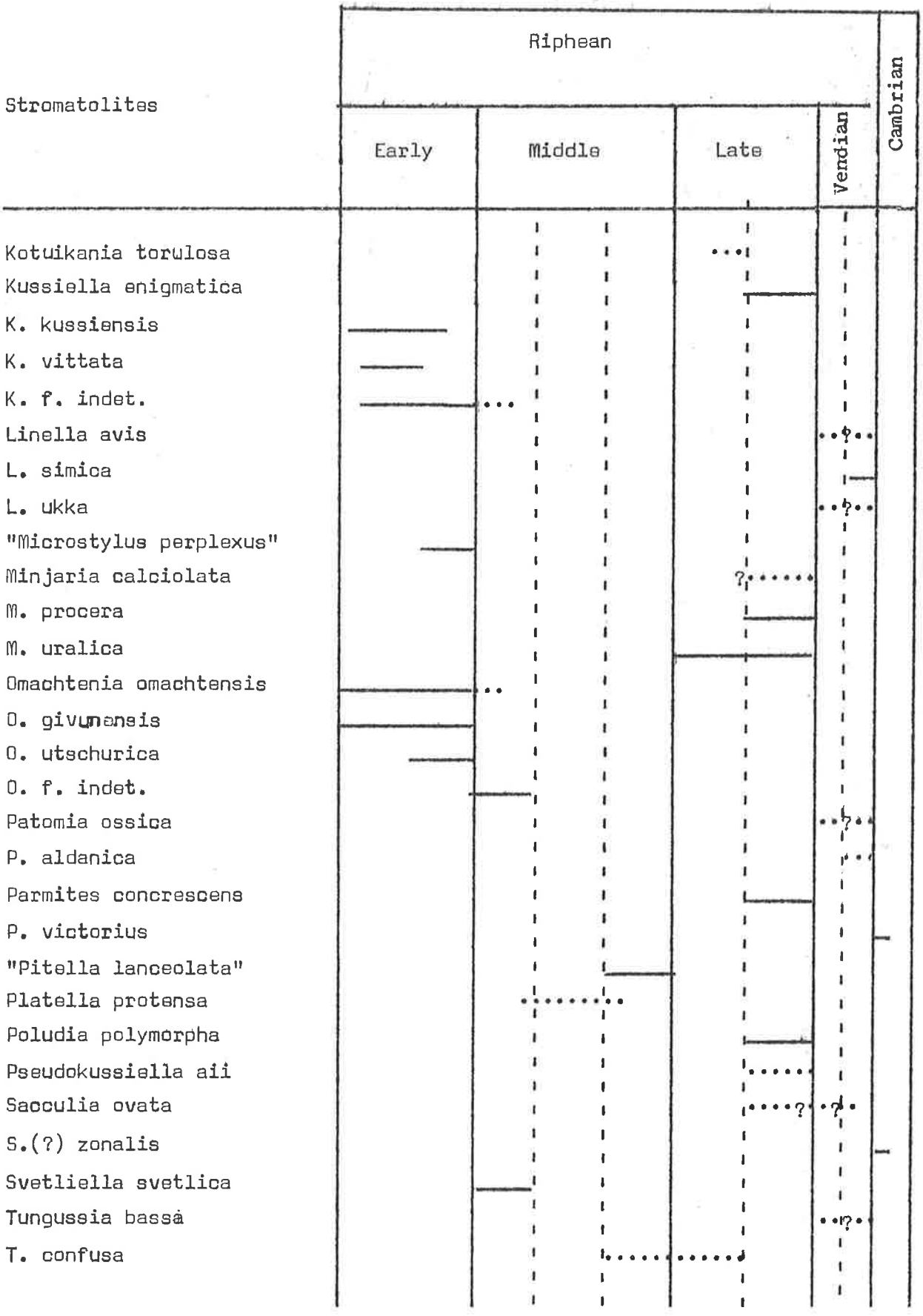
\+ Komar & Semikhatov (1969) do not show B. lacera extending into the Late Riphean

* Komar & Semikhatov (1969) do not show B. prima in the early Middle Riphean

** Raaben (1969a) places K. karatavica in the younger subdivision of the Late Riphean, although Krylov (1963) had placed it in the older Late Riphean


Stromatolites
Riphean
Cambrian
Early
Middle
Late
Vendian
Colonnella laminata
C. discreta
C. cormosa
C. lineata
C. kyllachi
Conophyton cylindricum
C. lituum
C. garganicum garganicum
C. garganicum nordicum
C. metula
C. baculum
C. miloradovici
C. circulum
C. gaubitza
Jacutophyton multiforme
J. ramosum
Aldania sibirica
Anabaria radialis
A. divergensis
Baicalia aimica
B. ampla
B. baicalica
B. ingilensis
B. kirgisica
B. lacera+
B. maica
B. minuta
B. prima*
B. rara
B. unca


Stromatolites
Riphean
Early
Middle
Late
Vendian
Cambrian
Boxonia bianca
B.(?) divertata
B. gracilis
B. grumulosa
B. ingilica
B. lissa
"Collenia" turtschanensis
Collumnacollenia titovi
C. tigris
Collumnaefacta elongata
C. vulgaris
Gymnosolen altus
G. asymmetricus
"G. confragosus"
G. furcatus
G. giganteus
G. levis
G. ramsayi
Ilicta composita
Inzeria confragosa
I. djejimi
I. nimbifera
I. nyfrislandica
I. tjomusi
I. toctogulii
Jurusania allahjunica
J. cylindrica
J. judomica
J. nisvensis
J. tumuldurica
Katavia karatavica**


Stromatolites
Riphean
Cambrian
Early
Middle
Late
Vendian
Kotuikania torulosa
Kussiella enigmatica
K. kussiensis
K. vittata
K. f. indet.
Linella avis
L. simica
L. ukka
"Microstylus perplexus"
Minjaria calciolata
M. procera
M. uralica
Omachtenia omachtensis
O. givumensis
O. utschurica
O. f. indet.
Patomia ossica
P. aldanica
Parmites concrescens
P. victorius
"Pitella lanceolata"
Platella protensa
Poludia polymorpha
Pseudokussiella aii
Sacculia ovata
S.(?) zonalis
Svetliella svetlica
Tungussia bassa
T. confusa

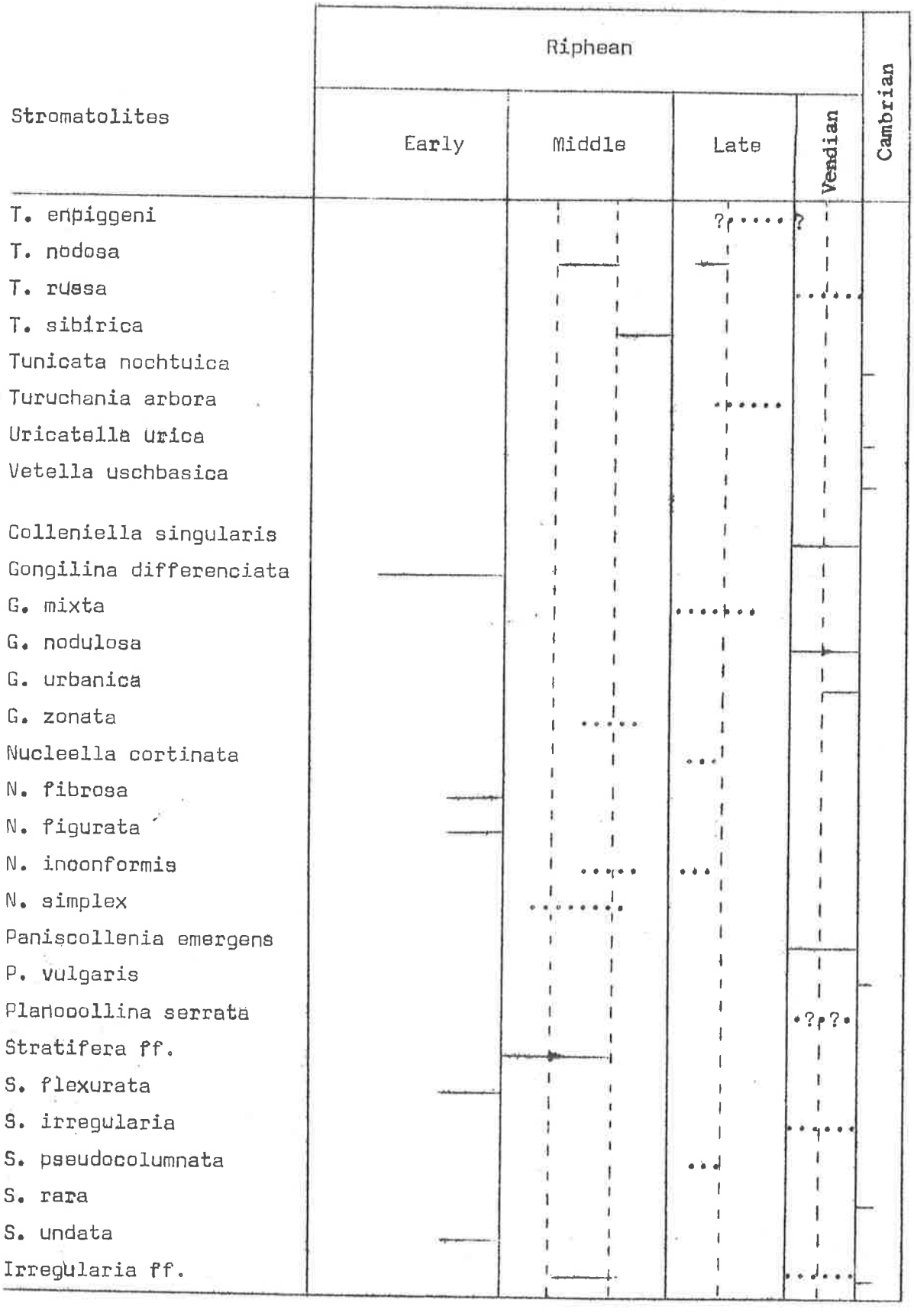

Stromatolites
Riphean
Early
Middle
Late
Vendian
Cambrian
T. enpiggeni
T. nodosa
T. russa
T. sibirica
Tunicata nochtuica
Turuchania arbora
Uricatella urica
Vetella uschbasica
Colleniella singularis
Gongilina differenciata
G. mixta
G. nodulosa
G. urbanica
G. zonata
Nucleella cortinata
N. fibrosa
N. figurata
N. inconformis
N. simplex
Paniscollenia emergens
P. vulgaris
Planocollina serrata
Stratifera ff.
S. flexurata
S. irregularia
S. pseudocolumnata
S. rara
S. undata
Irregularia ff.

TABLE X

Correlation of South Australian stromatolite-bearing sequences with those established in the USSR. Note that the vertical dimension is not drawn to scale (neither with respect to time nor thickness of sediments).

△ △ △ are the symbols for tillites

..... indicates correlations based on stromatolite assemblages

~~~~~ indicates an unconformity
~~~~~

TABLE X

	Rock Unit	Stromatolites	Correlation with USSR
Є	HAWKER GROUP	Acaciella angepena	CAMBRIAN
			----- 570 ± 10 m.y. -----
LATE ADELAIDEAN	WILPENA GROUP	Ediacara Fauna (Stromatolites not yet identified)	VENDIAN
	UMBERATANA GROUP	Kulparia kulparensis	----- 680 ± 20 m.y. -----
	Etina Fm Wundowie Ls Balcanoona Fm	Jurusania burrensis Inzeria cf. tjomusi Linella munyallina Tungussia etina Linella ukka	LATE RIPHEAN
	Brighton Ls	Katavia costata Boxonia melrosa Inzeria multiplex Inzeria conjuncta Acaciella augusta Omachtenia utschurica	..... Minyar Complex 760 to 680 m.y.
	Tapley Hill Fm	Gymnosolen ramsayi	
		Acaciella f. indet.	
EARLY ADELAIDEAN	BURRA GROUP		
			----- 950 ± 50 m.y. -----
	Skillogalee Dolomite	Baicalia burra Tungussia wilkatanna	..... Lakhandin Complex
	UPPER CALLANNA BEDS	Conophyton garganicum garganicum	MIDDLE RIPHEAN
	LOWER CALLANNA BEDS		

Table XI

The environments of growth of the better known South Australian stromatolites. The first five columns are based on direct observations in the field and in the laboratory; the other six are interpretative

TABLE XI

STROMATOLITE FORM	MODE OF OCCURRENCE	RELIEF OF COLUMNS	RELIEF OF BIOHERMS	DIASTEMS AND EROSION	TERRIGENOUS CLASTICS	CURRENT OR WAVE ENERGY	DEPTH ZONE	SALINITY	CONDITIONS OF OXIDATION	PALAEOGEOGRAPHIC SETTING	TRANSGRESSIVE OR REGRESSIVE
Acaciella augusta	Extensive tonguing or domed bioherms	0.5 to no more than 5 cm	0 to 2 m	Very rare	A little silt, sand in the interspaces	Very high, but reduced within bioherms	Intertidal to shallow subtidal	Probably normal	Probably oxidizing	Littoral, exposed to the open sea	Slowly regressive
Acaciella angepena	Domed and tabular bioherms	0.5 to no more than 5 cm	0 to 1 m	Very rare	Very variable sand content	Variable, low to moderate	Not known	Probably normal	Probably reducing	Not known	Possibly transgressive
Baicalia burra	Biostromes, rarely small bioherms	Up to 20 cm	At least 10 cm when biohermal	Contemporaneous erosion in the higher energy environments	Very little silt and sand	Very variable, low to very high, even within biostromes	May be less than 1 m	May reach hypersalinity	Variable: oxidizing to reducing	Sheltered lagoons or headlands exposed to wave action	Not known
Boxonia melrosa	Domed bioherms	More than 2 to 3 cm	Probably more than 2 m	Very rare	Negligible	Low, at least within bioherms	Not known	Possibly elevated	Probably strongly oxidizing	Possibly a sheltered littoral position	Probably regressive
Conophyton garganicum garganicum	Very thick bioherm or biostrome	More than 10 cm in the conical portions	Not known	Rare	Negligible	Possibly low	Not known	Possibly elevated	Uncertain: may be slightly reducing	Not known	Not known
Gymnosolen ramsayi	Not known, possibly biohermal	More than 2 to 3 cm	Not known	Slight contemporaneous erosion	Considerable silt	Low to moderate	Not known	Probably normal	Strongly reducing	Possibly on shoals above a rising diapir	Not known
Inzeria cf. tjomusi	Low domed bioherms	Not known	Less than 50 cm	Very rare	Considerable silt in the interspaces only	Very low within bioherms	Not known	Probably normal	Uncertain	Carbonate banks in the open sea	Sea level fluctuating with diapirism
Inzeria conjuncta	Domed bioherms	0.5 to no more than 5 cm	Possibly up to 2 m	Rare	Considerable sand in the interspaces	Very high, but reduced within bioherms	Intertidal to shallow subtidal	Probably normal	Probably oxidizing	Littoral, exposed to the open sea	Slowly regressive
Inzeria multiplex	Extensive bioherms	0.5 to no more than 5 cm	Not known	Rare	Extremely variable sand content	Low to moderate within bioherms	Possibly upper intertidal	Either elevated or normal	Strongly oxidizing	Littoral, & in a carbonate bank in the open sea	Probably regressive
Jurusania burrensis	Juxtaposed spherical bioherms	More than 2 to 3 cm	Up to 2 m	Very rare	Minor sand in interspaces	Low within bioherms	Not known, possibly more than 2 m	Probably normal	Probably oxidizing	Carbonate banks in the open sea	Sea level fluctuating with diapirism
Katavia costata	Domed bioherms	More than 2 to 3 cm	Up to 1 m	Very rare	Sand present in columns, abundant in interspaces	High even within bioherms	Upper intertidal	Probably elevated	Strongly oxidizing	Littoral, exposed to the open sea	Regressive
Kulparia kulparensis	Domed bed, possibly biostrome	Commonly 1 to 2 cm	Not known	Penecontemporaneous sand dykes	Coarse sand very abundant	Very high, even within the stromatolite bed	Intertidal to subtidal	Probably normal	Probably slightly reducing	Possibly littoral to the to the open sea	Not known
Linella ukka	Gently domed bioherms	More than 2 to 3 cm	0 to 50 cm	Very rare	Negligible	High even within bioherms	Intertidal to shallow subtidal	Probably normal	Possibly reducing	Carbonate banks in the open sea	Sea level fluctuating with diapirism
Linella munyallina	Juxtaposed domed bioherms	More than 2 to 5 cm	50 cm to 2 m	Rare	Sand content extremely variable	Variable, from low to moderate	Intertidal to subtidal	Probably normal	Variable: oxidizing to reducing	Carbonate banks in the open sea	Sea level fluctuating with diapirism
Omachtenia utschurica	Small domed bioherms	Commonly 1 to 2 cm	10 to 20 cm	Erosion of silts prior to stromatolite growth	Very little terrigenous clastics	Variable, from low to moderate	Low intertidal to shallow subtidal	Probably normal	Probably slightly reducing	Littoral, exposed to the open sea	Regressive
Tungussia etina	Tonguing bioherms	More than 2 to 3 cm	0 to 50 cm	Slight contemporaneous erosion of laminae	Very variable silt and sand content	Very variable, from low to very high	Intertidal to shallow subtidal	Probably normal	Variable: oxidizing to slightly reducing	Carbonate banks in the open sea	Sea level fluctuating with diapirism
Tungussia wilkatanna	Biostromes	More than 2 to 3 cm	------	Slight contemporaneous erosion of laminae	Very little terrigenous clastics	Low or moderate	Possibly less than 1 m	Possibly elevated	Oxidizing, possibly also reducing	Probably in sheltered lagoons	Not known

Plate 1

Acaciella augusta: Brighton Limestone, Depot Creek. Vertical sections showing mode of occurrence.

(a) Margin of a bioherm (pale coloured at right of photograph) intertonguing laterally with massive-bedded cosparite (at left).

(b) Longitudinal section of a bioherm, showing the passage from basal flat-laminated stromatolite through broad columns into narrow upper columns.

(c) Frequently bridged narrow columns arising directly from undulatory stromatolite.

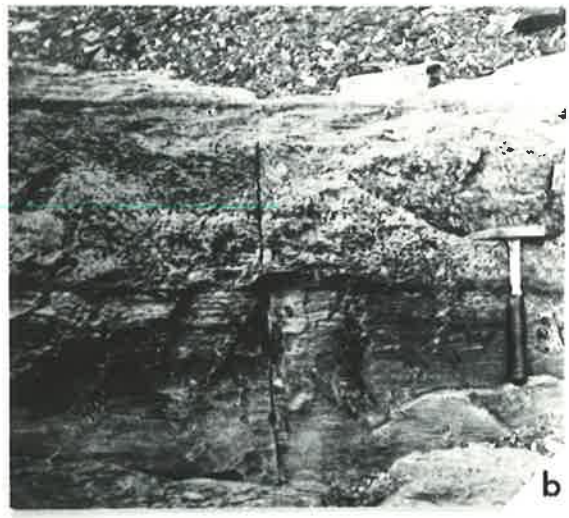
(d) Portion of a bioherm showing the intercalation of columnar and laterally linked stromatolites.

(e) Details of transition from broad, frequently bridged basal columns to upper, narrow, discrete columns. Broad columns in lower right-hand corner have inclined margins and sub-horizontal laminae.

Note: hammer is 30 cm long; marking pen is 10 cm.

1

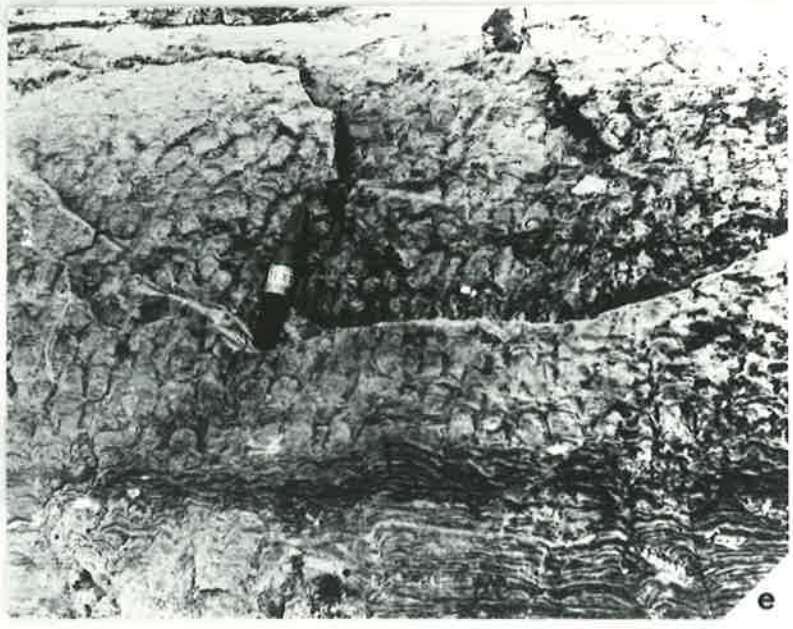
a



b

c

d



e

Plate 2

Acaciella augusta: Brighton Limestone, Depot Creek. Microstructure (thin sections).

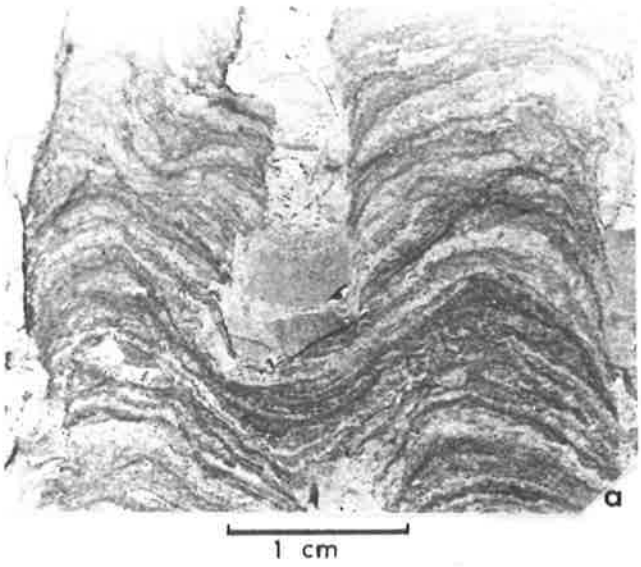
(a) Two narrow columns, linked by a bridge; illustrates the slightly wavy, discontinuous, streaky lamination. The darker laminae are green, dolomitic (S401).

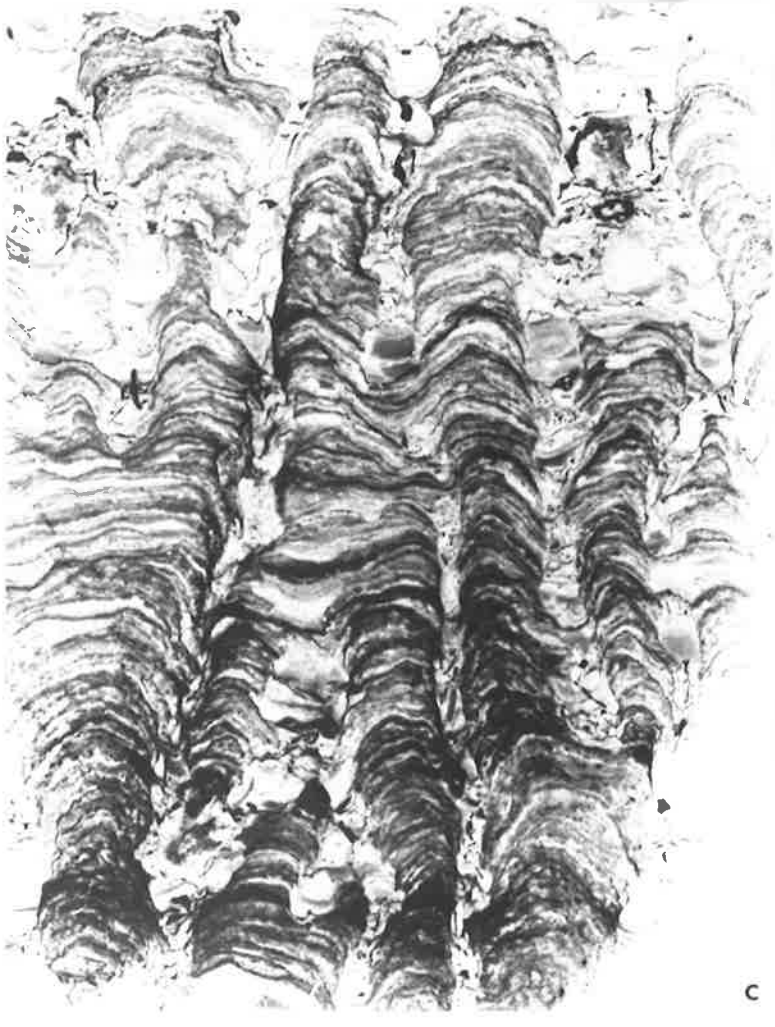
(b) & (c) (S404 and S401 respectively). The gross shape and branching of columns. The interspaces are filled with interlayered micrite and intramicrite, in 0.5 to 1.0 cm bands. (c) is natural size. In (b), laminae become doubly-crested before branching, but in the centre of the photograph (c) is an example of a short interspace between crests bridged by the overlying lamina; the column resumes its former growth pattern.

(d) Recrystallized specimen from Mundallio Creek (S538), illustrating radiating recrystallized acicular textures in the lower part of the photograph.

(e) Lenticular open spaces between laminae, possibly representing original gas vesicles (S163).

2





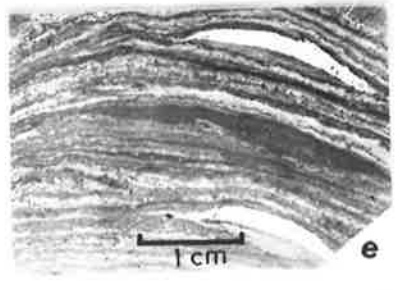


Plate 3

(a) Irregular, frequently bridged columns; part of an Acaciella augusta bioherm. Thin section. Brighton Limestone, Depot Creek (S162).

(b) Evenly laminated ferruginous stromatolite, possibly Acaciella angepena. Thin section. Lower Cambrian, near Wirrealpa. The dark laminae are outlined by finely disseminated haematite. (S564; specimen collected by Mr. P. Haslett).

(c) & (d) Acaciella f. indet. Both specimens are erratics from the lower tillite, north of the Enorama Diapir. Thin sections. Note the very numerous concordant stylolites in (d). (S509 and S539 respectively. S539 was collected by Dr. B. Daily).

(e) to (g) Acaciella angepena: Lower Cambrian. Thin sections.

(e) Irregular columns from the margin of a small bioherm; Angepena (S458).

(f) Pseudocolumns with rare interspaces. Note the domed laminae grown upon partly buried intraclasts, and the extremely continuous lamination; Angepena (S462).

(g) Regular, alpha-parallel branching columns, Italowie Gorge. Lamination is very continuous but indistinct (S2, Mawson's specimen).

3

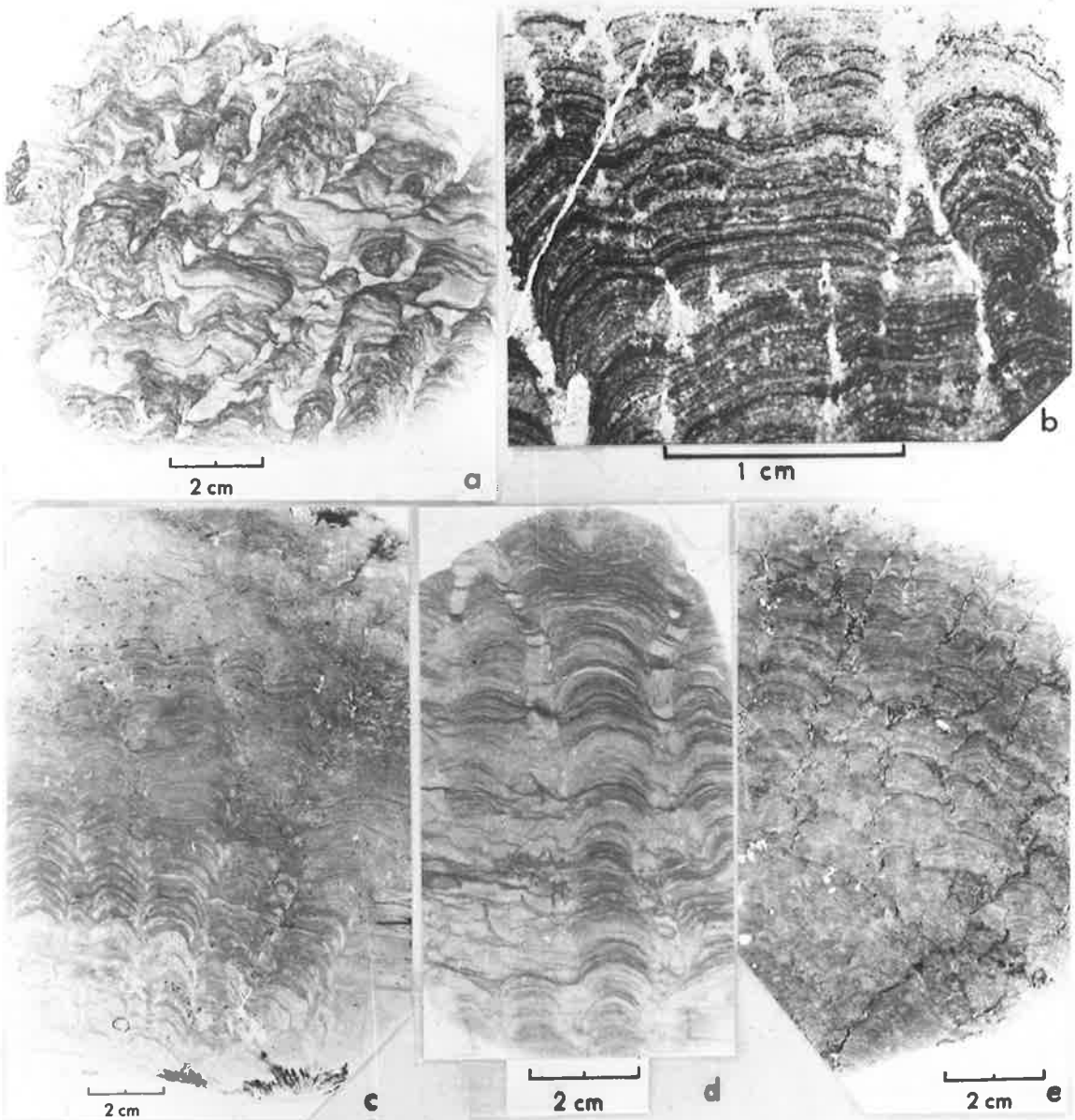


Plate 4

Acaciella angepena: Lower Cambrian. Sections perpendicular to bedding, showing mode of occurrence at Angepena.

(a) A bioherm of cumulate and pseudocolumnar stromatolites. Small cumuli are seen immediately to the right of and above the pen.

(b) Lateral termination of a thin bioherm; at the margin, columns remain subvertical and pass laterally into flat-laminated, mechanically deposited lime mudstone.

(c) Upper portion of an elliptical bioherm, showing irregular, frequently coalescing columns.

(d) Marginal section of a bioherm. Note that laminae are completely recurved under the bioherm edge. Specimen is *in situ*. In (a) to (d), the ball point pen is 16 cm long.

(e) Lateral termination of a bioherm, which sank into the soft substrate during growth. White areas are dolomitized. Width of specimen is 21 cm (S460).

(f) & (g) Etched sections of recurved margins of the bioherm in (d) (S300). Note that here growth partly proceeded downwards. Specimens collected from the outcrop shown in (d). (f) is 17 cm wide, (g) is 15 cm wide.

Specimens (e), (f) & (g) are sections cut perpendicular to bedding, and placed in their natural orientation.

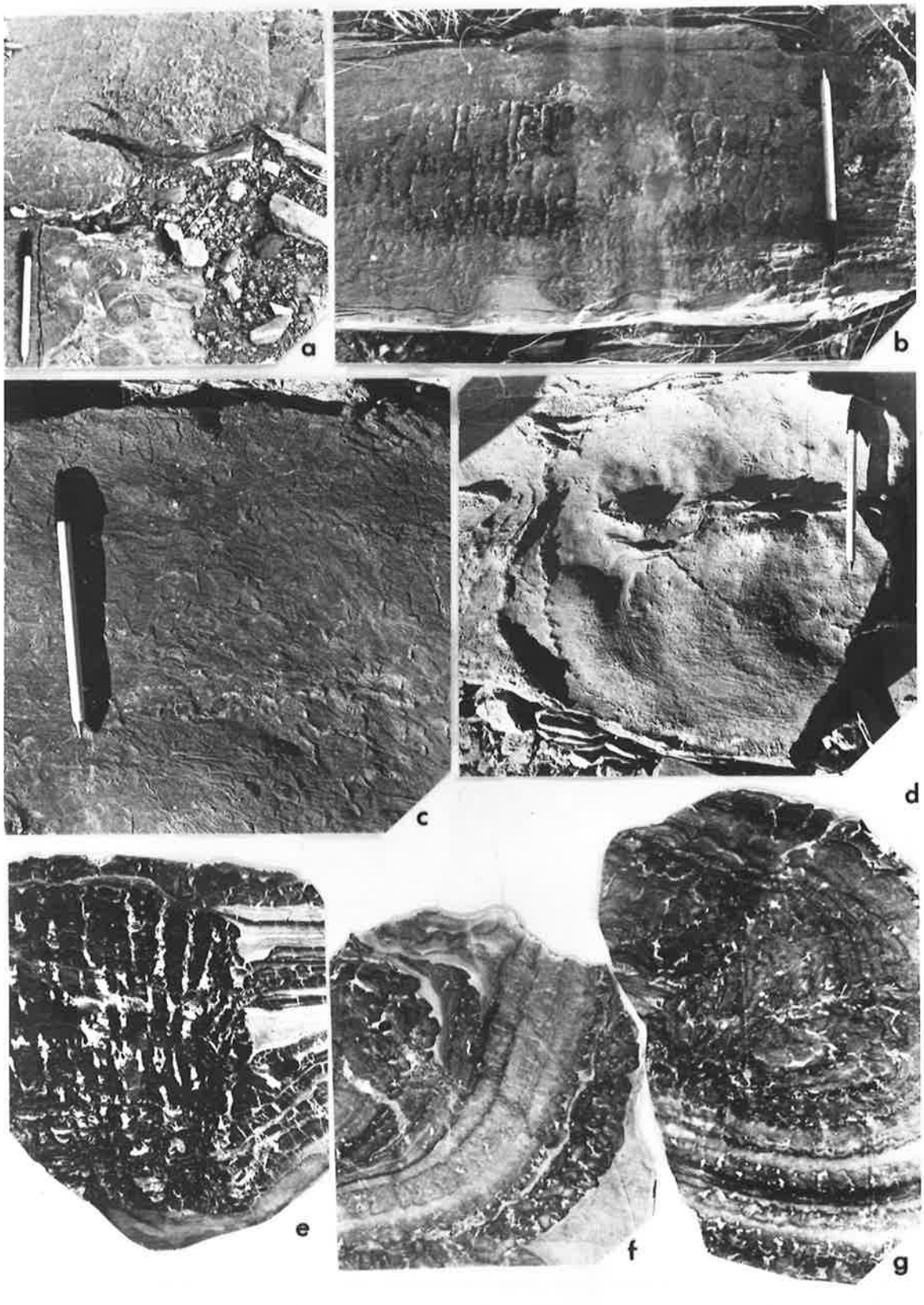

a
b
c
d
e
f
g

Plate 5

(a) to (c) Acaciella angepena: Microstructure. Thin sections.

(a) & (c) Evenly laminated, discrete columnar forms from Italowie Gorge (S44 and S4 respectively, Mawson's specimens).

(b) Vermiform microstructure, interpreted as due to algal boring, disrupting the normally very even, continuous lamination; Angepena (S458).

(d) to (f) Baicalia burra: Skillogalee Dolomite. Sections perpendicular to bedding, showing the mode of occurrence.

(d) Small lenticular bioherms interbedded in thinly bedded dolomites; Yatina.

(e) Broad pseudocolumns; West Mount Hut.

(f) Broad cumuli at base of a biostrome; West Mount Hut.

Note: the ball-point pen is 15 cm long; the hammer is 30 cm.

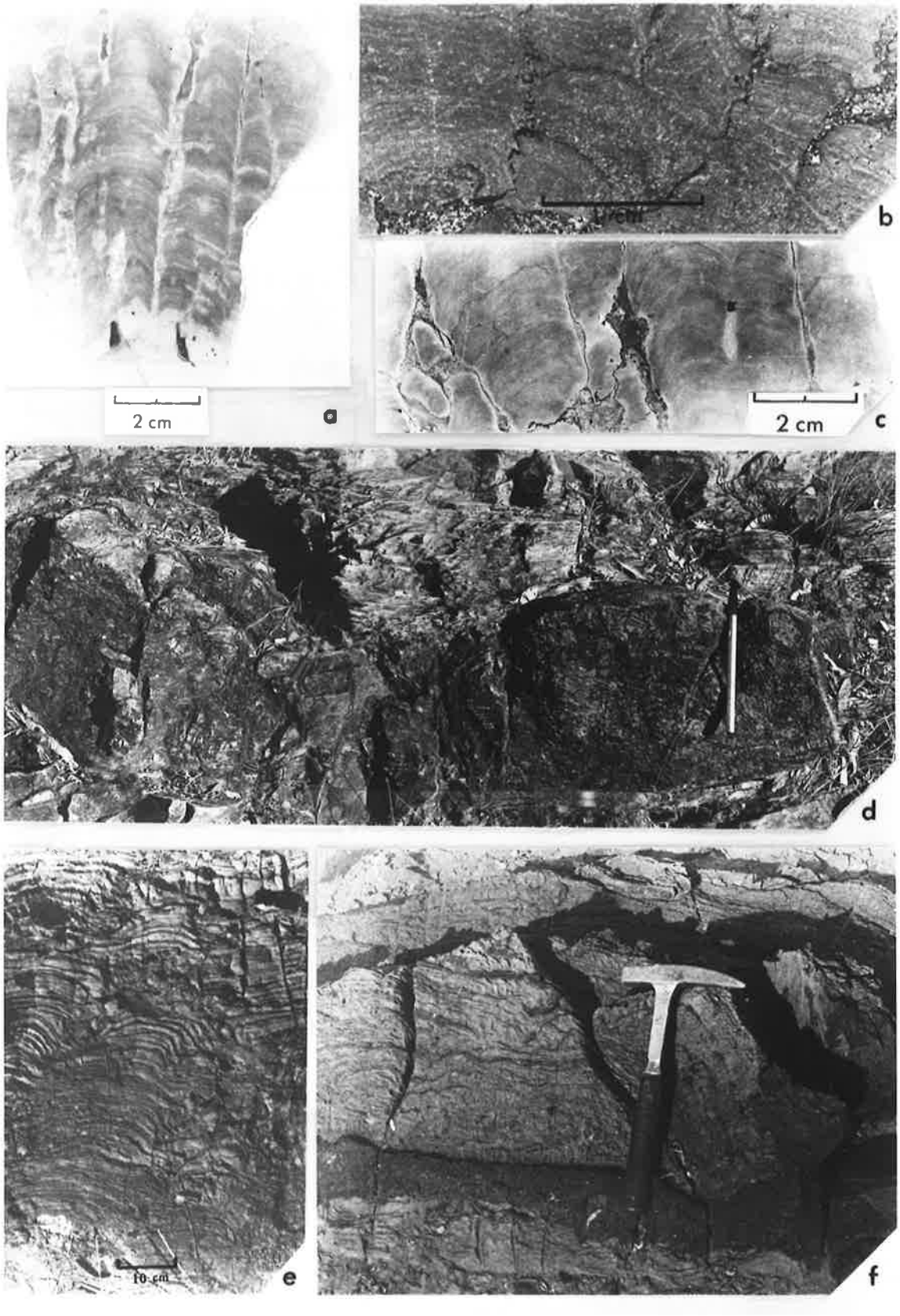

2 cm
a
b
c
2 cm
d
10 cm
e
f

Plate 6

Baicalia burra: Skillogalee Dolomite. Mode of occurrence.

(a) Nearly circular transverse sections of silicified subcylindrical columns (section parallel to bedding, *in situ*); Dutton's Trough H.S.

(b) Portion of a biostrome interbedded in massive, fine grained dolomites; Dutton's Trough H.S.

(c) Possible *Baicalia burra*; Depot Creek (examined in the field only)

(d) Columns arising from flat-laminated stromatolites; West Mount Hut

(e) Columns arising from flat-laminated stromatolites; Dutton's Trough H.S.

(f) Details of the biostrome shown in (b). Longitudinal section of partially silicified columns; the section is parallel to the tectonic cleavage, in the plane of flattening of the columns

(g) Irregular columns with numerous micro-unconformities and highly variable lamina shape; West Mount Hut

Note: The hammer is 30 cm long and the marking pen in (e) is 10 cm long. In (d), the length of the pen shown in the photograph is 11 cm long

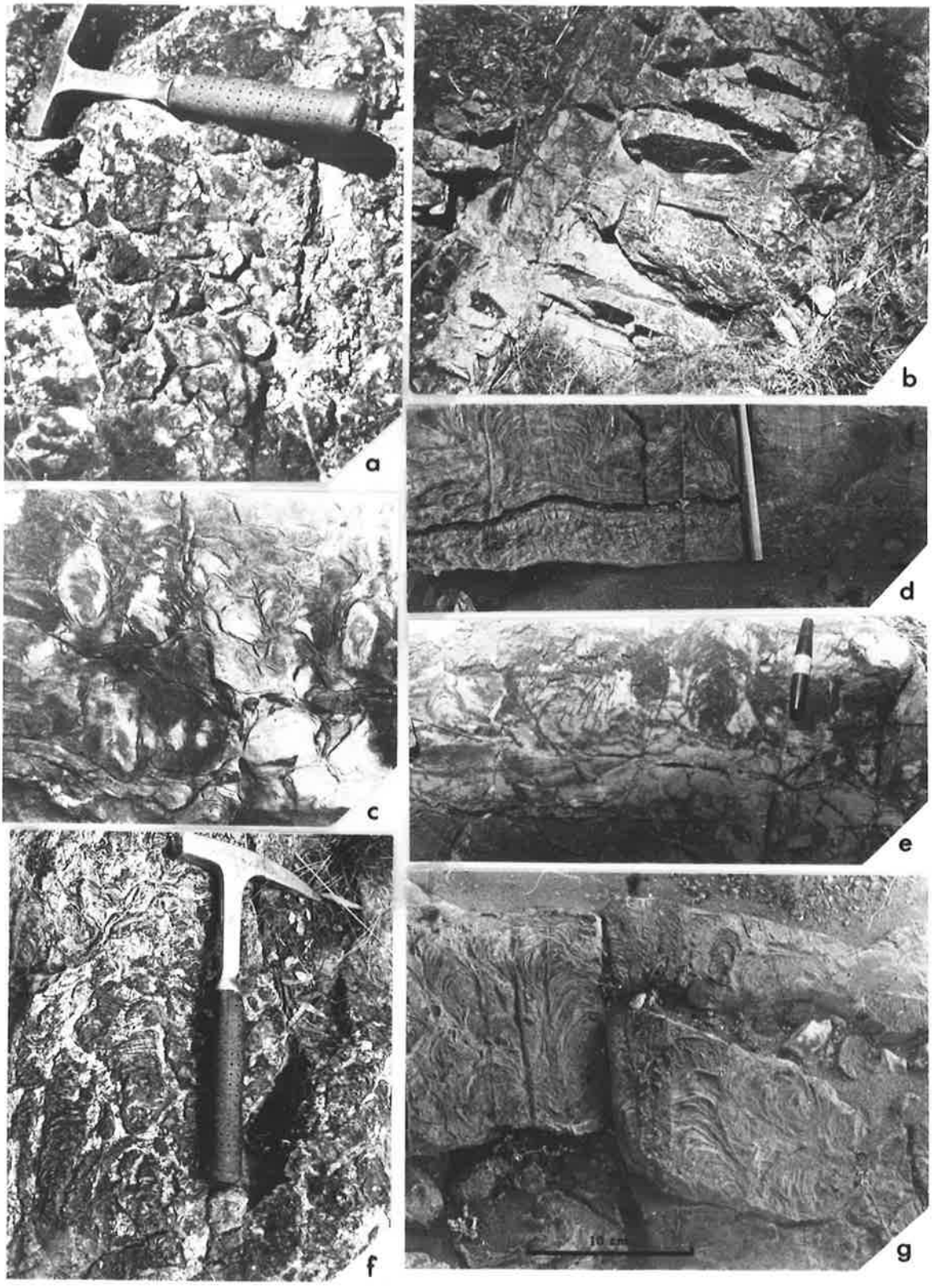

a
b
c
d
e
f
g
10 cm

Plate 7

Baicalia burra: Skillogalee Dolomite

(a) Longitudinal section of upward-expanding tuberous columns near the base of a biostrome; Dutton's Trough H.S.

(b) Partially silicified vertical, subcylindrical columns; Dutton's Trough H.S.

(c) Markedly tuberous columns with high-angle micro-unconformities. The laminae are distinctly, evenly banded, except where eroded. Interspaces are filled with coarse intrasparite comprising both flat dolomite pebbles and small, rounded grains. Thin section; Myrtle Springs (S489)

(d) Slightly divergent branching in regular, subcylindrical columns. Thin section; Dutton's Trough H.S. (S533). The specimen is taken from the biostrome shown in Pl.6b

(e) Branching of narrow columns from the sides of a main, wide column; Dutton's Trough H.S. (S534). The specimen is taken from the biostrome shown in Pl.6b

(f) Tuberous and inclined columns with evenly banded micro-structure and high-angle micro-unconformities. Thin section; Myrtle Springs (S487)

Note: The hammer in (a) is 30 cm long, and the marking pen in (b) is 10 cm.

7

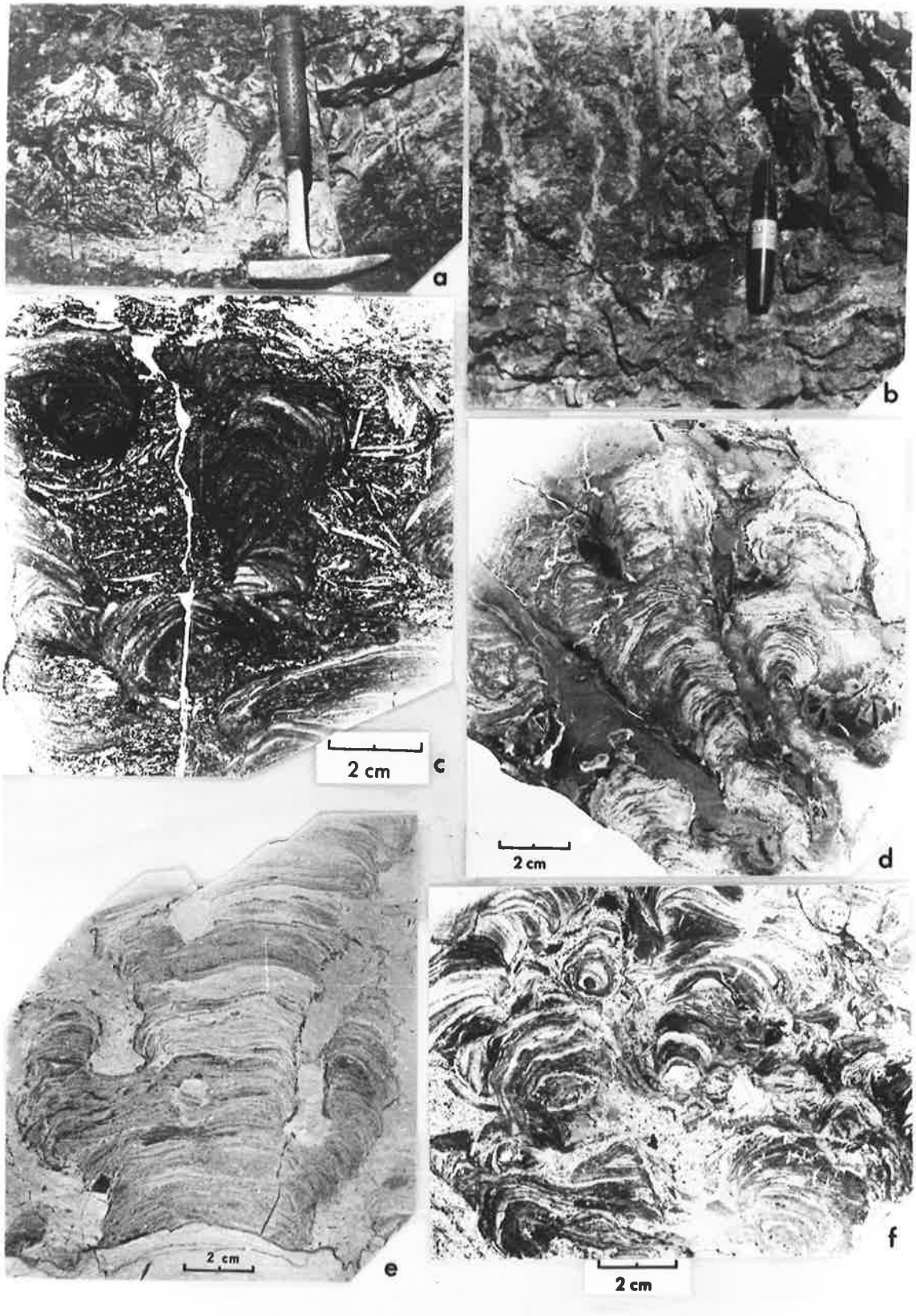


Plate 8

Baicalia burra: Skillogalee Dolomite. Thin sections.

(a) Irregular, tuberous columns with evenly banded but secondarily fractured laminae and frequent micro-unconformities. Thin section; West Mount Hut (S303)

(b) Subcylindrical columns with steeply domed, evenly banded laminae. Thin section; West Mount Hut (S302). The specimen is taken from the outcrop shown in Pl.6d

(c) Baicalia burra with minor pelletal laminae. Thin section; Worumba (S150)

(d) Baicalia burra with predominantly pelletal laminae. Thin section; Copley (S496)

(e)(f) Moderately divergent branching columns, with some pelletal laminae. Thin sections; Yatina (S222, holotype, and S218 respectively)

(g) Complex branching of columns from Arkaroola. Thin section (S457)

(h) Details of lamination of the specimen in (b); West Mount Hut (S302). Thin section illustrating the nature and continuity of laminae, the lenticular, spar-filled voids and the presence of detrital grains in some laminae

8

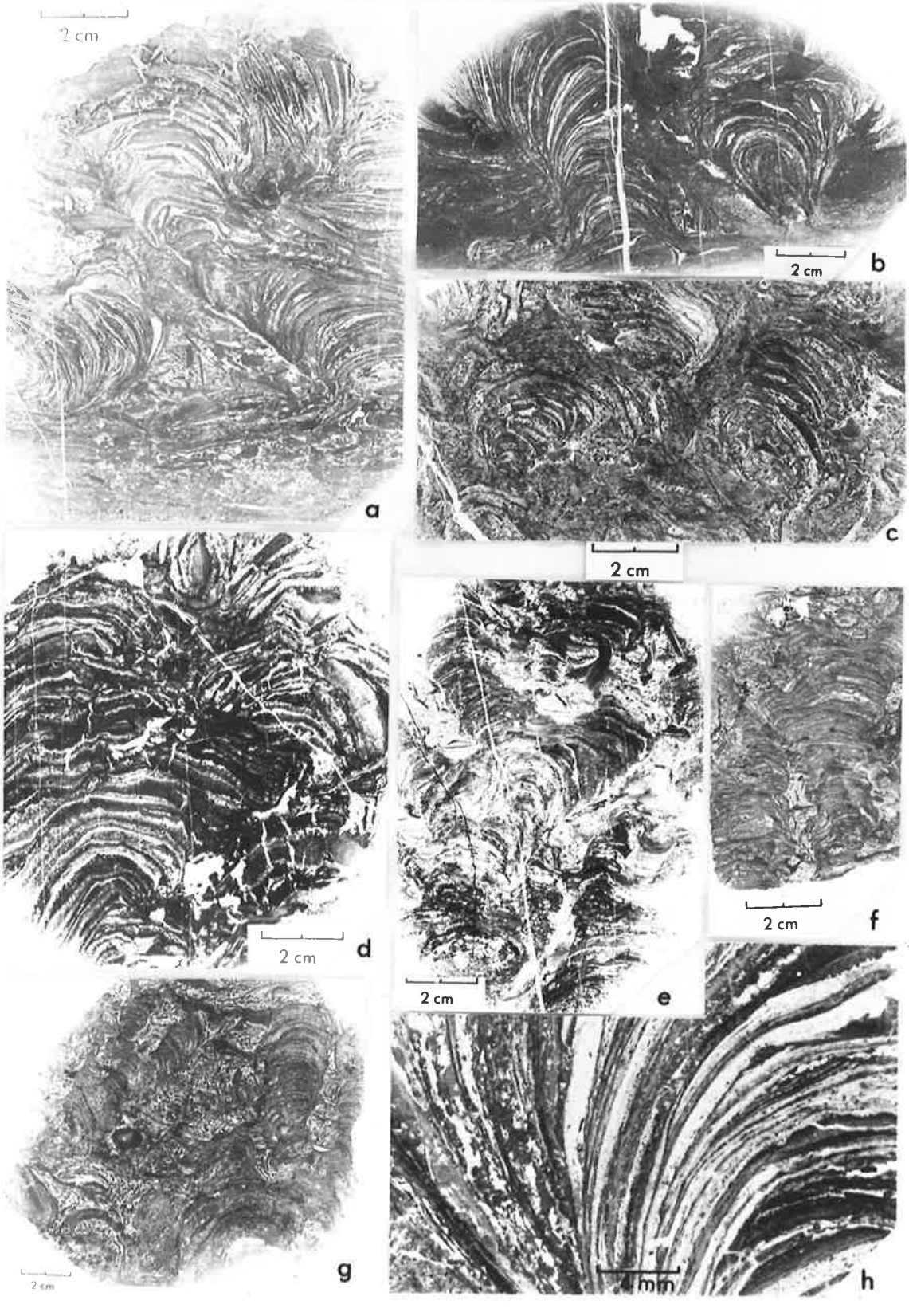


Plate 9

(a) Indeterminate stromatolite, possibly Baicalia burra. Thin section; River Wakefield Group, Carrieton (S322)

(b) Baicalia burra. Cut slab illustrating parallel branching columns with high-angle micro-unconformities and banded lamination; Chintapanna Well (S96, specimen collected by Mr. C. R. Dalgarno). Note the overgrown stromatolite fragment in the lower left quadrant, and the branch arising from an eroded column in the upper right

(c) Baicalia burra with finely silicified laminae. Thin section; Worumba. Natural size (S151). Note the vertical tectonic veins

(d) to (f) Boxonia melrosa: Brighton Limestone, Melrose

(d) Transverse sections of columns, as exposed on a bedding plane

(e) Hand specimen illustrating longitudinal sections of columns

(f) Thin section illustrating lamination and wall structure. Natural size (S177). Note: the upper left and lower left corners of the thin section are composed of highly weathered rock

9

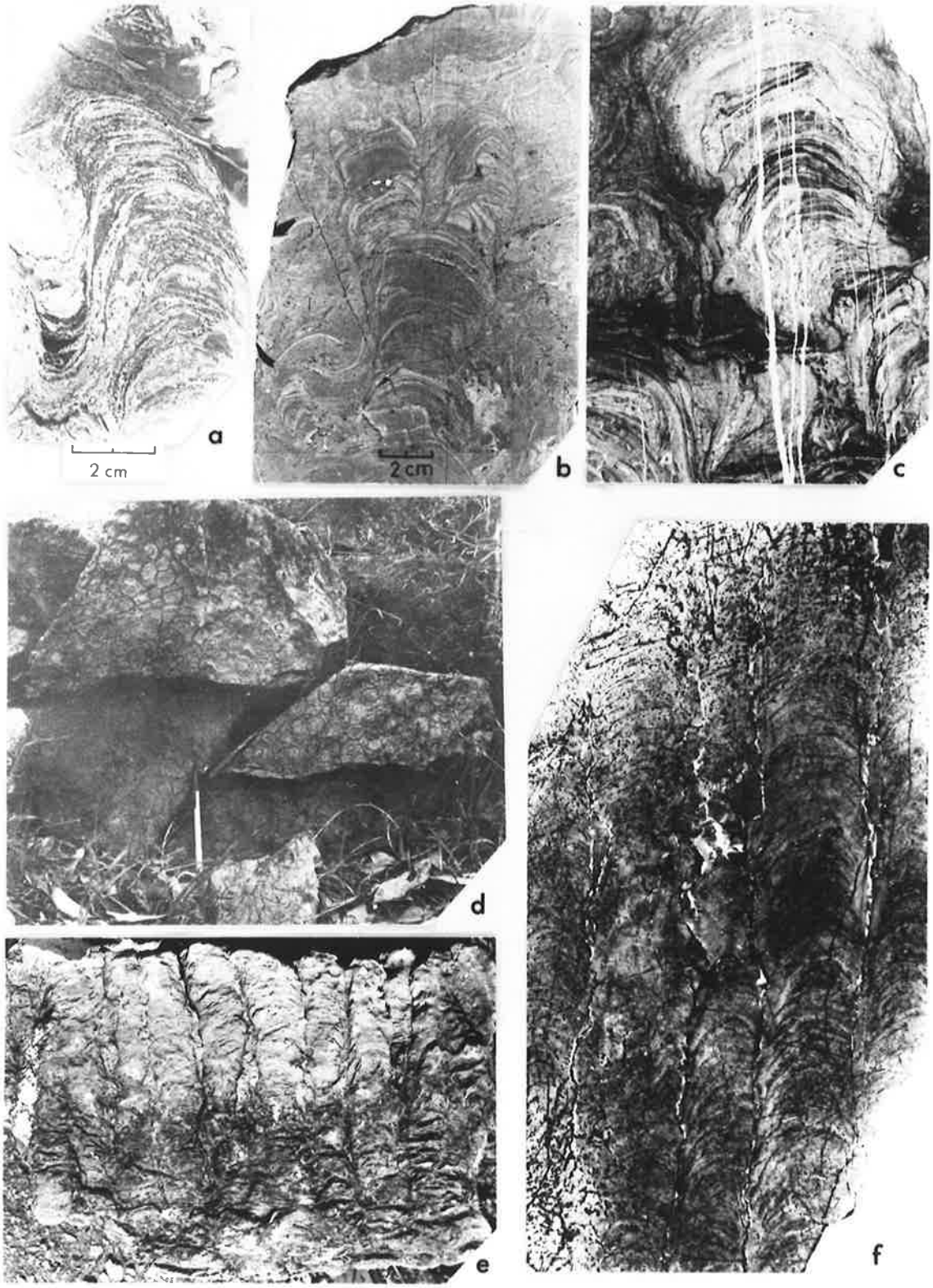


Plate 10

(a) to (c) Thin sections of *Boxonia melrosa*: Brighton Limestone, Melrose (S504, S502 and the holotype, S503 respectively). The lamination is indistinctly banded, and becomes diffuse in the wall zone

(d) to (f) *Conophyton garganicum garganicum*: Paratoo Diapir

(d) Part of a broad mound at the base of the stromatolitic bed

(e)(f) Circular, elliptical and lanceolate transverse sections of columns, in a section apparently parallel to original bedding

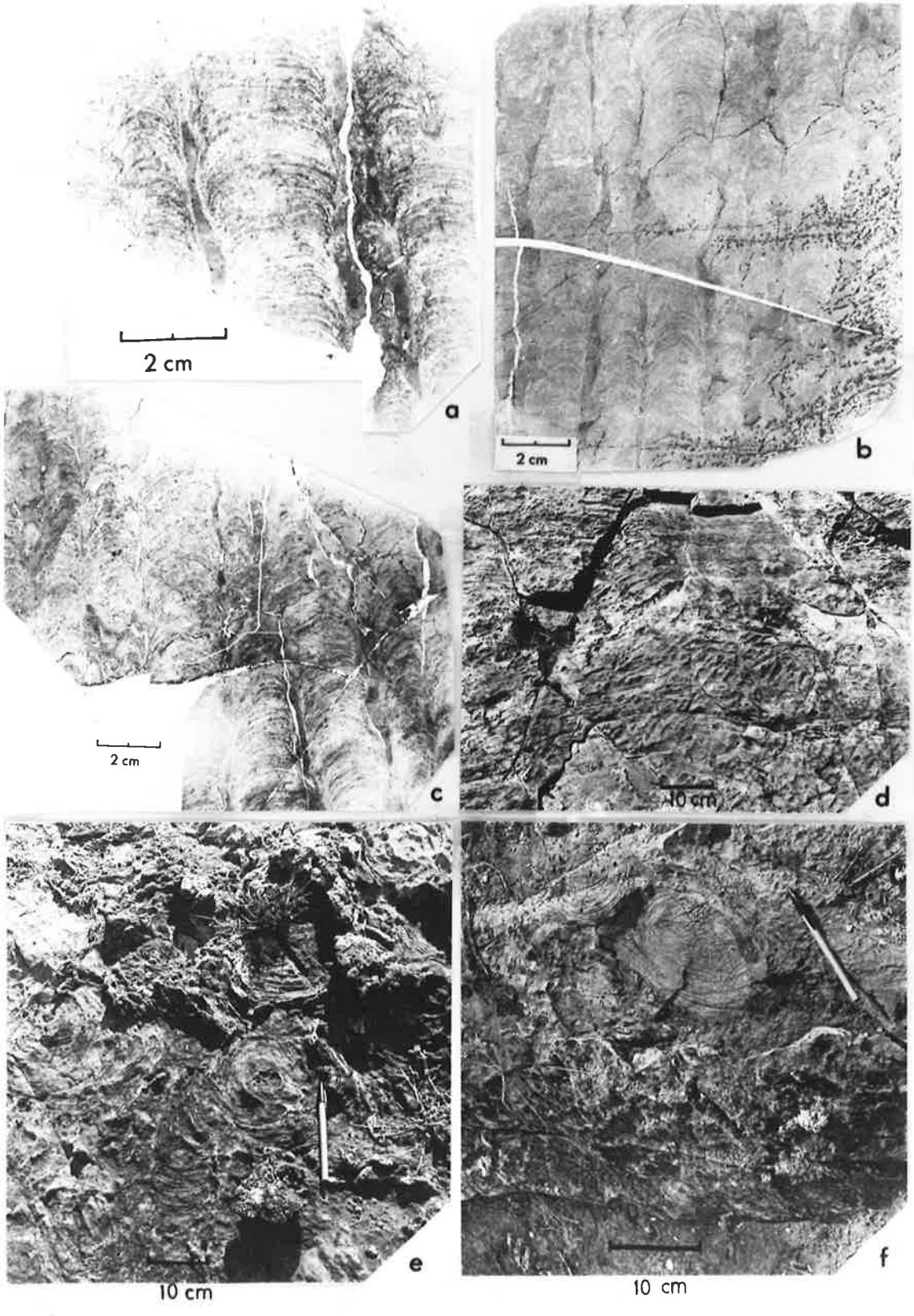


Plate 11

Conophyton garganicum garganicum: Paratoo Diapir

(a)(b) Longitudinal, axial thin sections, showing type of lamination and the crestal zone. Natural size (S214 and S532 respectively). Note that the extremely continuous bands visible in (a) & (b) are macrolaminae

(c) Slightly oblique section of a column, with a pronounced protrusion on its side (upper right corner)

(d) Basal part of columns (without conical laminae) arising from the flat-laminated stromatolites of the underlying broad mounds

(e) The partially silicified margins of two adjacent columns, illustrating their ragged nature


a
b
c
10 cm
d
10 cm
e

Plate 12

Conophyton garganicum garganicum: Paratoo Diapir. Microstructure. Thin sections.

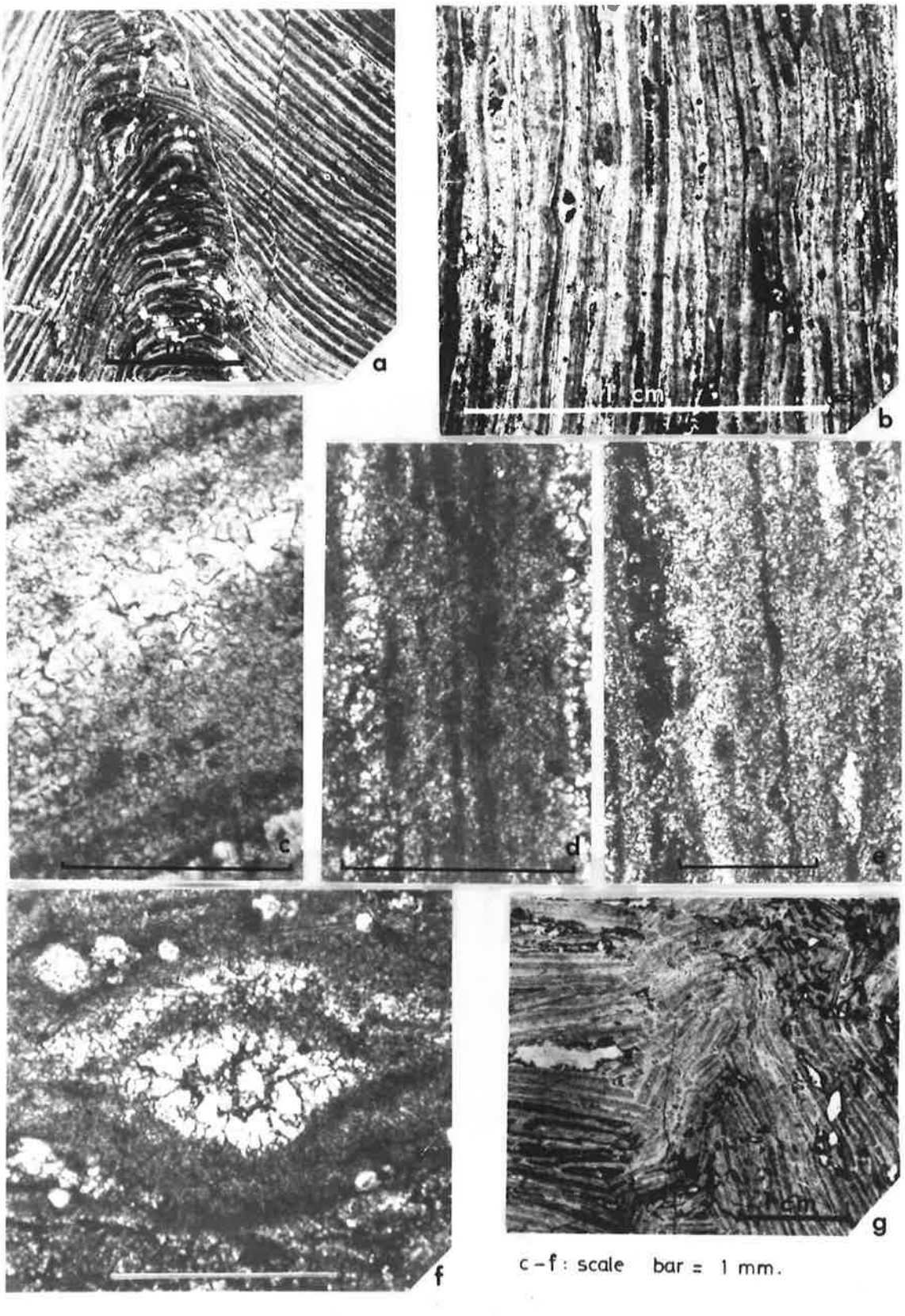
(a) Details of the crestal zone, illustrating sharp lateral displacements of successive crests (S532)

(b) Details of the lamination, showing the extremely thin, continuous laminae, macrolaminae and possible detrital grains incorporated in them (S214)

(c)(d) & (e) Details of the textures of dark and light laminae (S278)

(f) Small, lenticular, spar-filled void between laminae (S277)

(g) Brecciation of the crestal zone, perhaps by compaction of lithified laminae (S277)



c – f : scale bar = 1 mm.

Plate 13

Gymnosolen ramsayi occurs as boulders in a conglomerate in the Tapley Hill Formation, near Wilson.

(a) Longitudinal section of regular, walled columns interpreted to be derived from a bioherm centre (S388)

(b) Part of a stromatolitic boulder. The stromatolitic columns are dark grey; the pale grey areas are interspace sediment

(c) Longitudinal thin section of a column showing the recrystallization of the wall zone, where lamination is obliterated. Natural size (S344, specimen collected by Prof. E. L. Winterer)

(d) Inclined columns, interpreted as marginal in the bioherm from which they were derived (S387)

(e) Longitudinal thin section of vertical columns, illustrating the streaky microstructure. Natural size (S388)

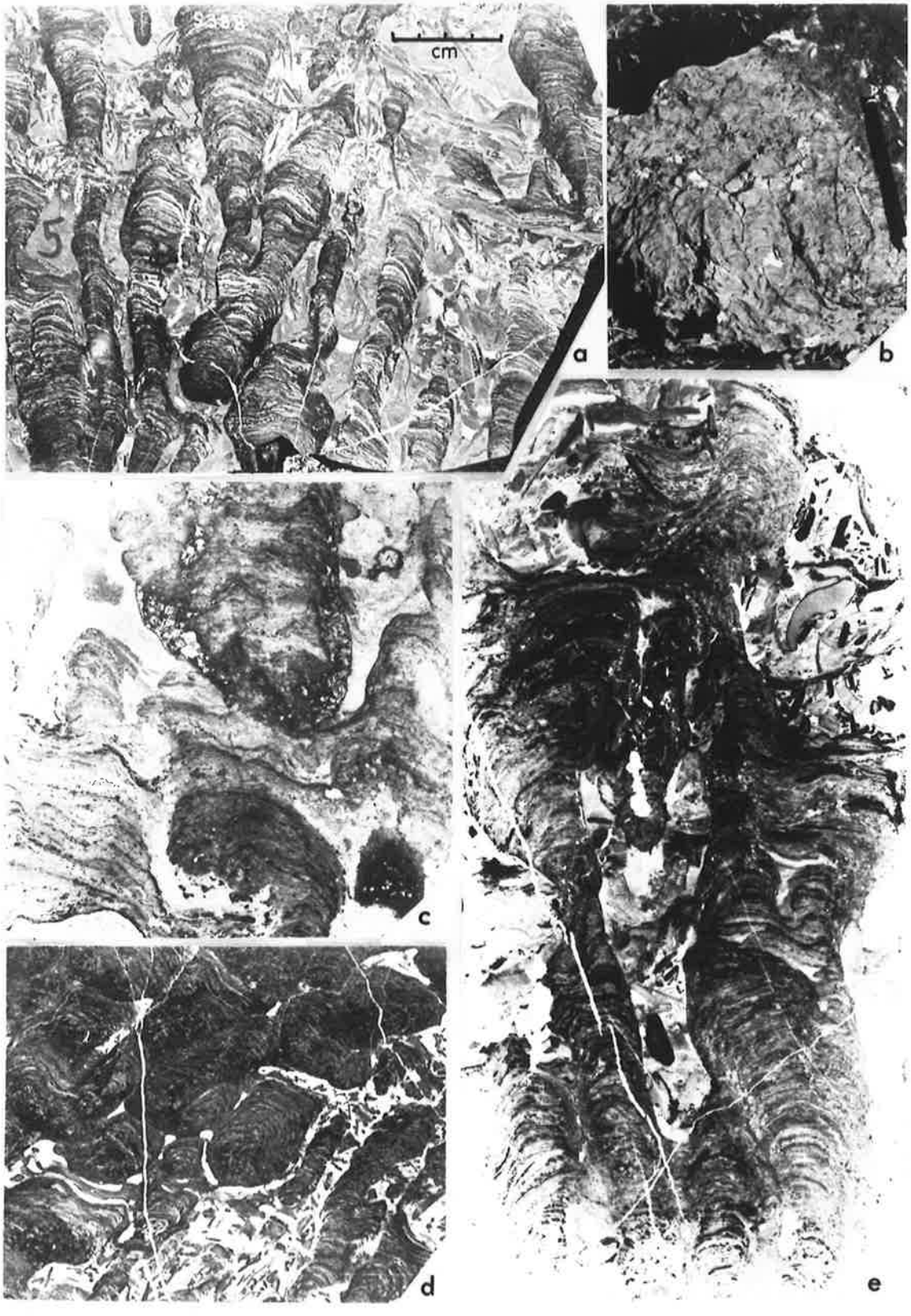

cm
5
a
b
c
d
e

Plate 14

(a) Gymnosolen ramsayi: broad, possibly basal columns. Thin section; boulder in conglomerate, Tapley Hill Formation, near Wilson (S387). Large patches within columns are recrystallized

(b) Inzeria cf. tjomusi: portion of a thin bioherm, showing the lower, wavy-laminated stromatolites separated from the upper columnar stromatolites by a stylolite (at the pencil point); Middle member of the Wundowie Limestone, Burr Well. Columns are dark grey; pale grey areas are interspace sediment

(c) Gymnosolen ramsayi: thin section of strongly recrystallized columns; boulder in conglomerate, near Wilson (S390). The white patches consist of sparry calcite resulting from the recrystallization of the fine, dark grey stromatolitic calcite

(d),(e) Inzeria cf. tjomusi: portions of bioherms: middle member of the Wundowie Limestone, Burr Well. In each case, the upper columnar zone (poorly visible in the photographs) is separated from the lower continuously laminated stromatolite by an intensely lobate stylolitic zone

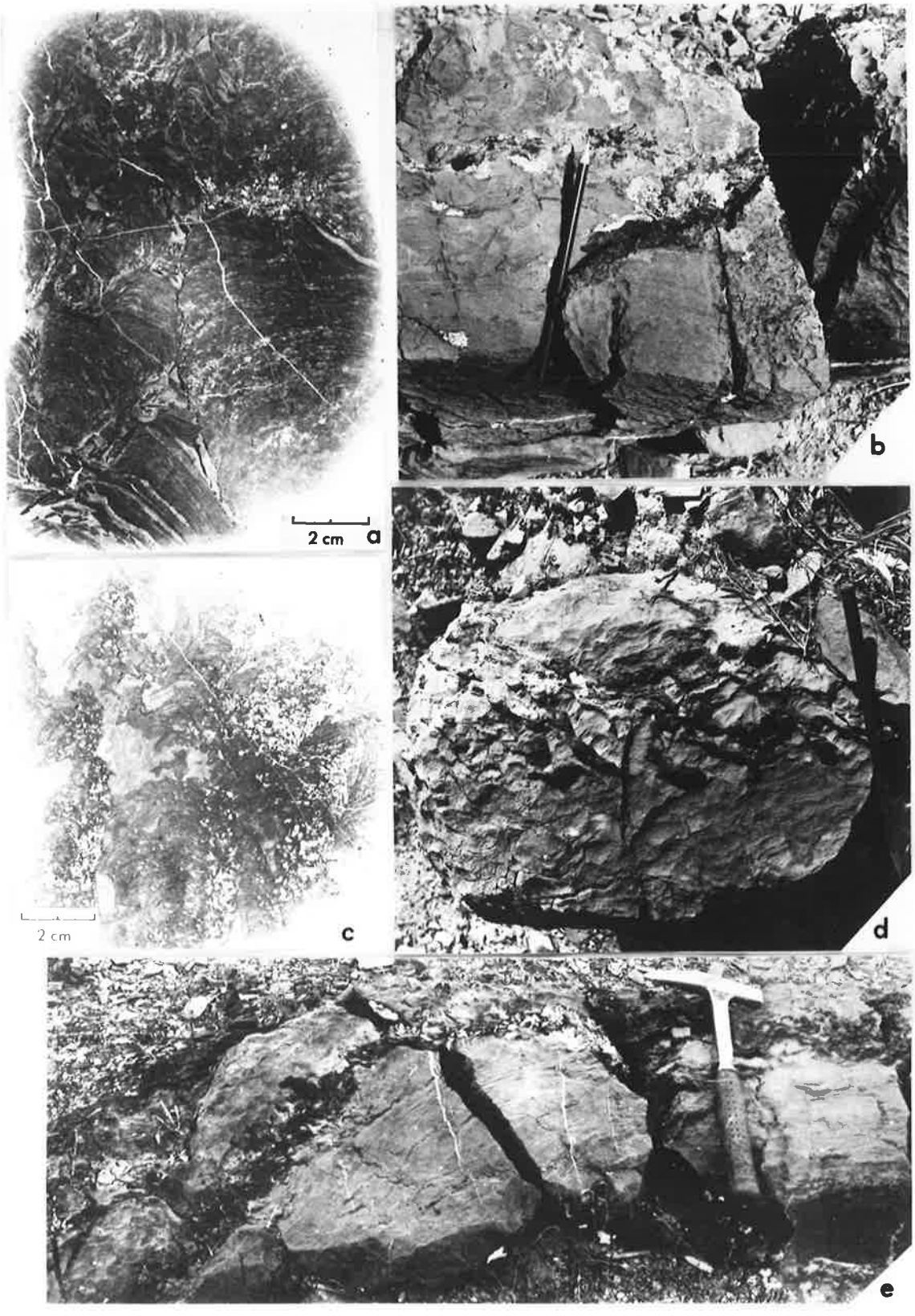

2 cm
a
b
2 cm
c
d
e

Plate 15

(a),(c) & (e) *Inzeria* cf. *tjomusi*: middle member of the Wundowie Limestone, Burr Well.

(a) Thin section, illustrating subcylindrical columns with altered margins and interspaces, the gently convex to low-conical lamina shape, a niche-projection (column on the left) and the intensely stylolitic zone at the base of the columns (S542)

(c) Outcrop of columnar zone from which S542 was taken. Note the small niche in the column at the right

(e) Details of the niche-projection and diffusely banded lamination, thin section (S542)

(b),(d) & (f) *Inzeria conjuncta*: Brighton Limestone equivalent, Depot Creek

(b) Outcrop of part of bioherm. Owing to thick lichen cover, columns are not visible on the weathered surface, but the overall trend of the lamination is discernible

(d) Thin section illustrating narrow, upper columns with frequent bridges. Column margins are frequently stylolitic. Dark laminae are green, dolomitic (holotype, S402)

(f) Thin section, specimen collected from the eastern margin of the bioherm shown in 15(b). Columns are inclined, elongated, tuberous, and usually in contact. The dark laminae are green, dolomitic (S403)

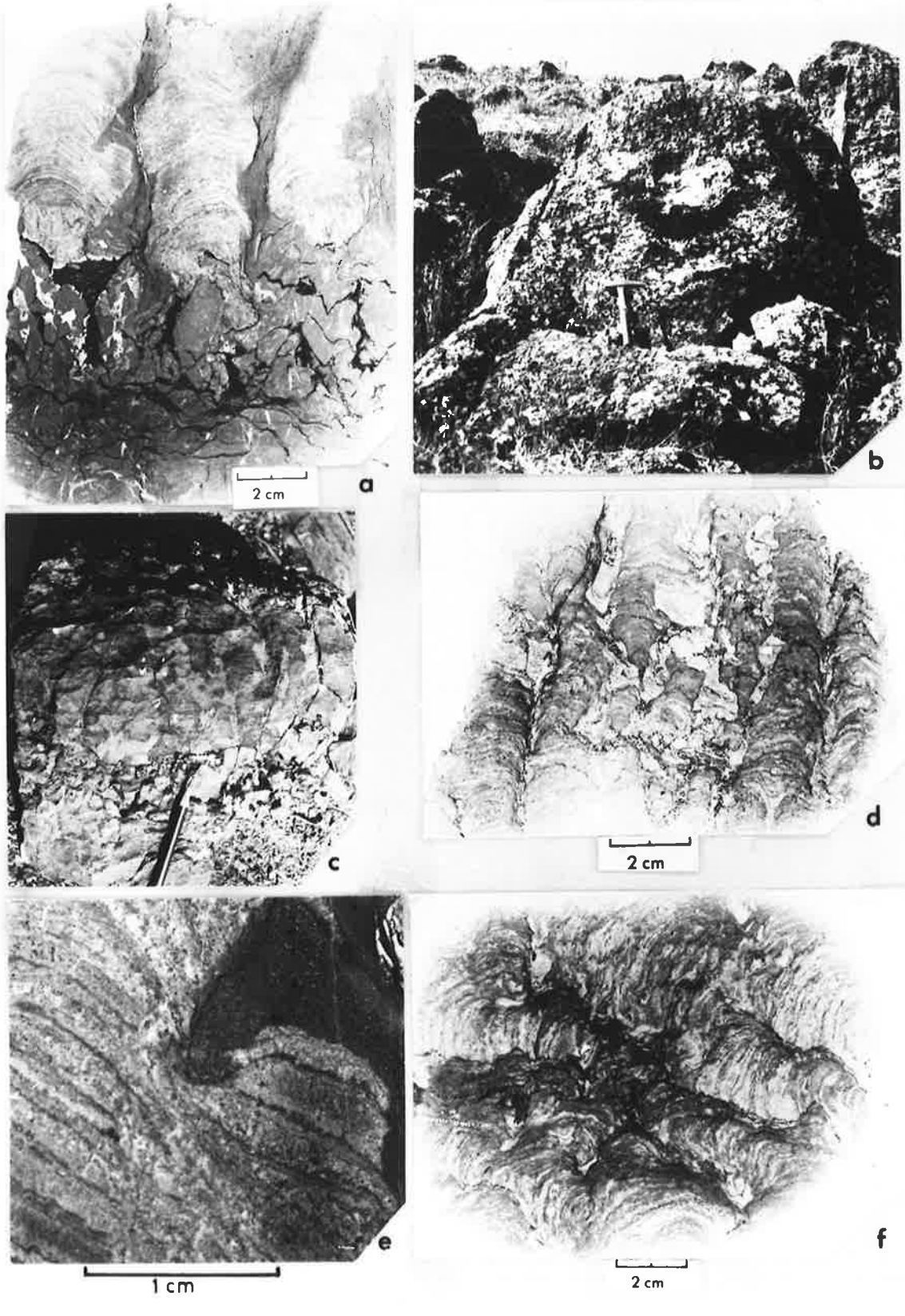

2 cm
a
b
c
d
2 cm
e
1 cm
f
2 cm

Plate 16

(a) Inzeria conjuncta: lower, broad columns, thin section; Brighton Limestone, Depot Creek; (holotype, S402). Note the niche in the column margin (centre of photograph) The dark laminae are green, dolomitic

(b) Indeterminate stromatolite: broad, frequently bridged columns; base of the Brighton Limestone, west of Mt Remarkable. Note: the marking pen is 10 cm long

(c) Inzeria conjuncta: details of distinct, streaky, wavy lamination and margin structure; Brighton Limestone, Depot Creek. Thin section (holotype, S402)

(d) Inzeria multiplex: thin section illustrating vertical columns; Brighton Limestone, NW of Mt Remarkable. Natural size (holotype, S385). The interspaces consist of banded, fine grained dolomite with a few flat intraclasts. The niche-projection in the lower right corner passes into a short column (see Fig.13i)

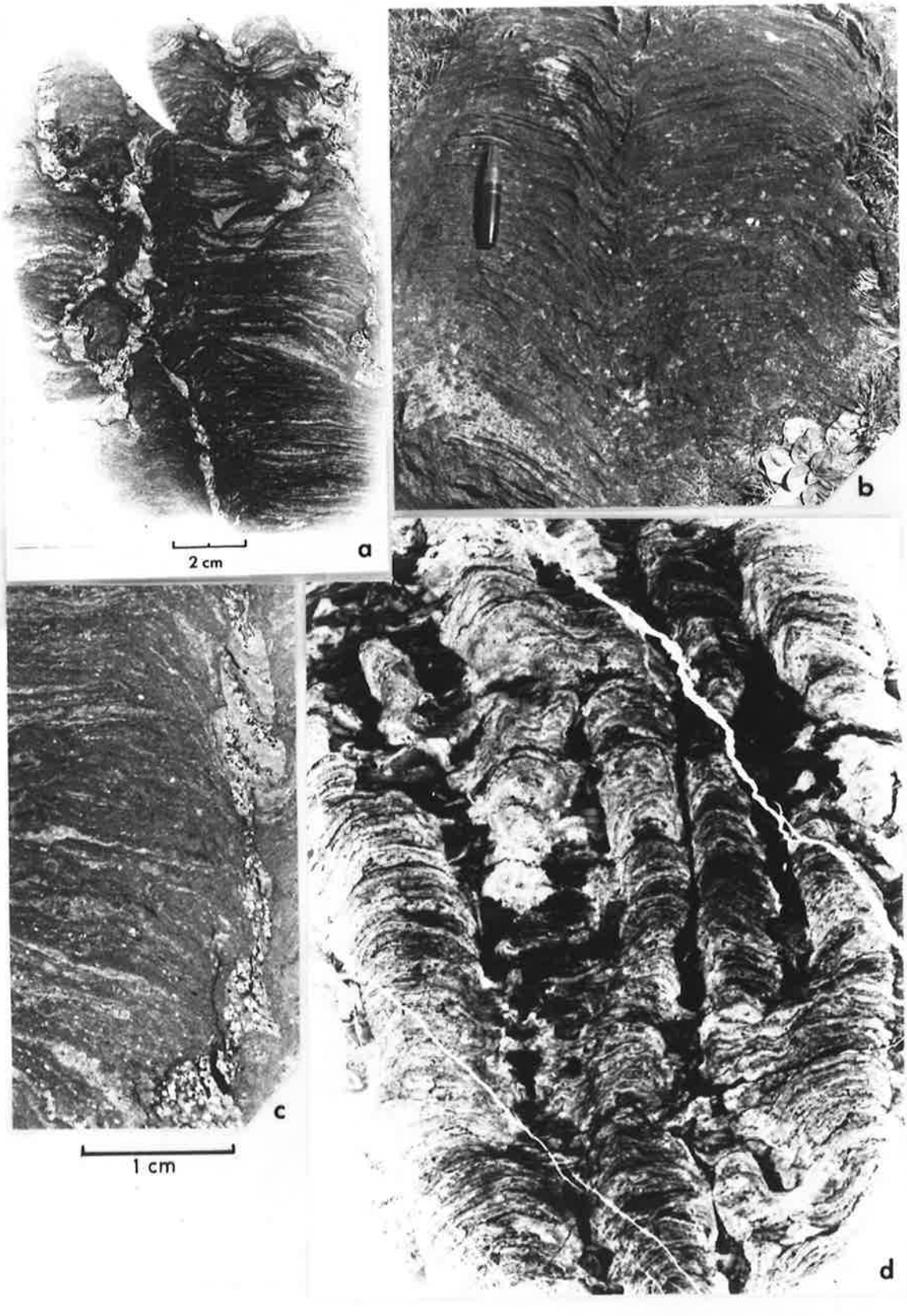

2 cm
a
b
c
1 cm
d

Plate 17

(a) to (d) *Inzeria multiplex*: Brighton Limestone

(a) Thin section of columns and sandy interspaces; Yednalue (S499). The column margins are frequently altered by stylolites. Note the niche-projections in the sides of columns

(b) Longitudinal section of inclined columns *in situ*; NW of Mt Remarkable

(c) Longitudinal section, cut slab (holotype S385). Note the banded interspace sediment.

(d) Details of streaky lamination and margin structure, partly obliterated by stylolites. Thin section (holotype S385); NW of Mt Remarkable

(e) *Jurusania burrensis*: contiguous spherical bioherms; upper member of the Wundowie Limestone, Burr Well. Note: the hammer is 30 cm long

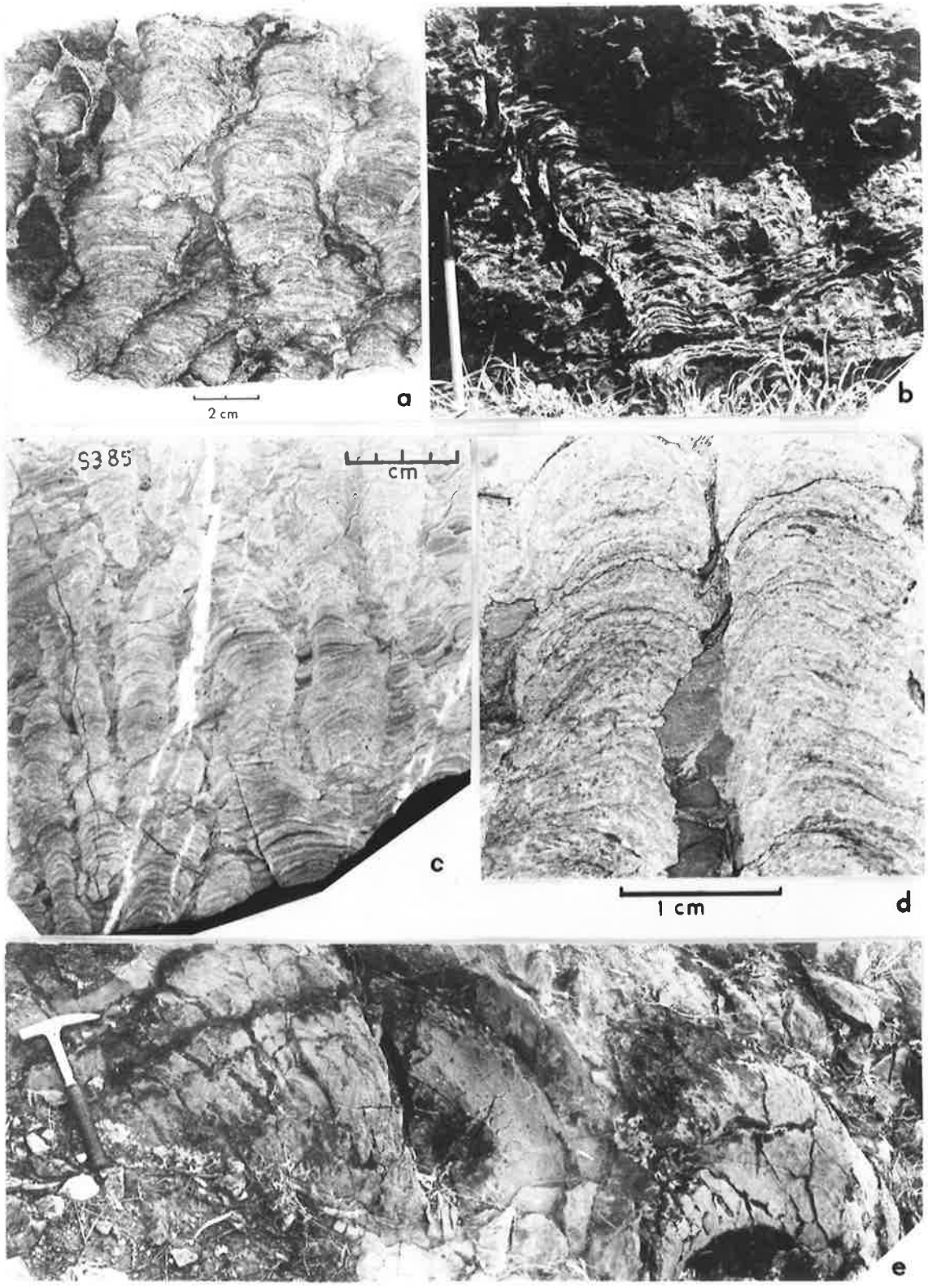

2 cm
a
b
S385
cm
c
1 cm
d
e

Plate 18

Jurusania burrensis: upper member of the Wundowie Limestone, Burr Well

(a),(d) Vertical straight columns in the centre of a bioherm. In (a), note part of the bioherm core below the hammer handle

(b) Vertical straight columns near a bioherm margin

(c) Thin section of cylindrical columns with interspaces filled with flat-pebble intramicrite; (holotype S543)

(e) Details of the lenticular, streaky lamination and walled margin structure (S543)

(f) Base of columnar portion, arising from undulatory stromatolites; thin section (S481)

(g) Dichotomous, branching in alpha-parallel cylindrical columns; thin section (S482)

Note: in (a),(b) & (d), the hammer is 30 cm long

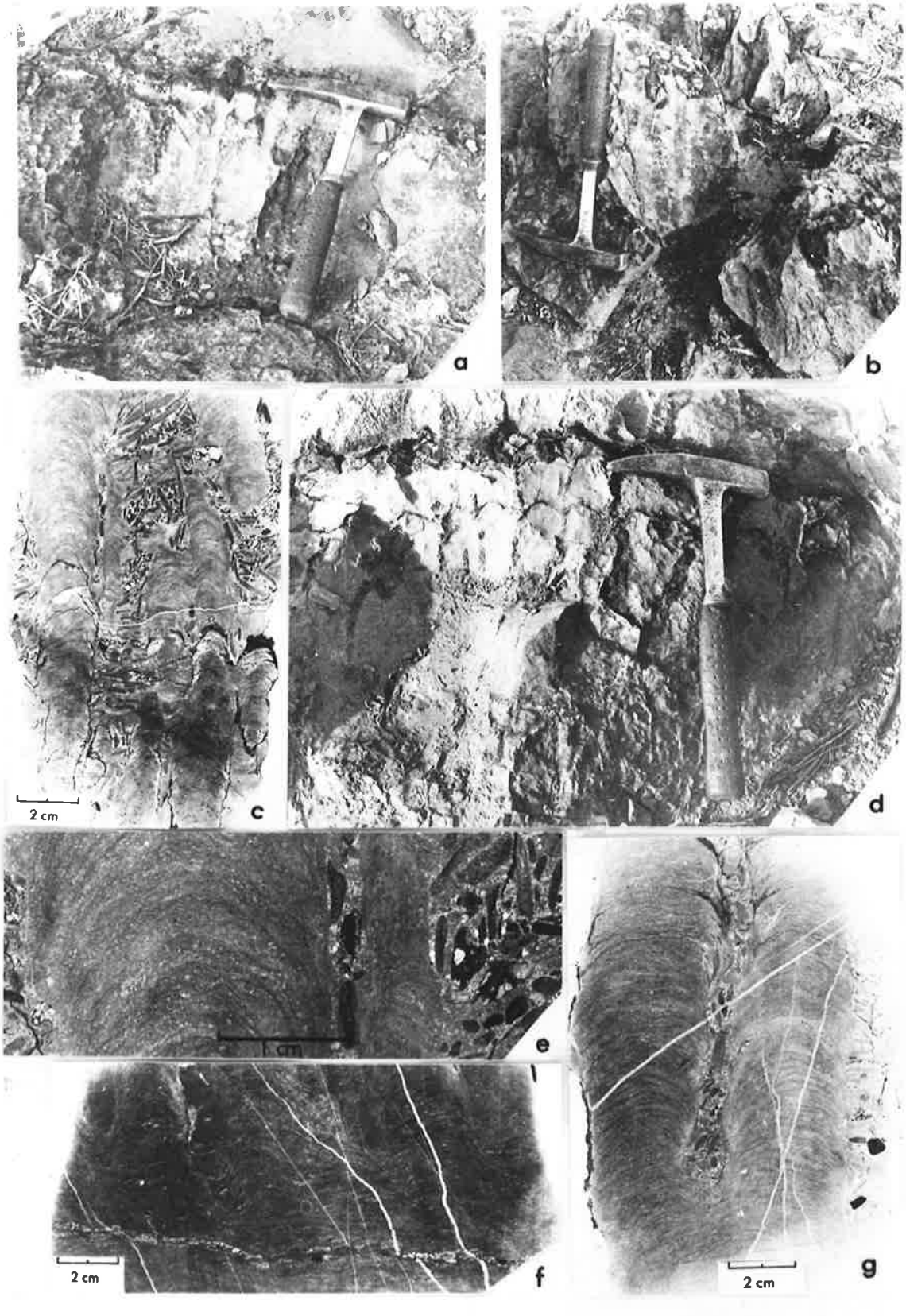

a
b
2 cm
c
d
1 cm
e
2 cm
f
2 cm
g

Plate 19

Katavia oostata: upper, dolomitic member of the Brighton Limestone equivalent, Depot Creek

(a) Portion of a bioherm with downturned margins. Note that the major layering is brought out by stylolites

(b) Longitudinal section of subcylindrical, straight columns, *in situ*. The hammer is 30 cm long

(c) Thin section, illustrating indistinct, wavy and wrinkled lamination and the wall (S175)

(d) Transverse sections of columns resemble mud-cracked polygons. Exposure parallel to bedding, in the same outcrop as 19(b). The pen is 15 cm long

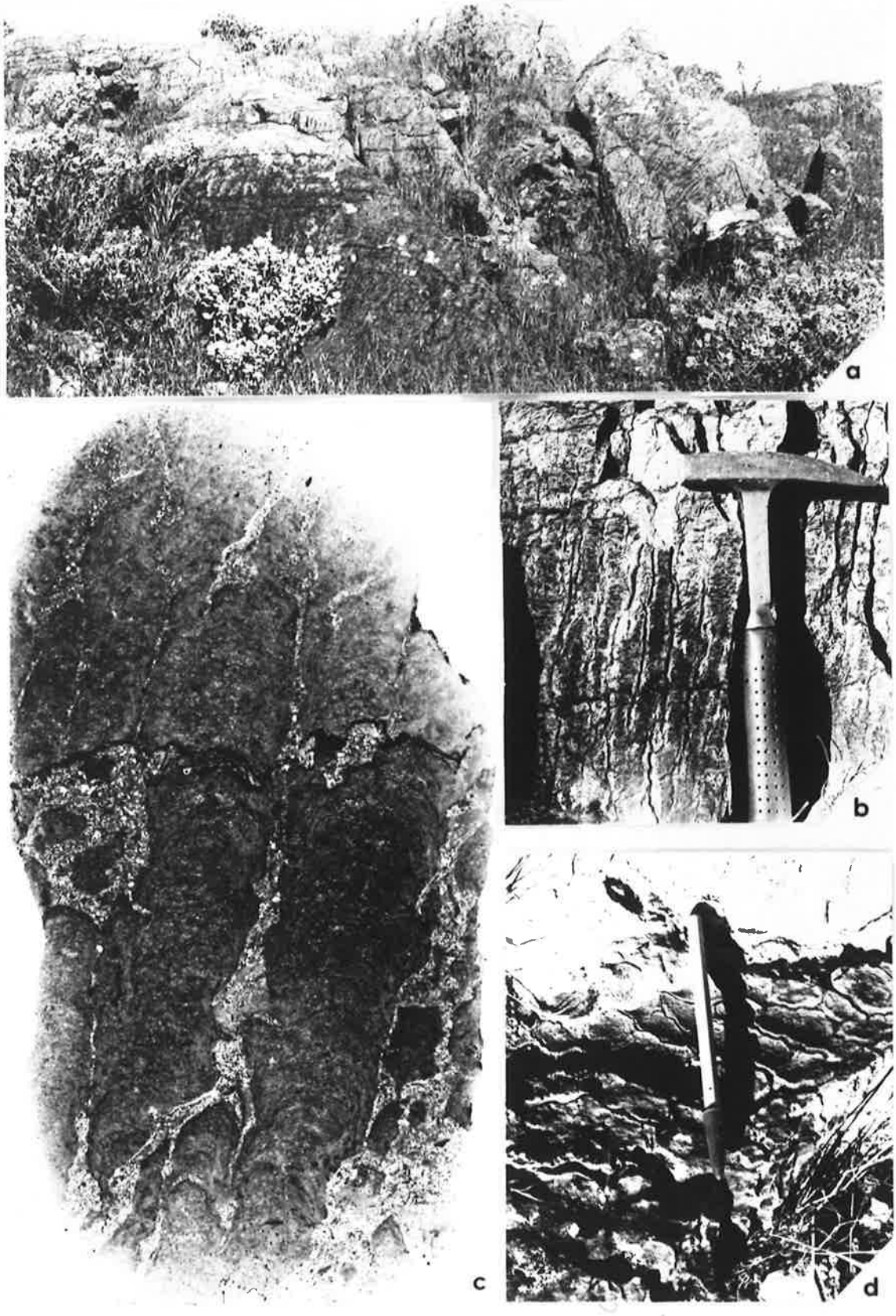

a
b
c
d

Plate 20

(a),(b) *Katavia costata*: Brighton Limestone equivalent, Depot Creek

(a) Vertical columns in the centre of a bioherm

(b) Cylindrical, narrow columns arising directly from flat-laminated stromatolites. Note: the hammer is 30 cm long

(c) to (f) *Kulparia kulparensis*: Etina Formation equivalent, near Kulpara

(c) Longitudinal section of cylindrical columns (float specimen)

(d) Complexly lobate transverse sections of columns (section *in situ*, parallel to bedding). Note: the pen is 15 cm long

(e) Small, irregular columns from unit A at the base of the bed; thin section (S270)

(f) A sand-dyke, post-dating the lithification of the stromatolites, cuts stromatolite columns and incorporates fragments of the wall rock; thin section (S420)

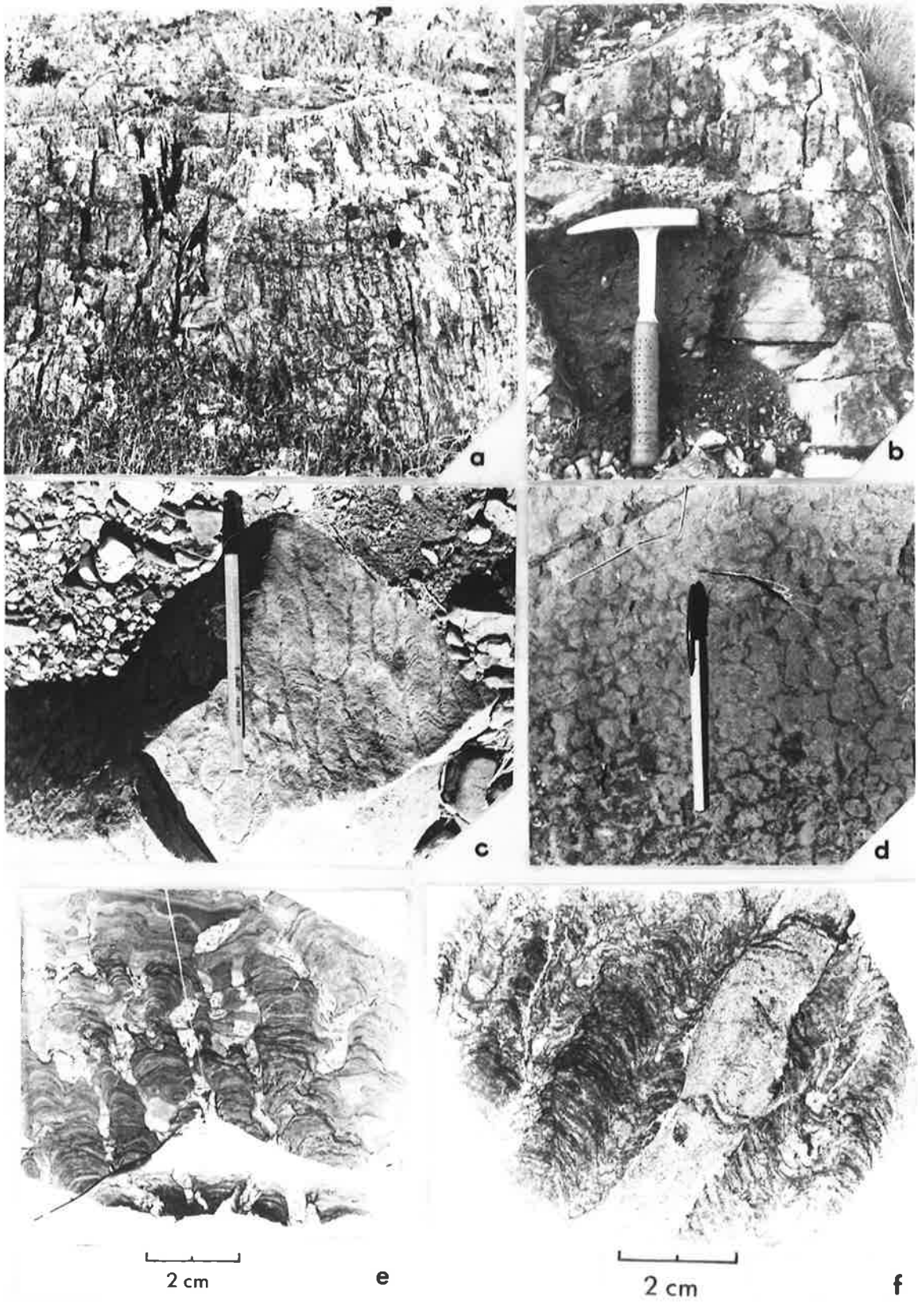

a
b
c
d
2 cm
e
2 cm
f

Plate 21

(a) to (d) (f) *Kulparia kulparensis*: Etina Formation equivalent, near Kulpara

(a) to (d) Longitudinal thin sections of columns (S271, holotype S380, S380 and S419 respectively). In (d) note the late stage vein filling a fracture within the sand-dyke

(f) Details of walled margin structure and the coarse interspace sediment. Thin section

(e) & (g) *Linella ukka*: Balcanoona Formation; Burr Well

(e) Longitudinal sections of tuberous, divergent branching columns; cut slab (S477)

(g) Subhorizontal columns at a bioherm margin

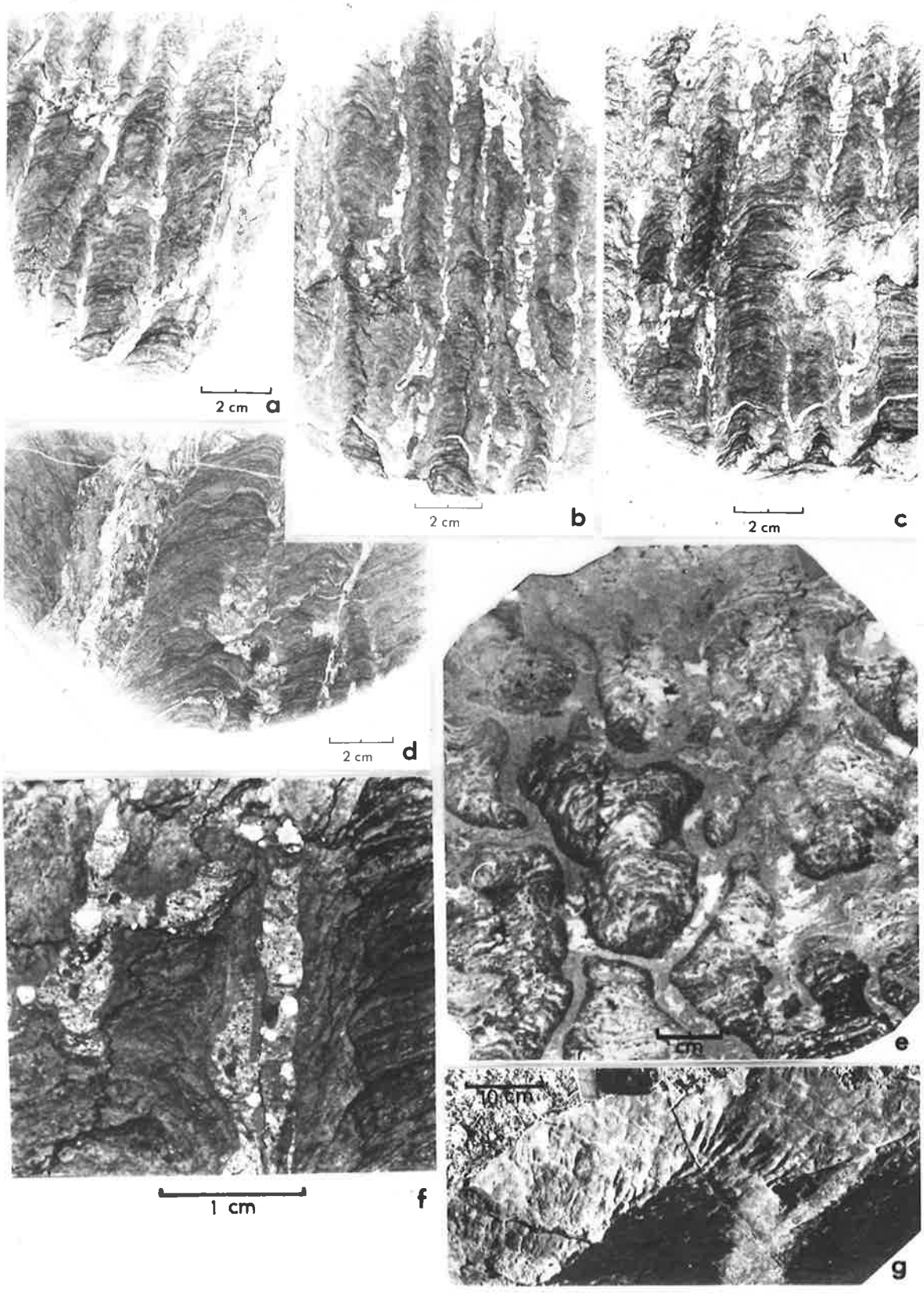

2 cm
a
2 cm
b
2 cm
c
2 cm
d
cm
e
10 cm
g
1 cm
f

Plate 22

(a) to (c) (e) *Linella ukka*: top of the Balcanoona Formation, Burr Well

(a) Longitudinal sections of tuberous columns with pointed projections. The marking pen is 10 cm long

(b) Cut slab, illustrating longitudinal section of columns and divergent branching (S478). The large white areas patches of coarsely recrystallized calcite

(c) Longitudinal thin section (S477). Note that the laminae are largely obliterated by recrystallization

(e) Details of microstructure and the wall zone. Note the patchy recrystallization and calcite veins; thin section (S477)

(d) *Linella munyallina*: Wundowie Limestone, Roebuck Bore. Inclined columns, at margin of a small bioherm

(f) Nearly vertioal section of columns, probably *Linella munyallina*, Wundowie Limestone, 2 miles east of Copley

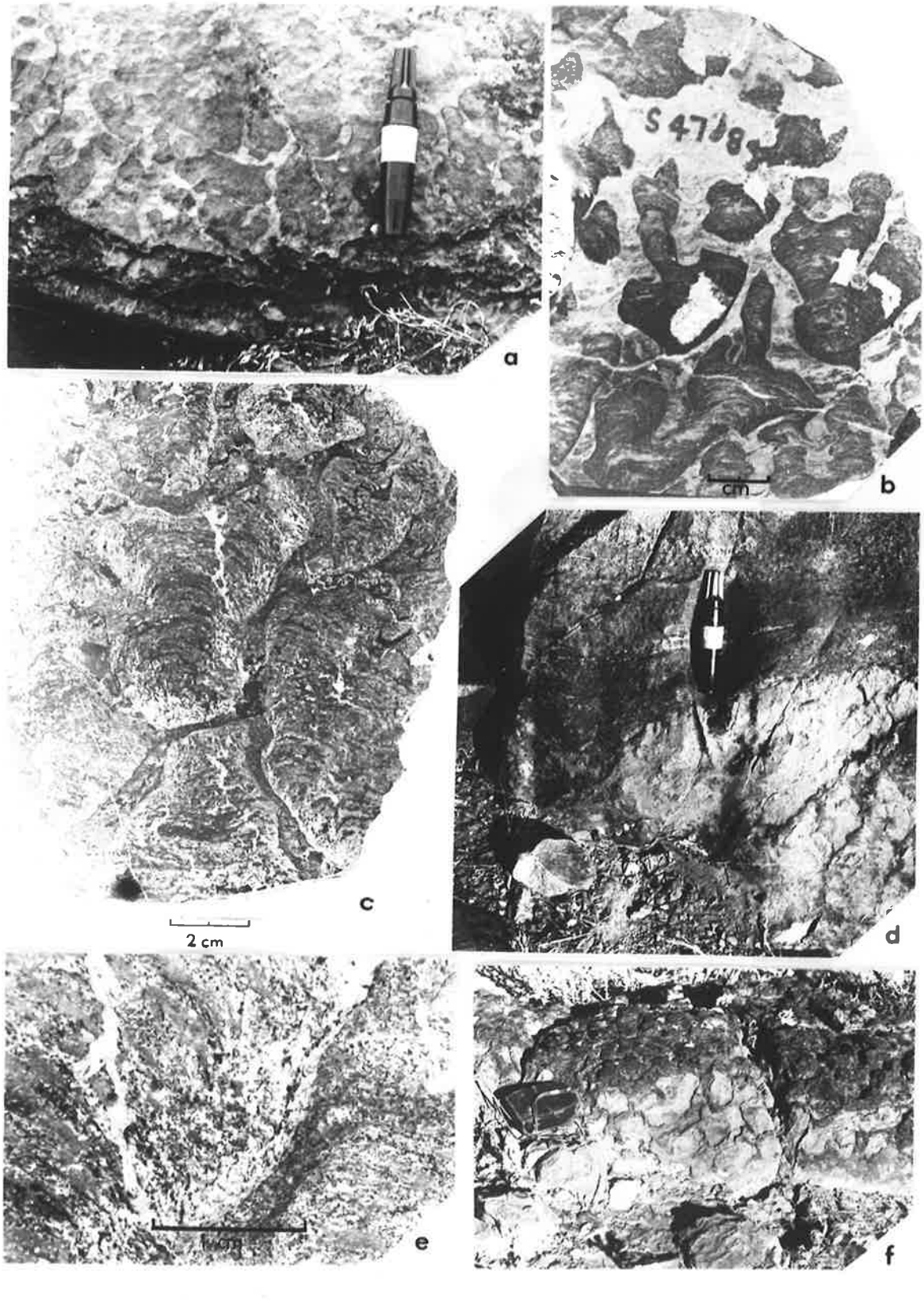

a
S 4718
cm
b
c
2 cm
d
e
f

Plate 23

(a) to (d) *Linella munyallina*: Wundowie Limestone

(a) Outcrop showing longitudinal sections of stylolite-bounded columns at Wundowie Bore

(b) Outcrop showing circular and lobate transverse sections of both broad and narrow columns, near Myrtle Springs

(c) Longitudinal sections of complexly branching columns; Roebuck Bore

(d) Part of a bioherm in the same bed as 23(b), near Myrtle Springs. Note the strong cleavage in the limestone bed; the curvature of the bioherm is, however, primary, not of tectonic origin

(e) Section perpendicular to bedding of interbedded wavy-laminated and columnar stromatolites, possibly *Linella munyallina*; Wundowie Bore

(f) Undulatory stromatolites (laminae are accentuated by concordant stylolites); north of Patsy Springs H.S., east of Copley

10cm

Plate 24

Linella munyallina: Wundowie Limestone

(a) Thin section, showing stylolite-bounded columns; Wundowie Bore (S471)

(b) Thin section showing walled, parallel columns; near Myrtle Springs (S494)

(c) Recurved margin of a bioherm; lower member of the Wundowie Limestone, Burr Well. The surrounding sediment at right is laminated shale

(d) Thin section showing steeply domed laminae in parallel columns, near Myrtle Springs. Note the lenticular sandy layers in the interspaces. Thin section (S495)

(e) Inclined columns at a bioherm margin; lower member of the Wundowie Limestone, Burr Well

(f) Short columns in a thin bed; near the Arkaroola Airstrip, Munyallina Valley

(g) Inclined columns from a bioherm margin; here the wall is poorly developed; lower member of the Wundowie Limestone, Burr Well. Thin section (S486)

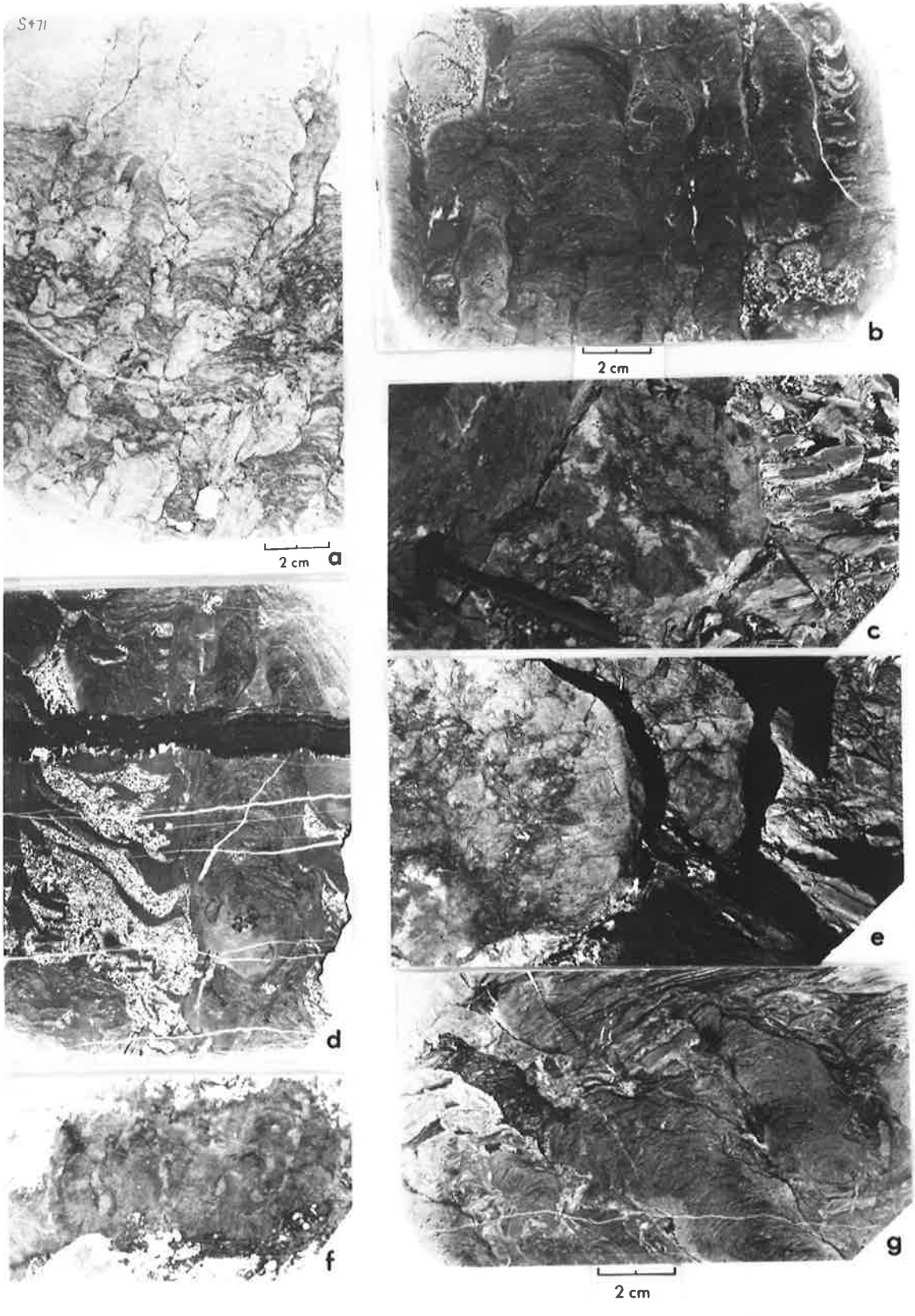

S471
2 cm
a
b
2 cm
c
d
e
f
g
2 cm

Plate 25

Linella munyallina: Wundowie Limestone

(a) Thin section of stylolite-bounded columns; two miles east of Copley

(b) Thin section showing basal columns arising from flat-laminated stromatolite; NE corner of Lake Arthur; (Specimen collected by Mr. B. Murrell, S552)

(c) Thin section showing columns with numerous bridges; near the Arkaroola Airstrip, Munyallina Valley (S294). Here the wall is well developed, but largely recrystallized

(d) Thin section showing irregular, bridged columns with poorly developed wall; lower member of the Wundowie Limestone, Burr Well (S485)

(e) Thin section of irregular, coalescing columns, part of a small isolated bioherm; near the Arkaroola Airstrip, Munyallina Valley (S451). Columns are extensively altered by fracturing, stylolites and recrystallization

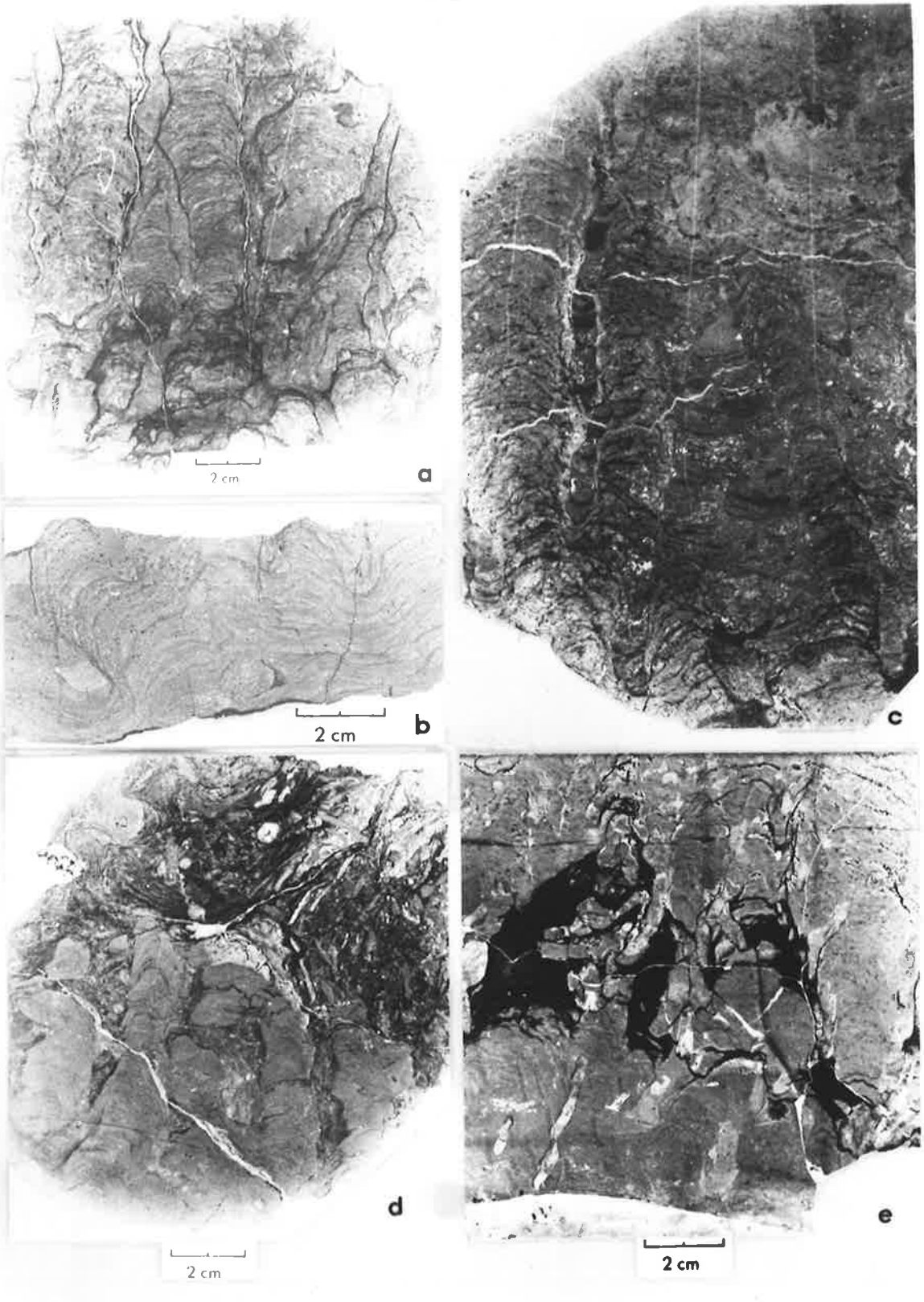

2 cm
a
2 cm
b
c
d
2 cm
e
2 cm

Plate 26

(a) Linella munyallina: thin section of slightly divergent branching columns, Wundowie Limestone, Roebuck Bore (S431)

(b) Linella munyallina: details of the lamination and wall structure; Wundowie Limestone, near Myrtle Springs; thin section (holotype S495)

(c) to (f) Omachtenia utschurica: lower (transitional) member of the Brighton Limestone, Depot Creek

(c) A large stromatolite cumulus grown over the eroded surface of the underlying laminated silts. At the right is a small erosional channel filled with flat-pebble breccia

(d) Thin section showing columns with numerous bridges and pelletal laminae (S399). The dark laminae are dolomitic

(e) Large cumulus containing pseudocolumns. At left is a channel filled with flat-pebble breccia

(f) Thin section showing small column with pelletal laminae commencing growth over an erosional high in the underlying silts (S165). Note the truncation of the lamination in the siltstone

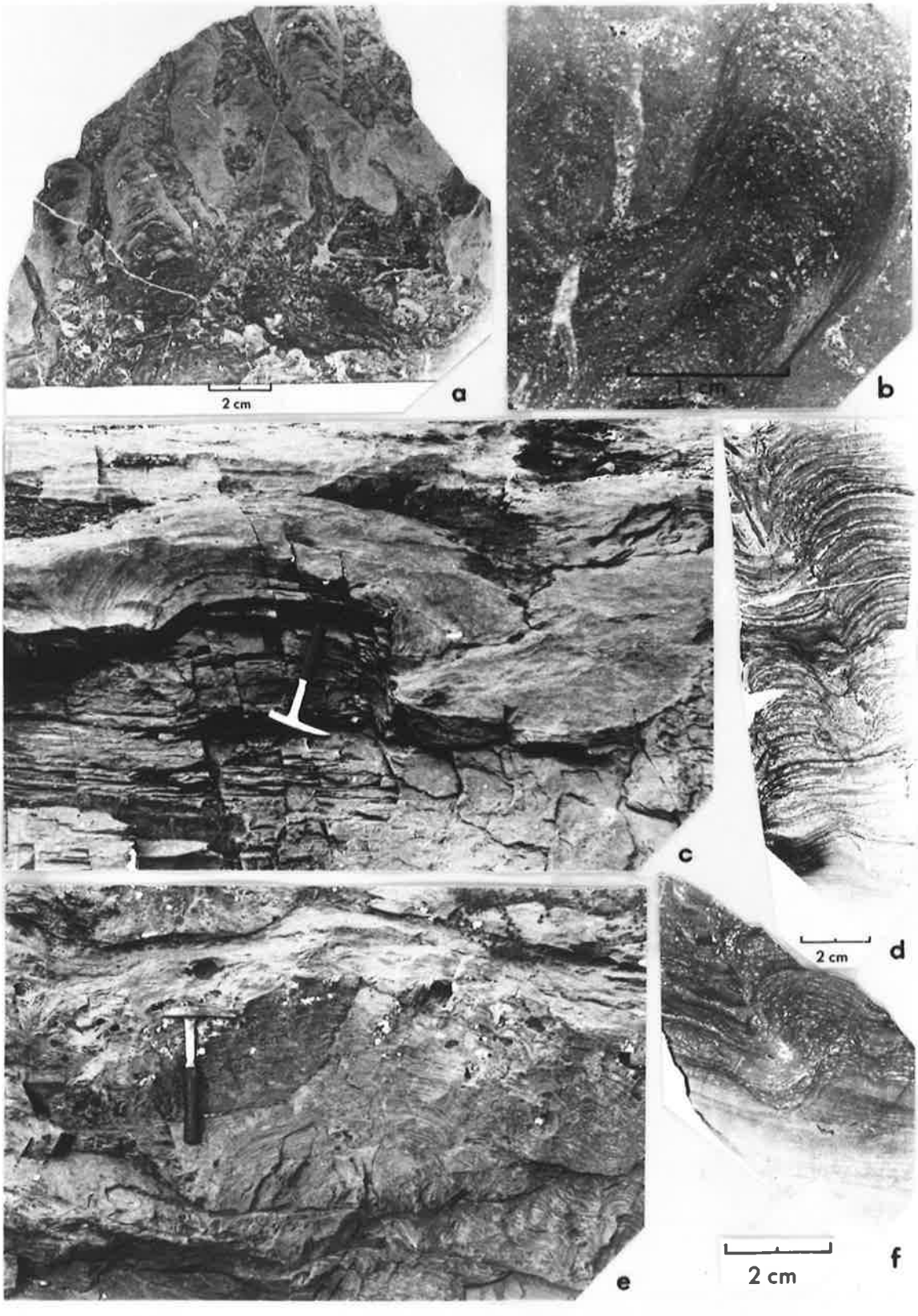

2 cm
a
b
c
d
2 cm
e
2 cm
f

Plate 27

(a),(b) Omachtenia utsohurica: Brighton Limestone, Depot Creek. Longitudinal sections of columns with numerous bridges

(c),(e) Columnar-layered stromatolites resembling Omachtenia, Balcanoona Formation, Nepouie Creek, 5 miles north of Balcanoona. Unlike the Depot Creek occurrence, here laminae grade to low-conical shape

(d),(f) Longitudinal thin sections, Depot Creek (S166 and S120 respectively). Pelletal laminae, present in (d), are poorly developed in (f). Note the inclined column margins and numerous bridges in (d)

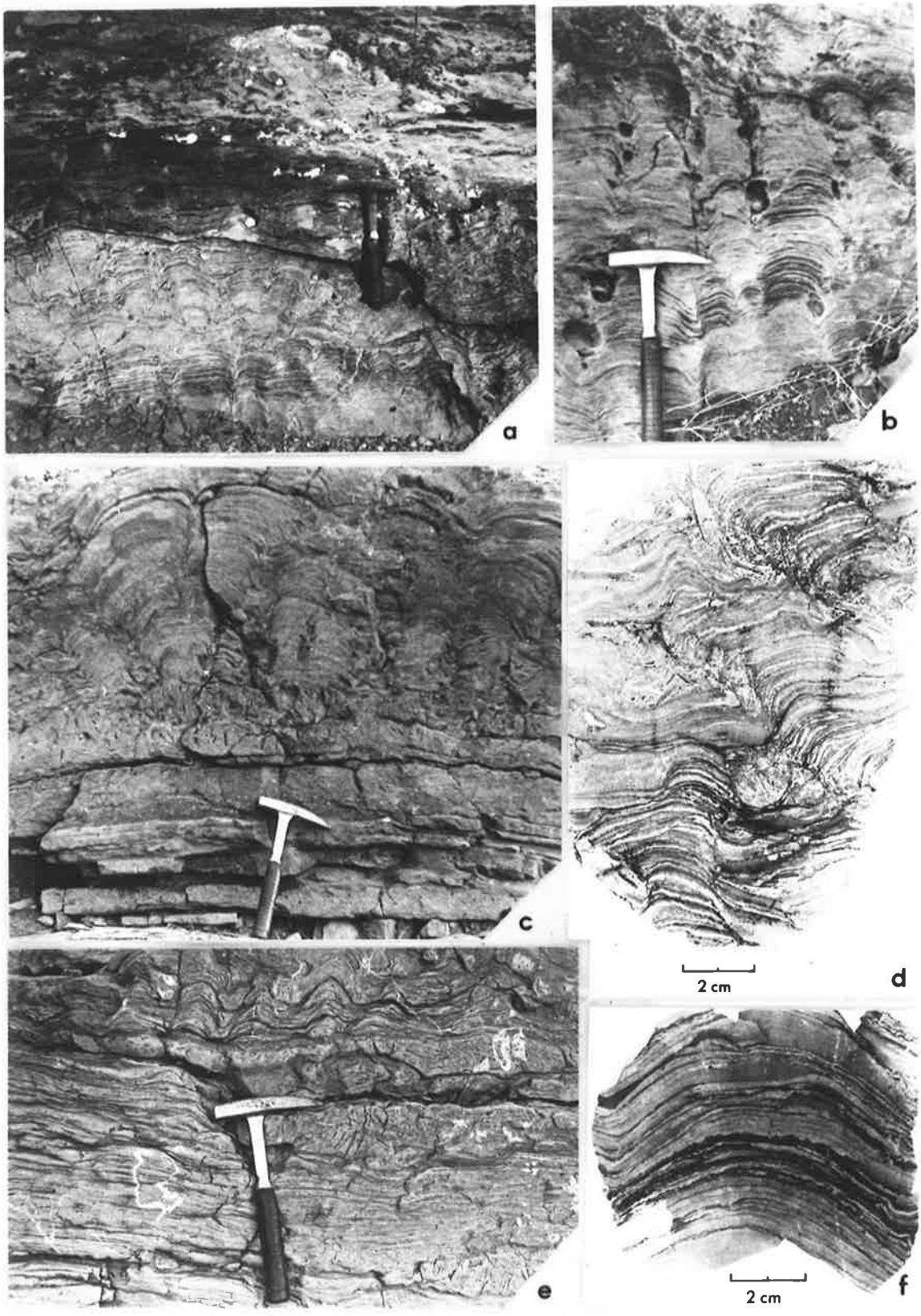

a
b
c
2 cm
d
e
2 cm
f

Plate 28

(a) to (c) *Omachtenia utschurica*: Brighton Limestone, Depot Creek

(a) Longitudinal thin section of short, frequently bridged columns (S164)

(b) Large stromatolite dome grown over siltstone. The bedding of the silts is also domed, probably by later compaction

(c) Thin section illustrating details of pelletal microstructure (S399)

(d) to (f) *Tungussia etina*: Flinders Ranges

(d) Tuberous, markedly divergent branching columns; Balcanoona Formation, east of Mt Chambers. Note the frequent tectonic veins

(e) Subparallel columns in the central part of a bioherm; Wundowie Limestone, near Teatree O.S.

(f) Poorly defined columns and undulatory stromatolites; Etina Formation, Enorama Creek

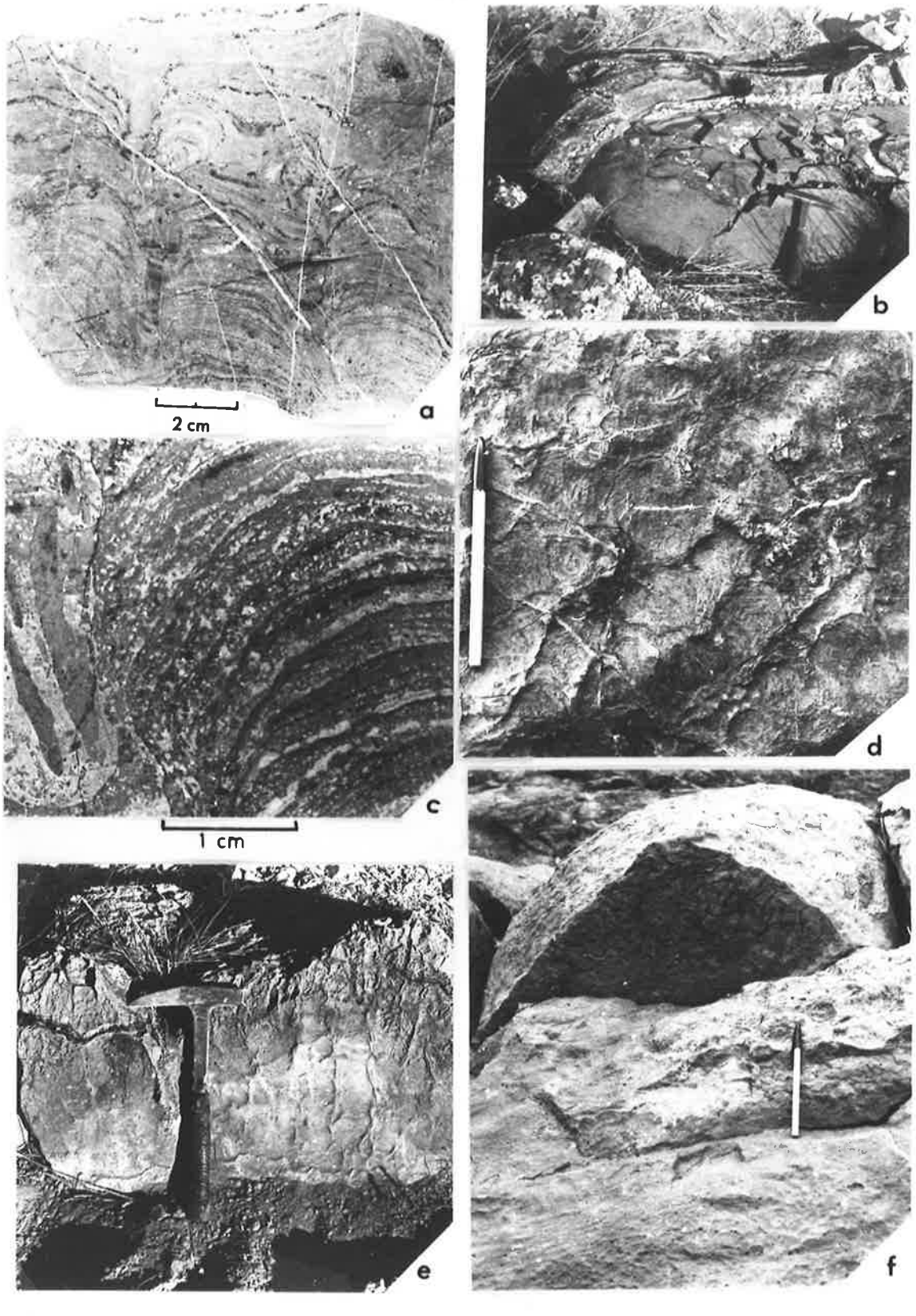

2 cm
a
b
c
1 cm
d
e
f

Plate 29

Tungussia etina: Flinders Ranges

(a) Longitudinal outcrop section of markedly divergent, multiple branching and tuberous columns; Balcanoona Formation, east of Mt Chambers

(b) Thin section of walled columns; Wundowie Likestone, near Teatree O.S. (S446). Laminae are largely altered, but the wall is generally perserved

(c) Thin section showing details of lamination and margin structure; Balcanoona Formation, east of Mt Chambers. Thin section (S525)

(d) Irregular, coalescing columns; Etina Formation, near Arkaba H.S. Thin section (S522). Note the numerous stylolites concordant with the stromatolitic lamination

(e) Vertical thin section showing both longitudinal and transverse sections of variously oriented columns; Balcanoona Formation, east of Mt Chambers (holotype, S435)

(f) Wavy, banded, partly inverse-graded lamination; Etina Formation, east of Blinman; thin section (S158)

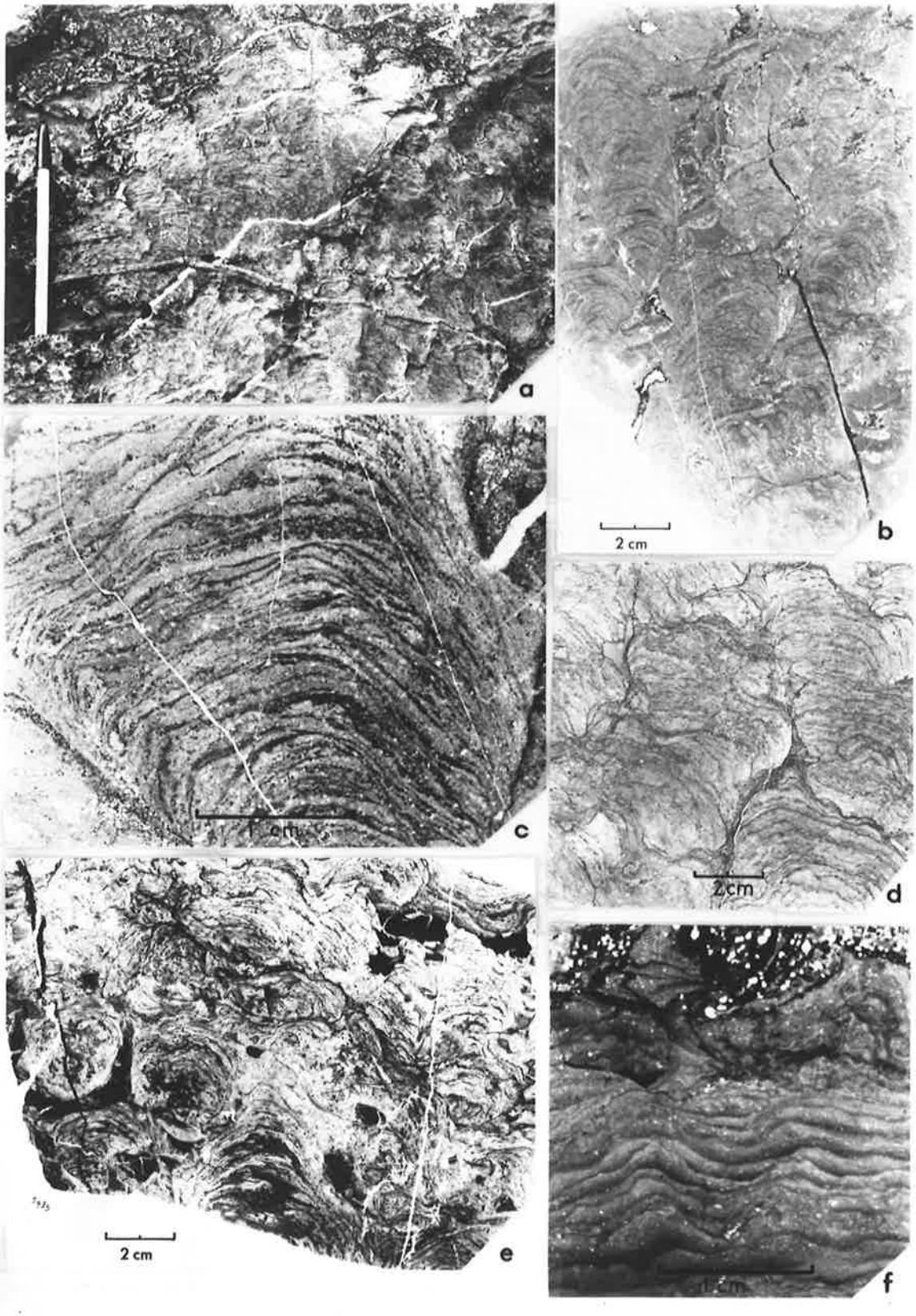

a
2 cm
b
1 cm
c
2cm
d
2 cm
e
1 cm
f

Plate 30

(a) Tungussia etina: cut slab showing markedly divergent, multiple branching of columns; Wundowie Limestone, near Teatree O.S. (S441)

(b) Longitudinal thin section of tuberous, patchily walled columns; Balcanoona Formation, east of Mt Chambers (S525)

(c) to (f) Tungussia wilkatanna: Skillogalee Dolomite, Depot Creek

(c),(d) Markedly divergent branching tuberous columns, with frequent bridges in the upper part

(e),(f) Thin sections of gently inclined columns (S170 and S167 respectively). Note the uniformly banded microstructure, with macrolaminae. Interspaces in (f) contain stromatolitic fragments

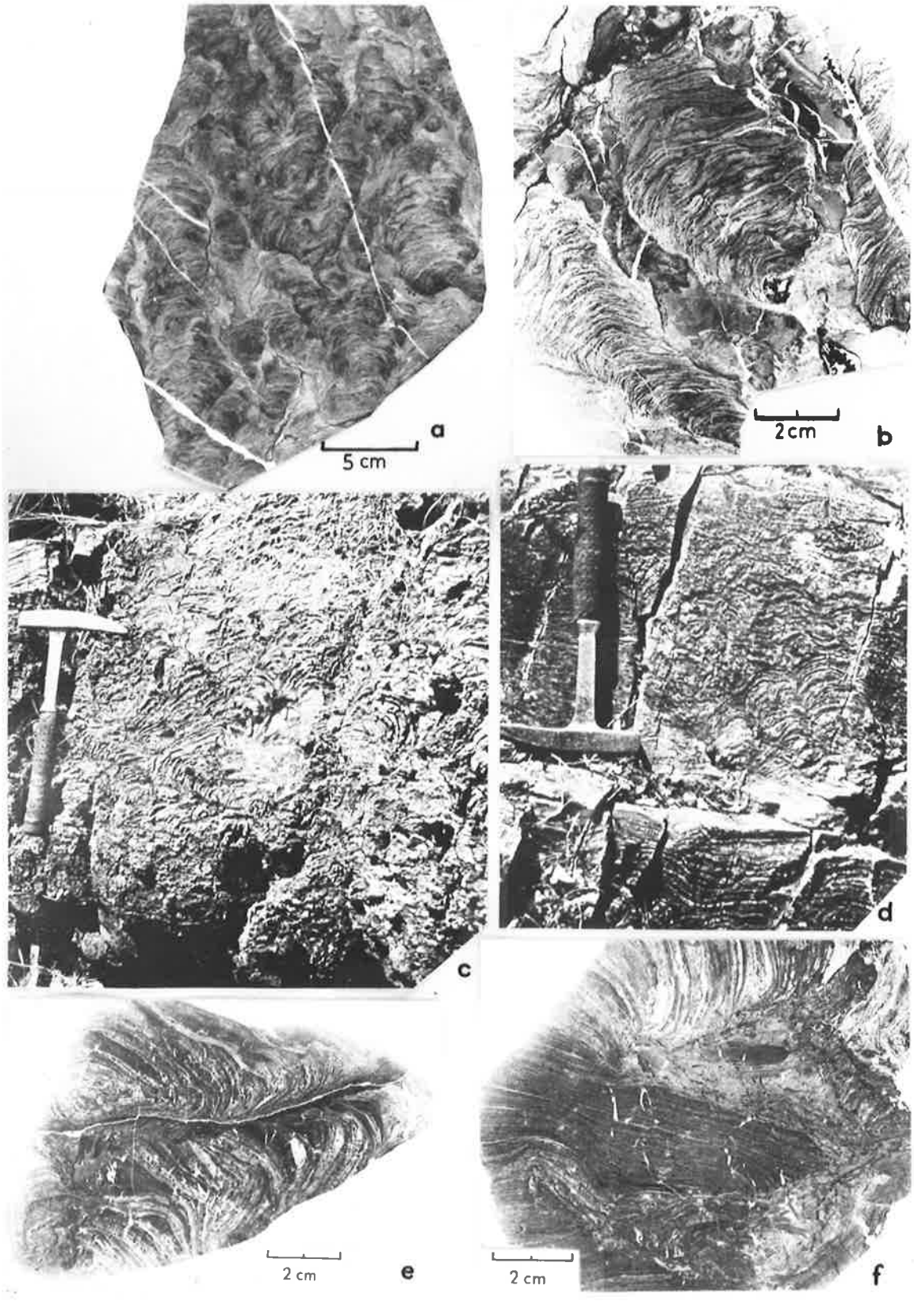

a
5 cm
2cm
b
c
d
2 cm
e
2 cm
f

Plate 31

(a) to (e) Tungussia wilkatanna: Skillogalee Dolomite, Depot Creek

(a) Right-angle bend in subhorizontal column. Thin section (S169)

(b) Thin section showing details of microstructure and wall. The darker areas are dolomitic remnants after patchy silicification. Laminae are best preserved in silicified portions (holotype S412)

(c) Cut slab showing markedly divergent branching columns (S169)

(d) Multiple, markedly divergent branching columns. Thin section (holotype S412)

(e) Details of wall in silicified columns. Thin section (S176)

(f) Indeterminate stromatolite resembling Parmites concrescens, Etina Formation, south of the Enorama Diapir. All the fine laminae are stylolitic. Thin section (S523)

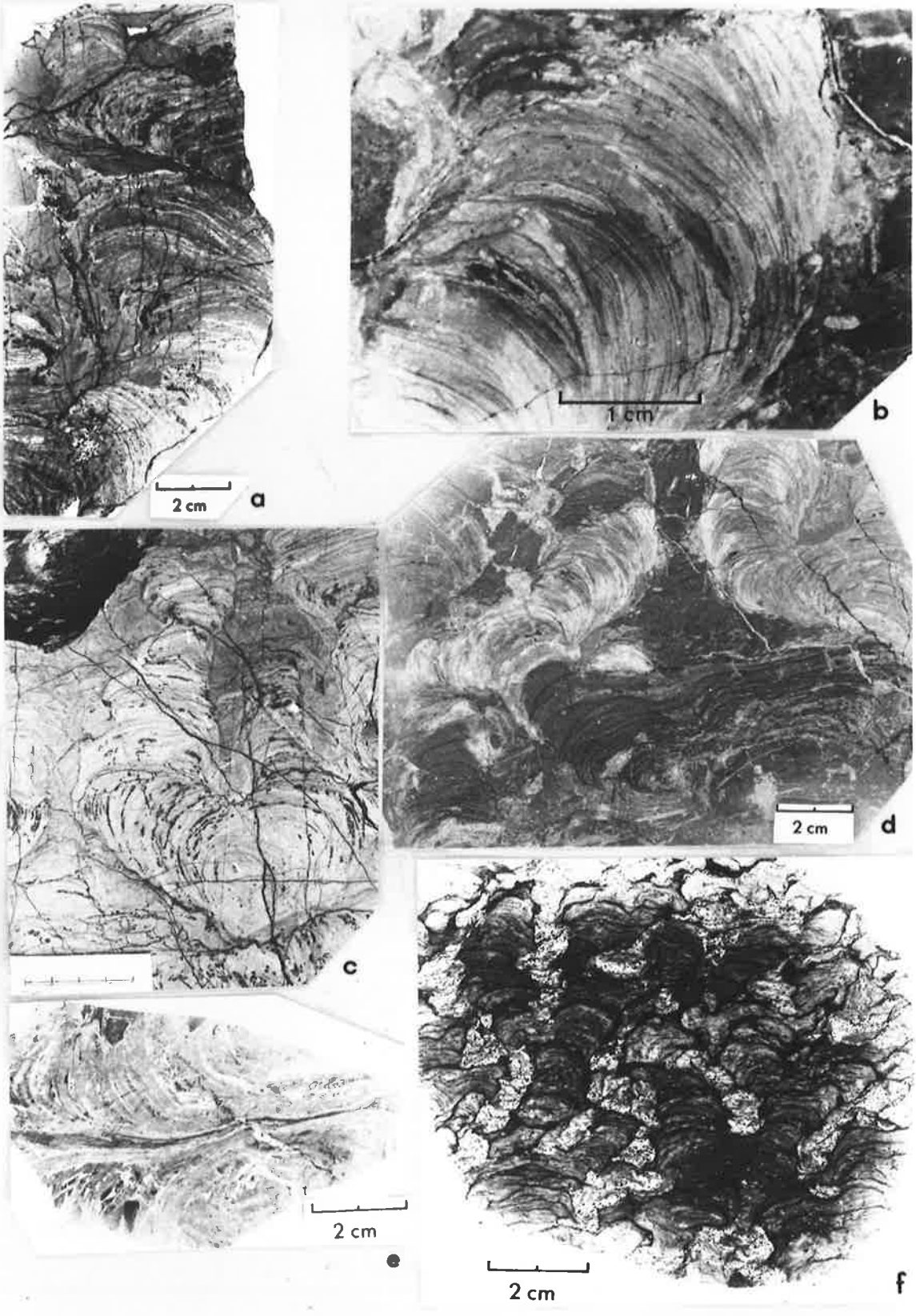

2 cm
a
1 cm
b
c
2 cm
d
2 cm
e
2 cm
f

Plate 32

Miscellaneous stromatolites

(a) Large elongate cumulate stromatolites; Trezona Formation, near Mt Chambers. The elongation trends approximately NS

(b) View of a bedding plane containing large, elongate cumulate stromatolites; Trezona Formation, Enorama Creek

(c) Thin sections of details of lamination in cumulate stromatolites; Trezona Formation, Enorama Creek, taken from the outcrop in (b). The upper thin section is parallel to the cuspate ridges, the lower is perpendicular. Almost all laminae have concordant stylolites (S559). In the lower section, successive lamina crests are displaced in a northerly direction

(d) Subconical pseudocolumn, Woocalla Dolomite, Pernatty Lagoon; thin section (S309)

(e) Thin section of pseudocolumns with minor interspaces, filled with intramicrite; Trezona Formation, Enorama Creek. Note laminated shale above the stromatolite (S102)

(f) Wavy, banded lamination in broad pseudocolumn, with minor interspaces; Trezona Formation, Bunkers Hut, near Wirrealpa. Thin section (Geology Department collection, S254)

(g) Outcrop section of indeterminate stromatolite; base of the Balcanoona Formation, Burr Well

(h) Silicified pseudocolumnar stromatolites; Lower Callanna Beds, near Nilpinna, Peake and Denison Ranges. (Specimen from Department of Mines collection)

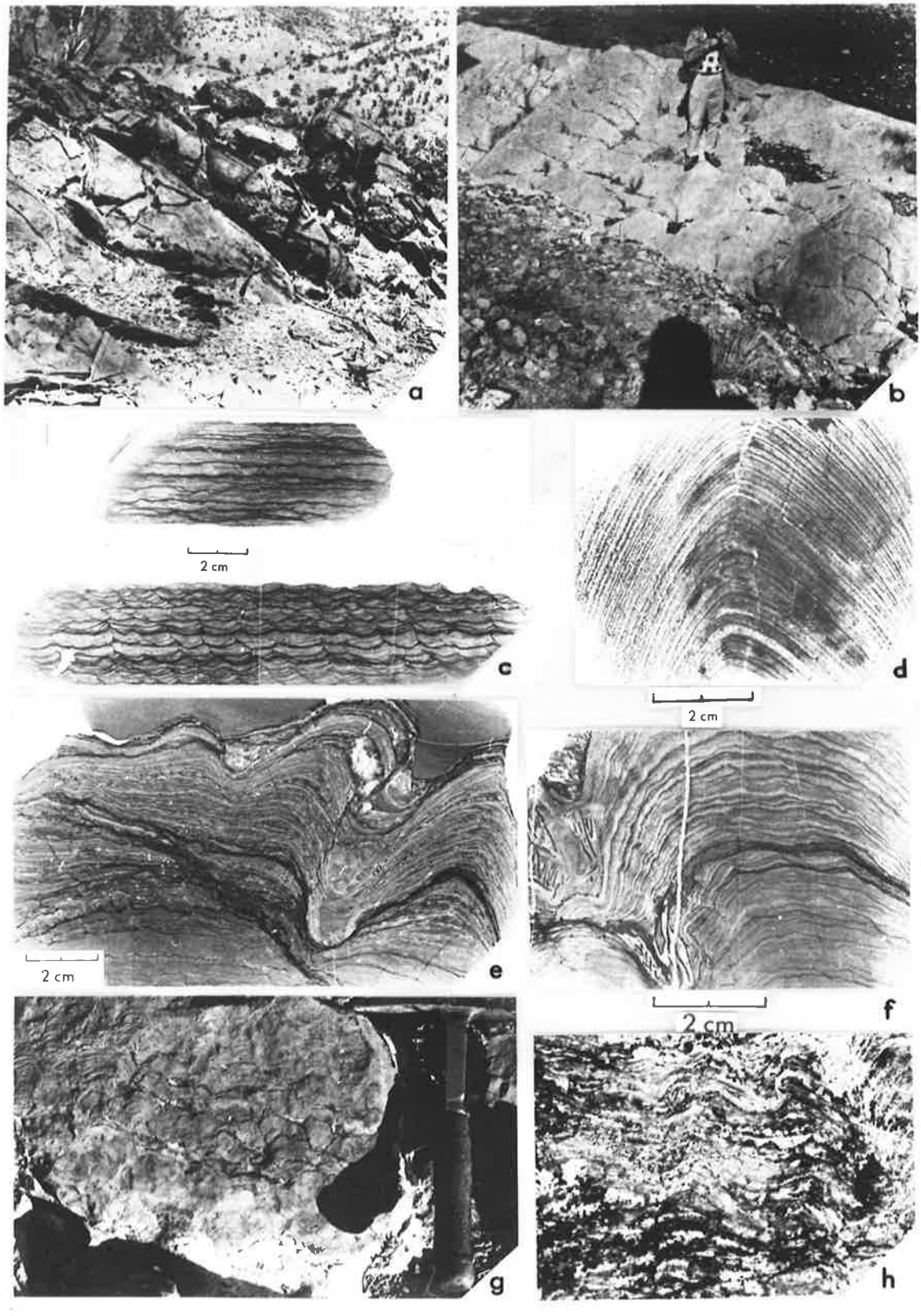

a
b
2 cm
c
d
2 cm
2 cm
e
f
2 cm
g
h

Plate 33

Miscellaneous stromatolites

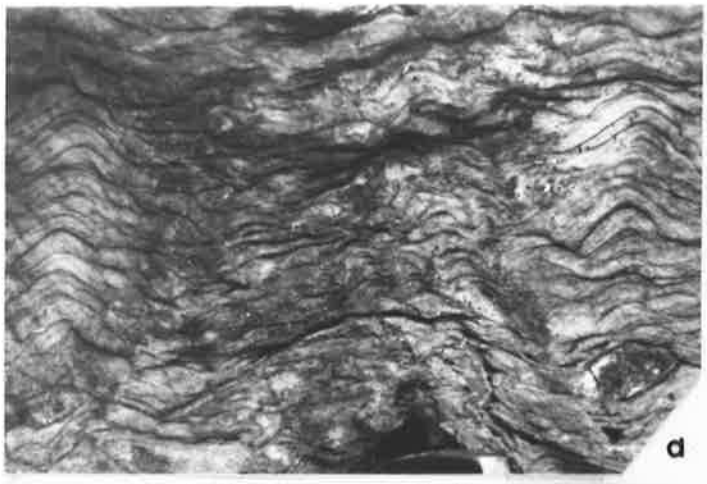
(a) Low-conical laterally linked stromatolites; Lower Cambrian, north end of Lake Torrens (photo by Mr. B. Murrell)

(b) Axial longitudinal thin section of low-conical stromatolite; Lower Cambrian, north end of Lake Torrens. (Specimen collected by Mr. B. Murrell, S546). The lamination is extremely indistinct

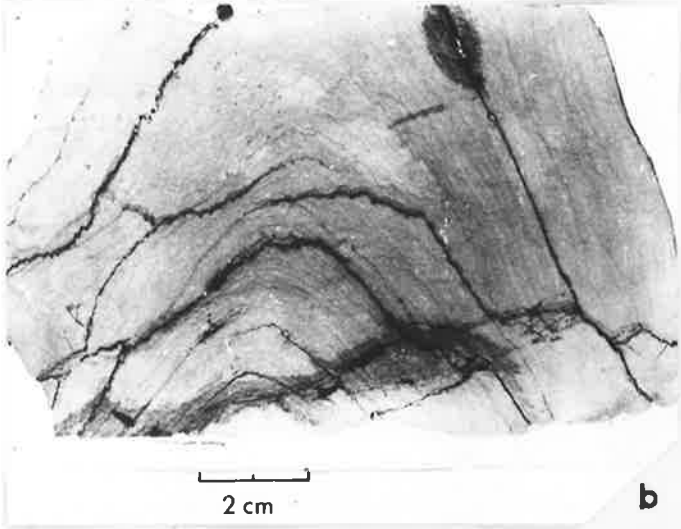
(c) Possible deformed stromatolites in cherty, intensely folded dolomite; Montacute Dolomite, Torrens Gorge. Natural size (S413)

(d) Circular transverse sections of pseudocolumns; Trezona Formation, Enorama Creek

(e) Thin section of indeterminate stromatolites with irregular, stylolite-bounded columns and dolomitized interspaces; from outcrop in Pl.32(g), base of Balcanoona Formation, Burr Well (S274)



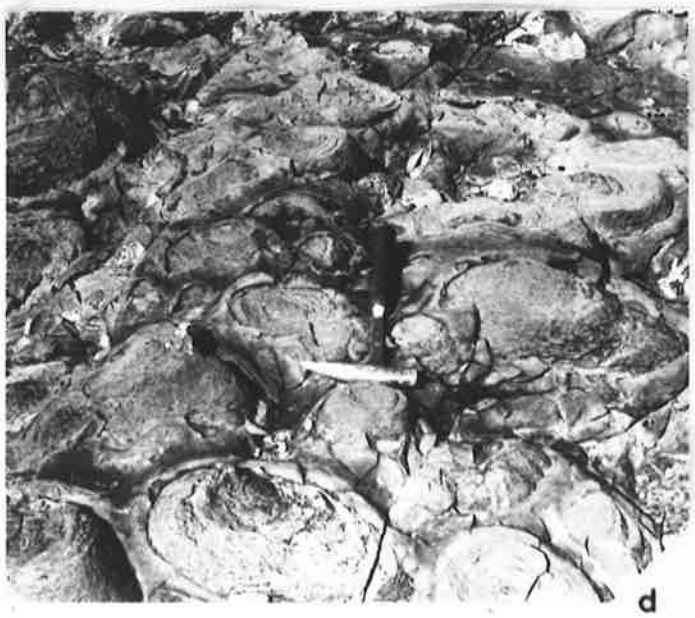
a



2 cm

b

c



d

2 cm

e

Plate 34

(a) to (e) Upward-concave structures in the upper (dolomitic) member of the Brighton Limestone

(a),(b) & (c) Interlayered intramicrite breccia and laminated dolomicrites, contorted by lateral compression into upward-concave structures with sharp crests across which laminae are often continuous; Depot Creek. (a) and (c) are thin sections

(d),(e) Upward-concave structures in the upper (dolomite) member of the Brighton Limestone, near Hallett Cove, south of Adelaide. Note the erosion of a crest prior to deposition of the next layer in (e), centre of photograph

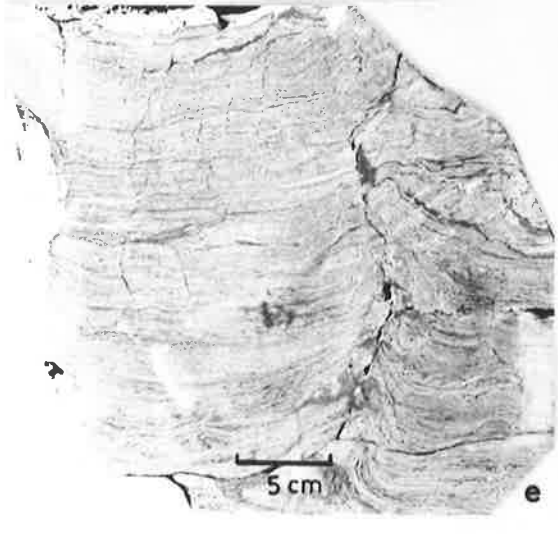
(f) Indeterminate columnar stromatolites, poorly preserved after dolomitization; Balcanoona Formation, 4 miles west of Angepena


2 cm
a


b


d


2 cm
c


5 cm
e


f

Plate 35

(a) Transverse section of upward-concave structure; upper (dolomite) member of the Brighton Limestone, near Hallett Cove, south of Adelaide

(b) Small cumulate stromatolite surrounded by magnesite conglomerate, the intraclasts of which are large and often curled, suggestive of very little transport; Skillogalee Dolomite, Depot Creek

(c) Transverse sections of indeterminate stromatolites resembling Parmites concrescens; Etina Formation, south of the Enorama Diapir

(d) Longitudinal section of stromatolite bed; as for (c)

(e) Indeterminate stromatolite with rectangular, pelletal laminae; Balcanoona Formation, Nepouie Creek, 5 miles north of Balcanoona. Thin section (S289)

(f) Poorly preserved, dolomitized stromatolite; Balcanoona Formation, from the outcrop shown in Pl.34(g), 4 miles west of Angepena (S467)

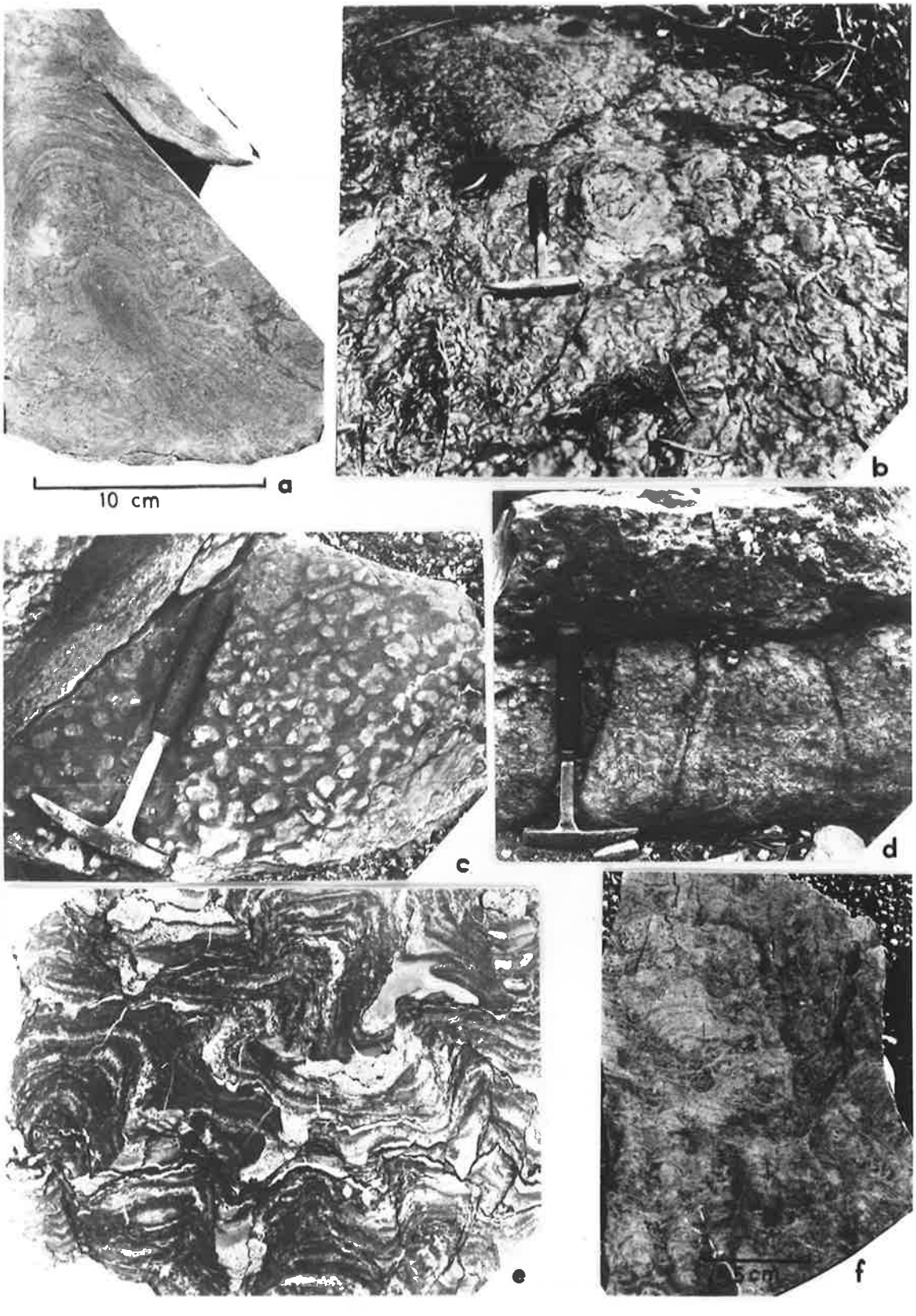

10 cm
a
b
c
d
e
5 cm
f

Plate 36

(a) Upward-concave structures analogous to those of the Brighton Limestone; Skillogalee Dolomite, Weekeroo

(b) Thin section of dolomitized oosparite, with secondary solution forming voids. Note the dismembered dolomitized ooid rims, and the later infilling of sparry, twinned calcite; Brighton Limestone, Reynella, south of Adelaide

(c) Isolated ripple marks of coarser silt in thinly laminated siltstones; Tapley Hill Formation, Tapley Hill, south of Adelaide. Note that the appearance of the relief of the ripples in the lower half of the photograph is partly accentuated by compaction, and partly by bleaching due to weathering

(d) Thin section of oosparite; Brighton Limestone, Depot Creek. Note the small "blister" under the outer lamina, which may indicate either that the outer lamina was a cohesive algal film, or that a small detrital grain was incorporated into the oolitic lamination

(e) Thin section of oosparite; Brighton Limestone, Depot Creek. Note the compound ooids and the authigenic feldspar grown in the outer lamina (immediately below the photograph centre)

(f) Intramicrite filling channels associated with bioherms of Omachtenia utschurica; Brighton Limestone, Depot Creek. Many flat pebbles are dissolved out and replaced by sparite, quartz, or a green, chloritic mineral (appearing black in the photograph)

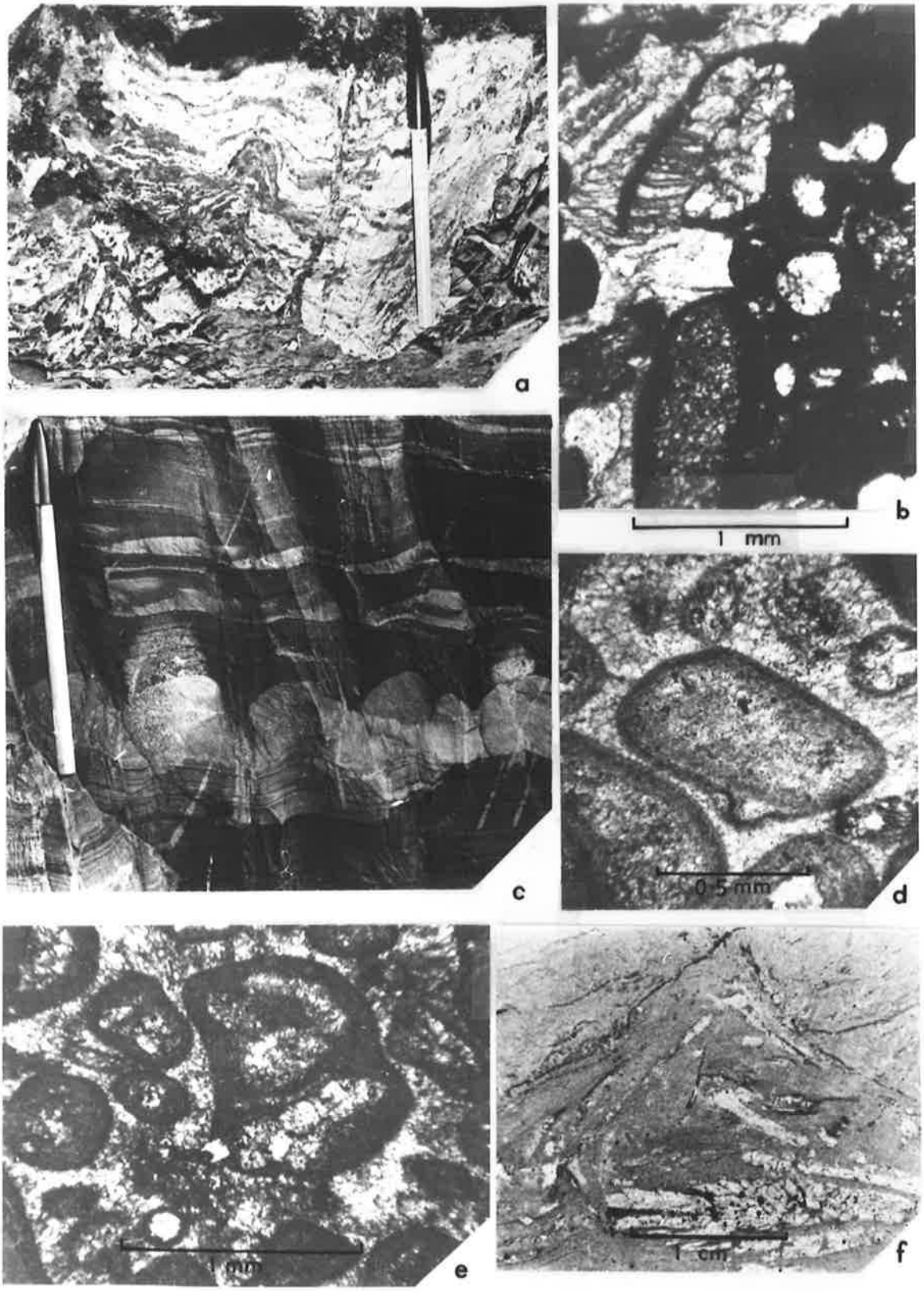

a
b
1 mm
c
d
0·5 mm
e
1 mm
f
1 cm

Plate 37

(a) Probable solution vughs, lined with drusy dolomite and filled with equidimensional, mosaic quartz; near the base of the Skillogalee Dolomite, Depot Creek. Thin section

(b) Void spaces in dolomitized oosparite; Brighton Limestone, Depot Creek; thin section. Note the fine rims of drusy cement

(c) Oosparite affected by late diagenetic or epigenetic dolomitization; at left is the original limestone, at right is dolomite, and the contact is marked by a dolomite vein. Thin section

(d) Cross-bedded oosparites; Brighton Limestone, Onkaparinga Gorge, south of Adelaide. Note the frequent reversals of current directions

(e) Internal sediment (micrite) filling a hollow mud curl (probably a disrupted thin algal mat), since replaced by coarse, twinned sparite. "Hieroglyphic" limestone; Trezona Formation, Enorama Creek

(f) Oosparite with some ooids replaced by sparite. The ooid in the centre was subject to erosion before deposition, but has excellently preserved lamination; from massive oolitic limestone, Brighton Limestone equivalent, Yednalue

(g) Oosparite with large, coated oomicrite intraclasts resembling botryoidal lumps; oolitic-intraclastic facies, Brighton Limestone, Depot Creek

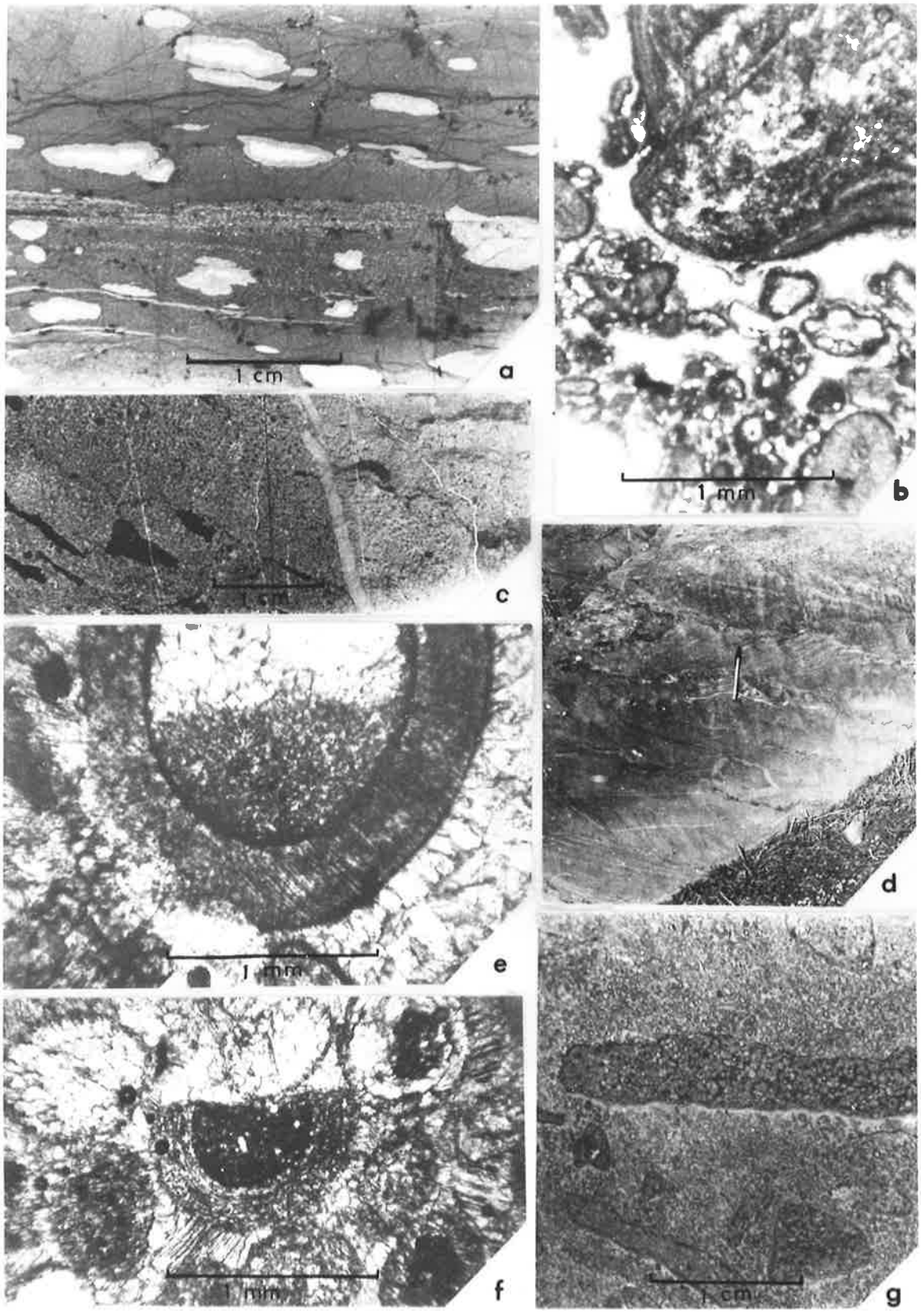

1 cm
a
1 mm
b
1 cm
c
d
1 mm
e
1 mm
f
1 cm
g

Fig. 1. Map of Localities Referred to in this Thesis

Adelaide	109	Jamestown	87	Pt Vincent	106
Aldgate	114	Johnburgh	63	Pt Wakefield	98
Andamooka	7	Kanmantoo	115	Quorn	58
Angaston	108	Kapunda	103	Reynella	117
Angepena	24	Kulpara	97	R Broughton	89
Appila	79	Lake Arthur	4	R Onkaparinga	118
Ardrossan	102	Leigh Creek	10	Riverton	100
Arkaba	47	Marree	2	Robertstown	96
Arkaroola	20	Martin's Well	46	Roebuck Bore	33
Auburn	99	Maynard's Well	23	Sellick Hill	122
Balcanoona	30	Melrose	73	Spalding	90
Barossa Ranges	108	Merinjina Well	28	Strathalbyn	118
Beltana	22	Mern Merna	44	Teatree O.S.	34
Bibliando	49	Mintaro	94	Telowie Gorge	78
Big Ben Bore	32	Moana	121	Termination Hill	8
Blinman	36	Montacute	111	Torrens Gorge	110
Booborowie	91	Mt Babbage	16	Truro	104
Booleroo Centre	74	Mt Chambers	38	Umberatana	12
Brachina	39	Mt Fitton	15	Victor Harbor	125
Brighton	113	Mt Grainger	82	Wabricoola	70
Broken Hill	67	Mt Painter	13	Warcowie	48
Buckaringa Gorge	53	Mt Remarkable	71	Warrakimbo	52
Burra	92	Mt Rose	19	Waukaringa	64
Burr Well	11	Mundallio Creek	59	Weekeroo	65
Cape Jervis	125	Munyallina Valley	26	West Mount Hut	5
Carrieton	62	Myponga	123	Whyalla	76
Chintapanna Well	3	Myrtle Springs	9	Wilkawillina Gorge	41
Clare	93	Nepouie Creek	29	Willochra	56
Copley	17	Nilpinna	1	Willunga	120
Crystal Brook	88	Noarlunga	118	Wilmington	69
Curramulka	105	Normanville	124	Wilpena Pound	45
Depot Creek & Depot Flat	57	Olary	66	Wilson	54
		Oraparinna	42	Wirrealpa	37
Dutton's Trough H.S.	95	Orroroo	72	Witchelina	6
		Palmer	112	Woocalla	43
Ediacara	21	Parachilna	35	Wooltana	27
Enorama Creek	40	Paralana	14	Woomera	31
Eudunda	101	Paratoo	83	Worumba	51
Gawler	107	Pekina	75	Wundowie Bore	18
Gladstone	86	Peterborough	81	Yatina	80
Hallett Cove	116	Pichi Richi Pass	61	Yednalue	55
Hawker	50	Pt Augusta	60	Yunta	84
Horrocks Pass	68	Pt Germein Gorge	77		
Italowie Gorge	25	Pt Pirie	85		

Fig. 1A. Inset. Geographic Location of the Adelaide Geosyncline in Australia

FIG. 1. LOCALITY MAP

0 50 100 miles
Scale

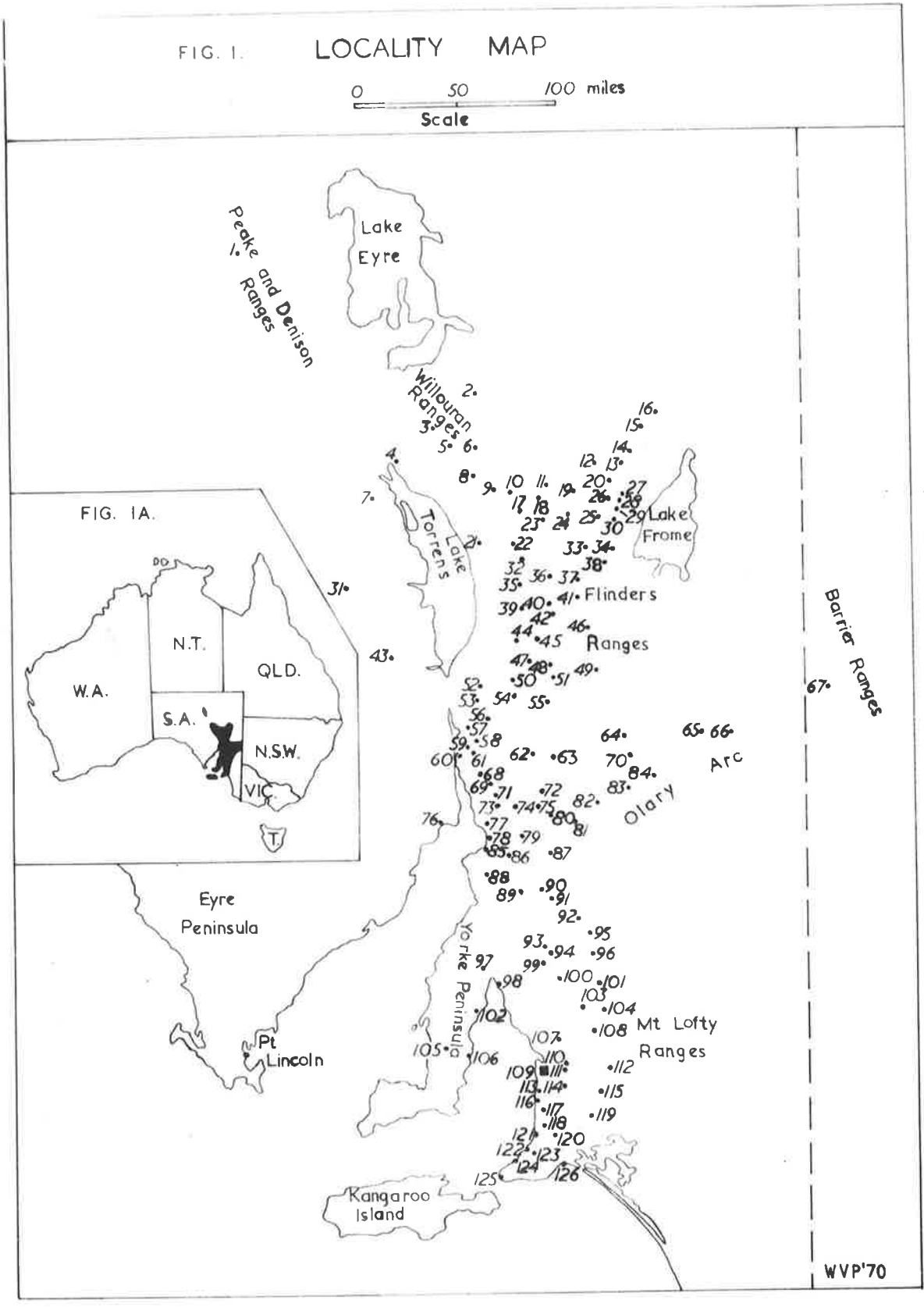
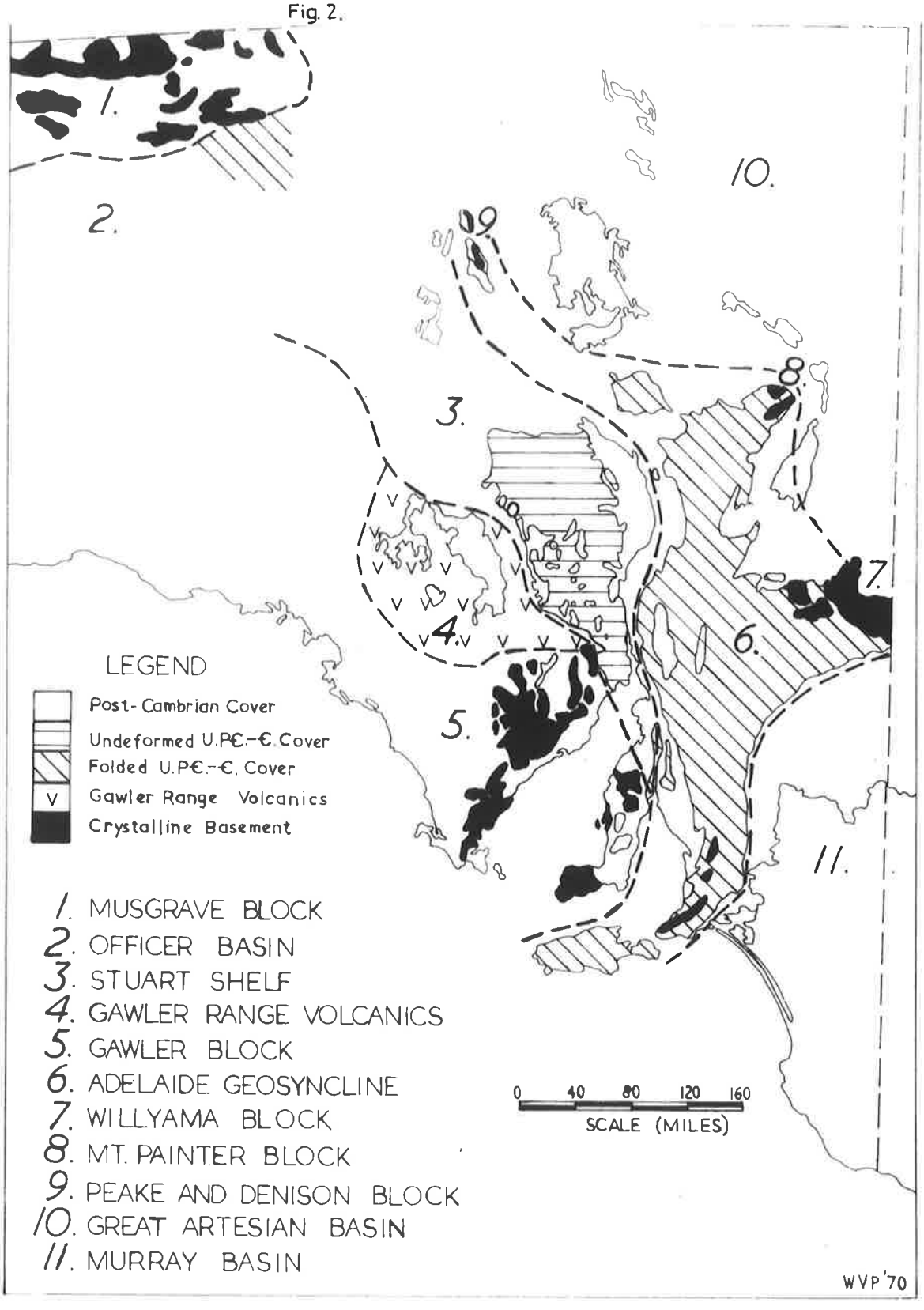


Fig. 2. Geological Setting of the Adelaide Geosyncline

Fig. 2.



1. MUSGRAVE BLOCK
2. OFFICER BASIN
3. STUART SHELF
4. GAWLER RANGE VOLCANICS
5. GAWLER BLOCK
6. ADELAIDE GEOSYNCLINE
7. WILLYAMA BLOCK
8. MT. PAINTER BLOCK
9. PEAKE AND DENISON BLOCK
10. GREAT ARTESIAN BASIN
11. MURRAY BASIN

Fig. 3. Structure and Metamorphism of the Adelaide Geosyncline

1. Unmetamorphosed, little deformed Late Precambrian to Cambrian cover rocks
2. Mildly folded Late Precambrian to Cambrian cover rocks; chlorite grade
3. Moderately folded Late Precambrian to Cambrian cover rocks; biotite grade
4. Strongly folded Late Precambrian to Cambrian cover rocks; amphibolite facies
5. Lower Palaeozoic granites
6. Older Precambrian basement
7. Horizontal strata
8. Fold axis
9. Fault

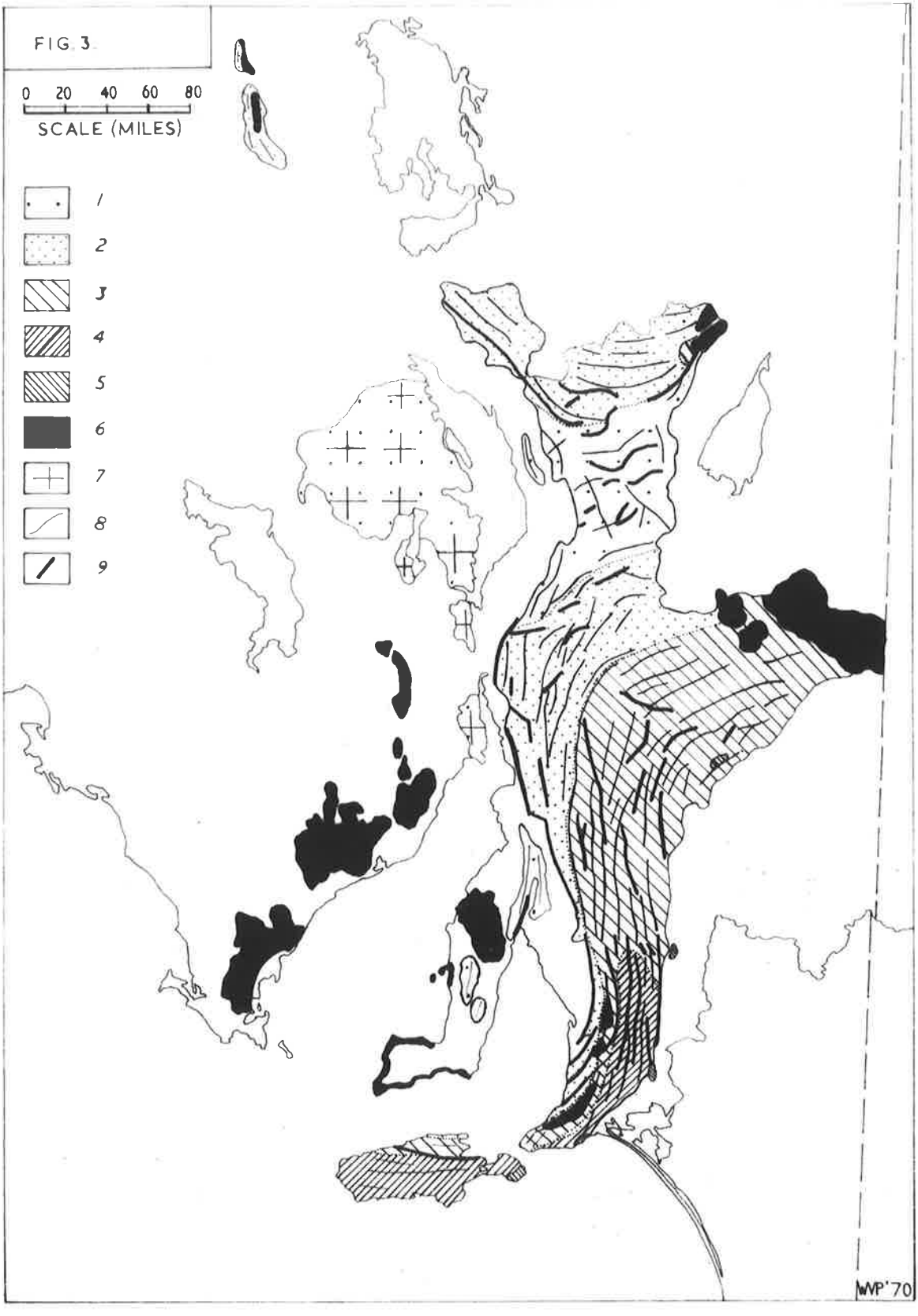


FIG. 3
0 20 40 60 80
SCALE (MILES)
1
2
3
4
5
6
7
8
9
WP '70

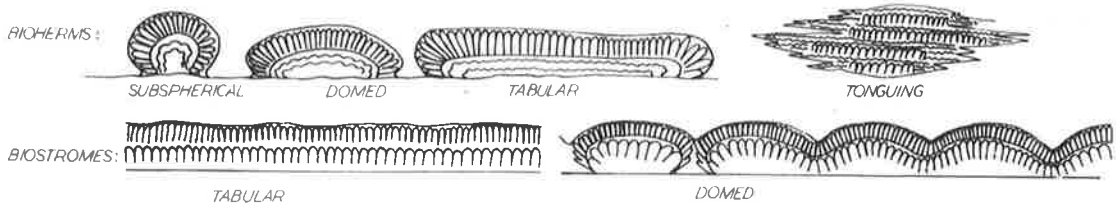
Fig. 4

Diagnostic terminology found useful in the description of stromatolites. The diagrams illustrate features discussed in Ch.5 and in Appendix I

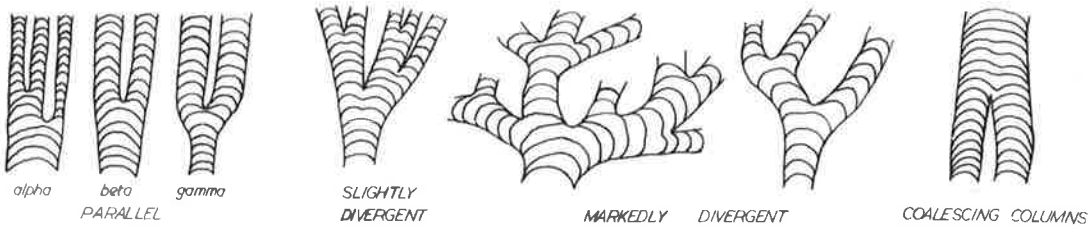
Fig. 4

DIAGNOSTIC TERMINOLOGY

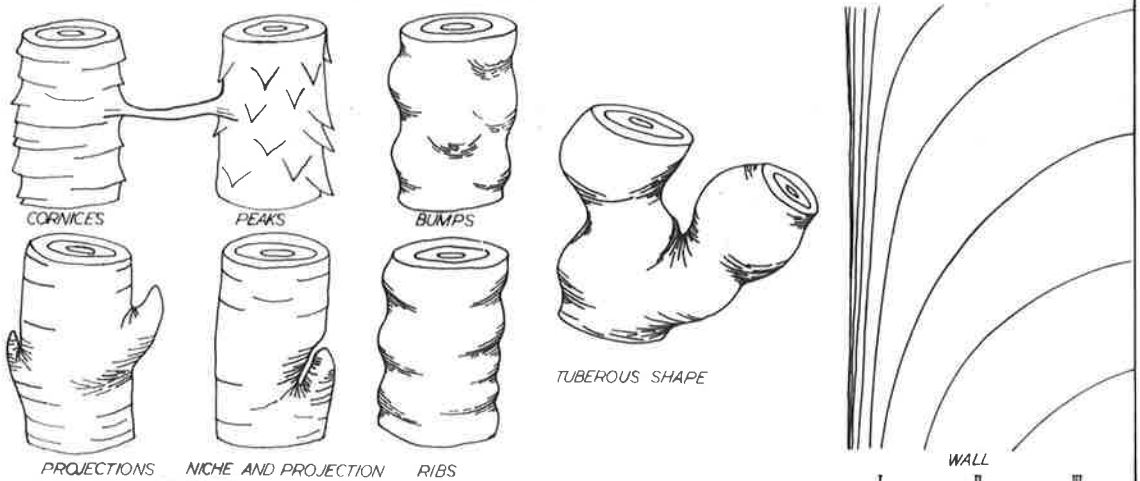
MODE OF OCCURRENCE



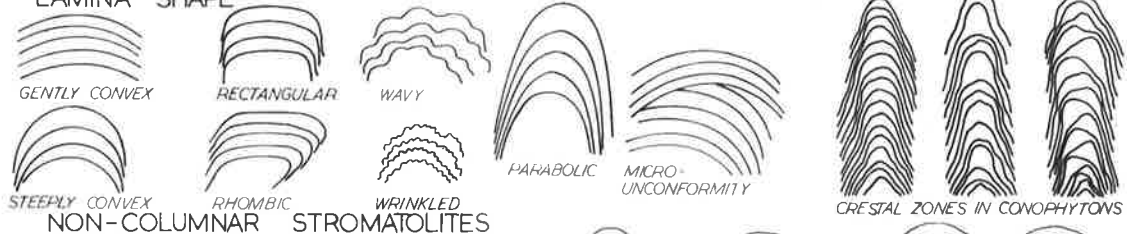
BRANCHING AND COALESCING



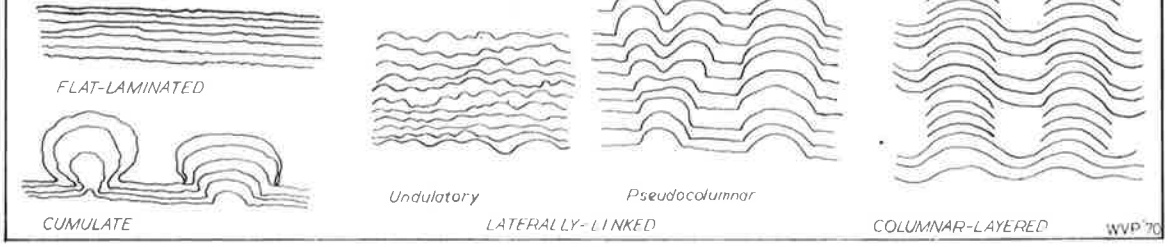
COLUMN SHAPE AND MARGIN STRUCTURE



LAMINA SHAPE



NON-COLUMNAR STROMATOLITES



WVP '70

Fig. 5

All reconstructions x $^{1}/_{3}$

(a) to (j) : *Acaciella augusta*: Brighton Limestone equivalent, Umberatana Group; Southern Flinders Ranges

(a)(b)(d) & (i) : S404; Depot Creek

(c),(e) : Holotype, S401; Depot Creek

(f) : S538; Mundallio Creek

(g),(h) : S396; Depot Creek

(j) : S537; Depot Creek

(k) to (n) : *Acaciella* f. indet., boulders in the Sturtian Tillite, north-east of the Enorama Diapir

(k),(l) & (m) : S539

(n) : S509, traced from a thin section

Fig. 5

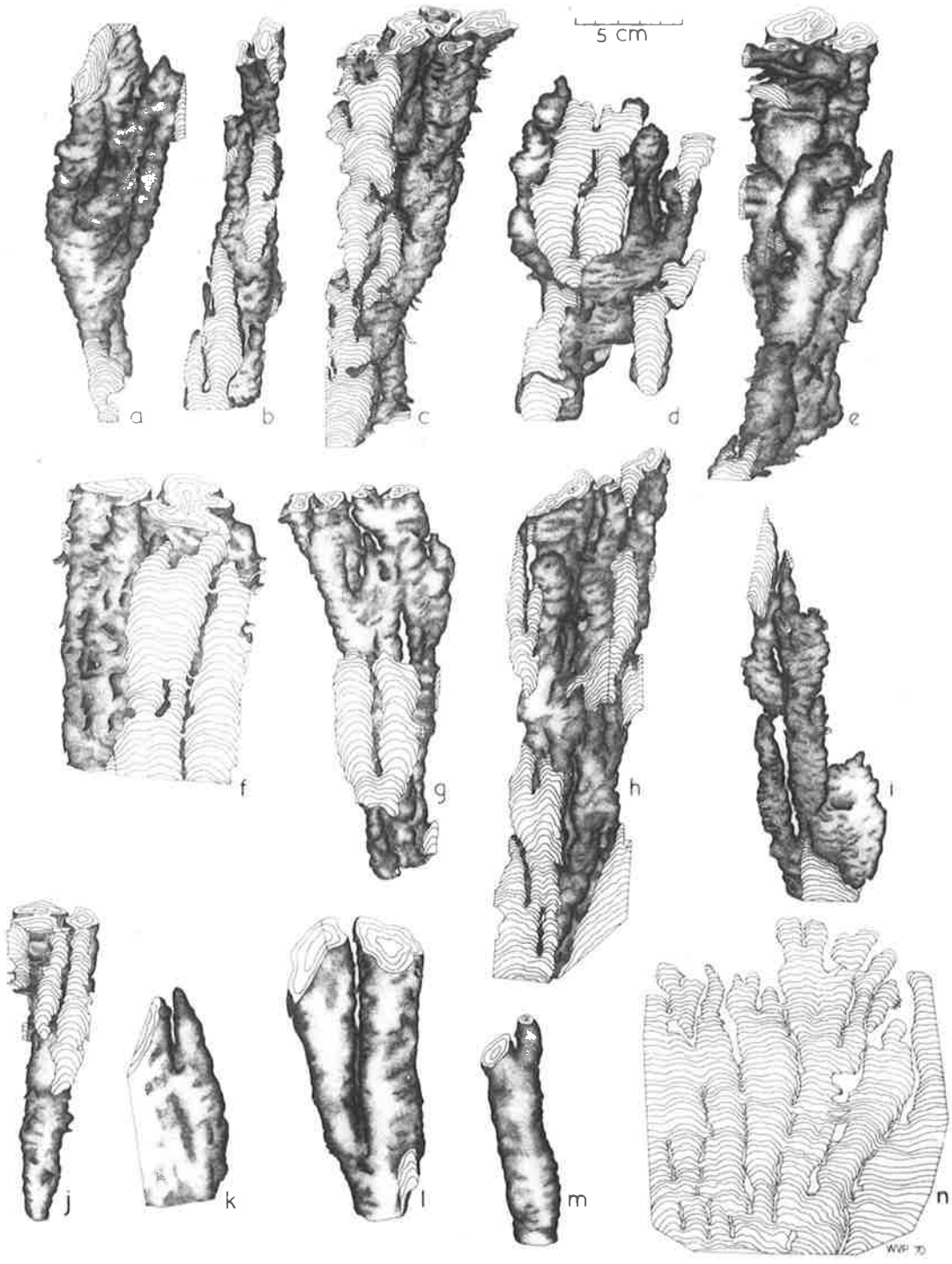


Fig. 6

All reconstructions are natural size.

(a) to (i) : Acaciella angepena, from Lower Cambrian limestones; Flinders Ranges

(a) : Holotype, S460; 2 miles south of Angepena H.S.

(b) : S458; 2 miles south of Angepena H.S.

(c),(e) & (i) : S459; 2 miles south of Angepena H.S.

(d) & (g) : S8; 3 miles west of Italowie Gorge (collected by Sir Douglas Mawson)

(f) : S44; 3 miles west of Italowie Gorge (collected by Sir Douglas Mawson)

(h) : S564; near Old Wirrealpa (collected by Mr. P. G. Haslett)

(j) : Possible Acaciella angepena, 3 miles west of Italowie Gorge

Fig. 6

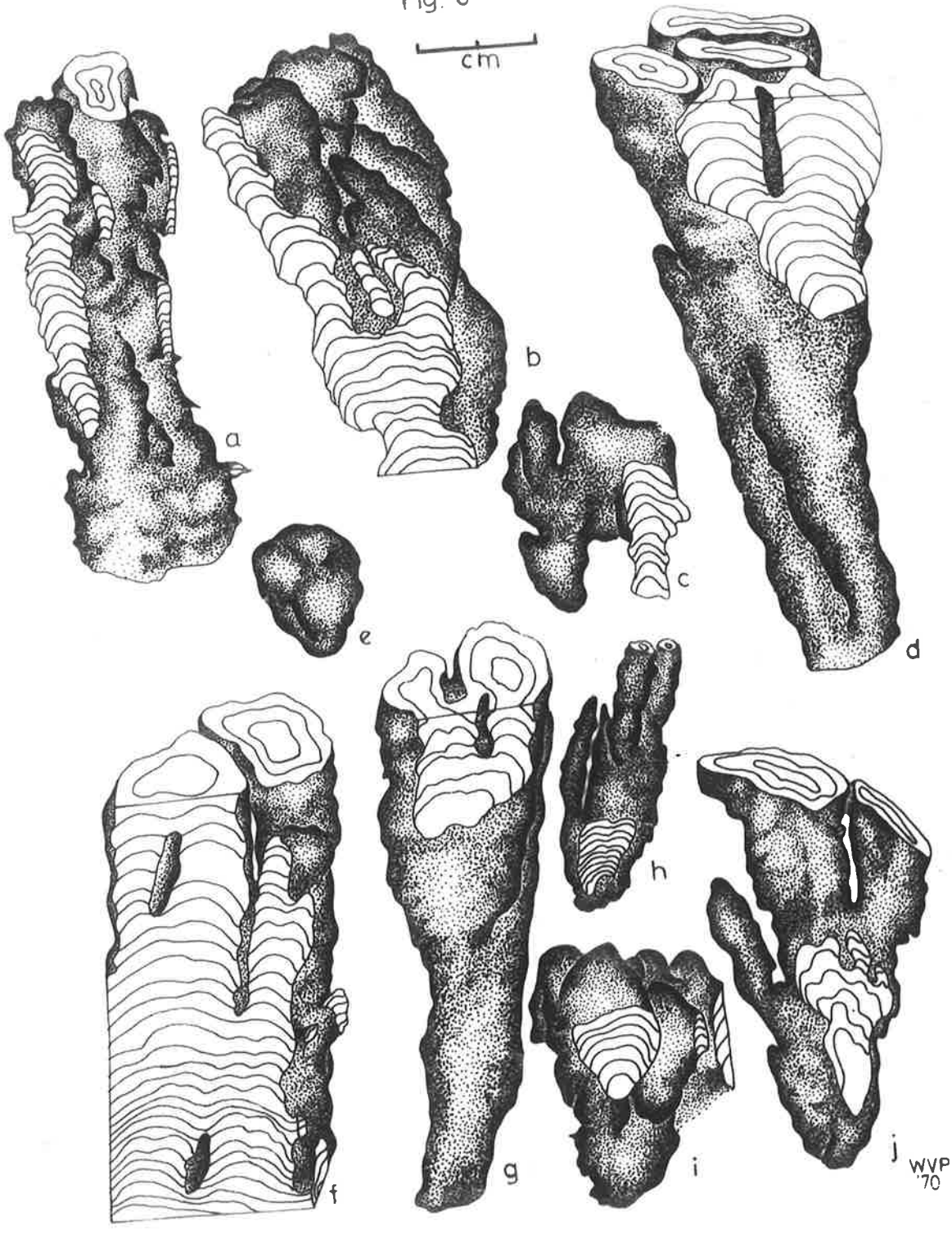


Fig. 7

Reconstructions (a),(b),(d),(e),(f),(g),(h),(i),(j),(k),(l),(m)x1/3
(c) x $^{1}/_{6}$

(a) to (m) : Baicalia burra: Skillogalee Dolomite, Burra Group; Southern Flinders Ranges

(a) & (c) : Holotype S222; 2 miles west of Yatina

(b) : S218; 2 miles west of Yatina

(d) : S151; 8 miles south-west of Worumba H.S.

(e) & (f) : S150; 8 miles south-west of Worumba H.S.

(g)(i)(j) : S221; Dutton's Trough H.S., 9 miles south of Burra

(h) & (l) : S314; Dutton's Trough H.S., 9 miles south of Burra

(j) : S533; Dutton's Trough H.S., 9 miles south of Burra

(k) : S534; Dutton's Trough H.S., 9 miles south of Burra

(m) : S383; float specimen, River Broughton, west of Spalding

Fig. 7

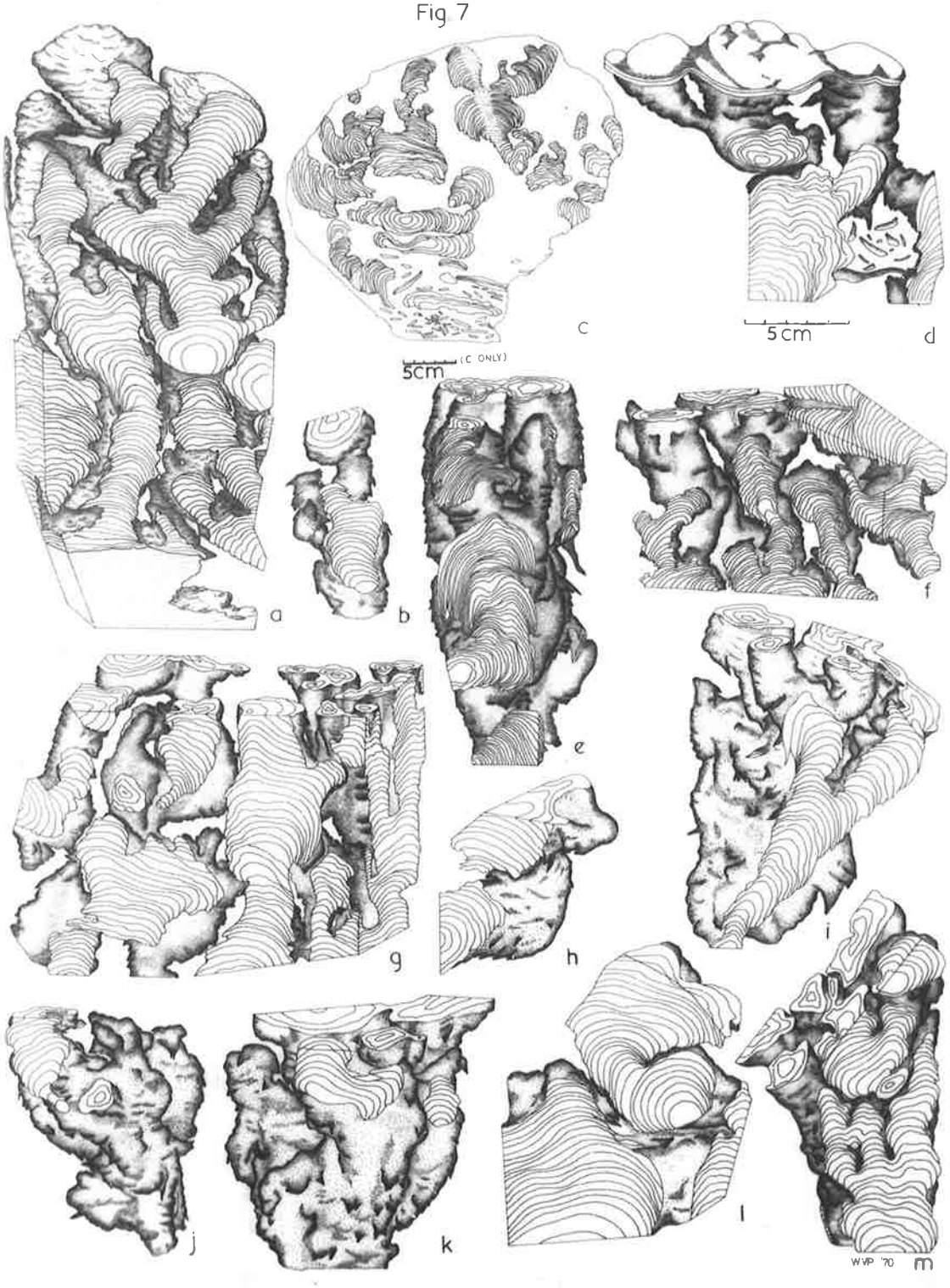


Fig. 8

All reconstructions x $^{1}/_{3}$

(a) to (n) : Baicalia burra: Skillogalee Dolomite, Burra Group

(a) : S533; Dutton's Trough H.S., 9 miles south of Burra

(b) : S534; Dutton's Trough H.S., 9 miles south of Burra

(c) : S383; River Broughton, west of Spalding

(d) : S456; 4 miles south of Arkaroola

(e) : S457; 4 miles south of Arkaroola

(f) : S491; 1½ miles east of Myrtle Springs (upper member)

(g) : S489; 1½ miles east of Myrtle Springs (upper member)

(h) : S490; 1½ miles east of Myrtle Springs (upper member)

(i) : S488; 1 mile east of Myrtle Springs (lower member)

(j) : S487; 1 mile east of Myrtle Springs (lower member)

(k) : S319; the Avondale Mine, Lyndhurst (collected by Mr. P. J. Binks)

(l) : S302; West Mount Hut, Willouran Ranges

(m) : S99; West Mount Hut, Willouran Ranges (collected by Mr. C. R. Dalgarno)

(n) : S97; Chintapanna Well, Willouran Ranges (collected by Mr. C. R. Dalgarno)

Fig.8

5cm

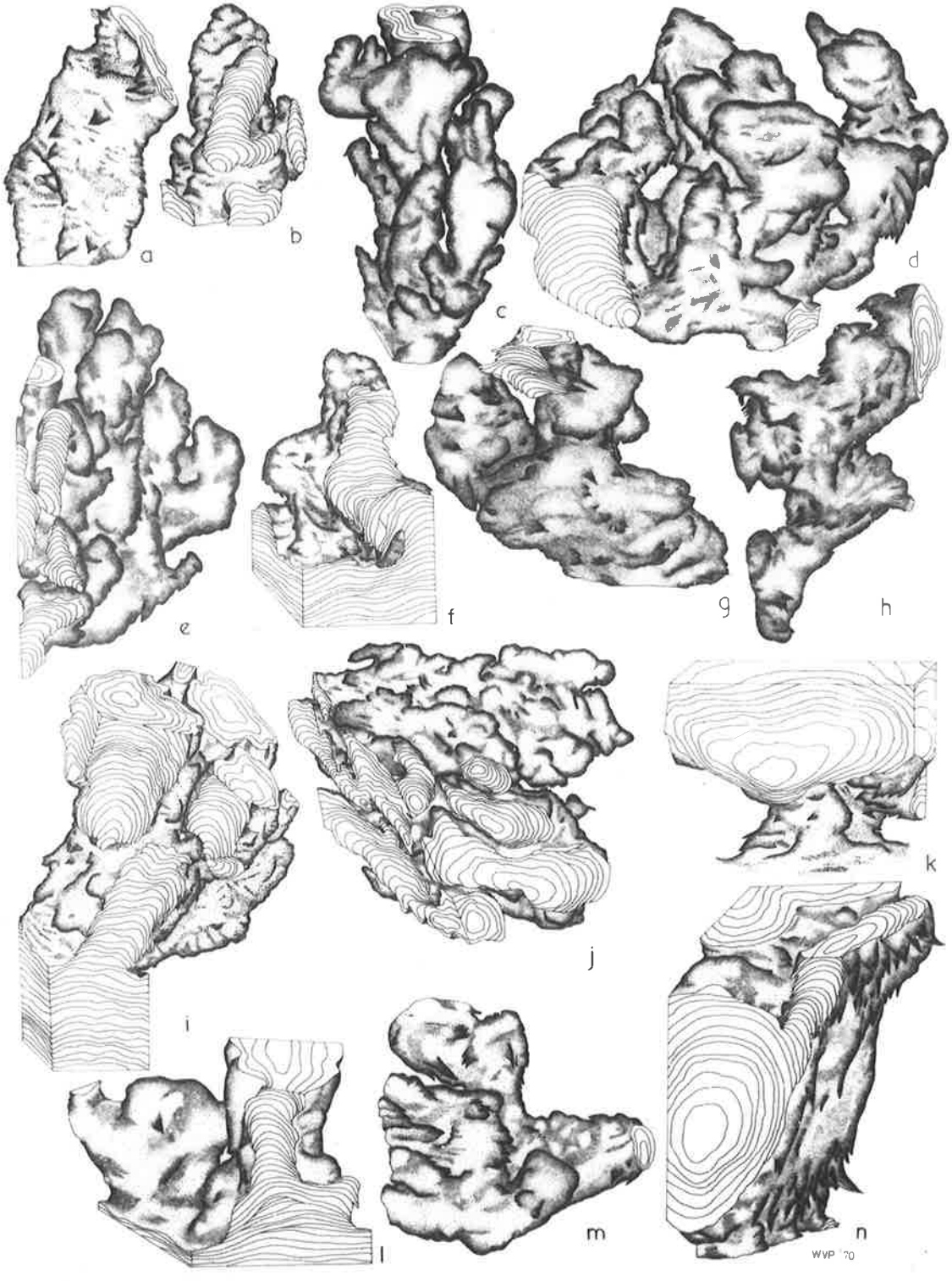


Fig. 9

All reconstructions x $^{1}/_{3}$

(a) to (f) : *Baicalia burra*: Skillogalee Dolomite, Burra Group; NW Flinders Ranges

(a),(b) & (f) : S96; Chintapanna Well, Willouran Ranges (collected by Mr. C. R. Dalgarno)

(c) : S98; West Mount Hut, Willouran Ranges (collected by Mr. C. R. Dalgarno)

(d) : S496; 3 miles west of Copley

(e) : S301; West Mount Hut, Willouran Ranges

Fig 9

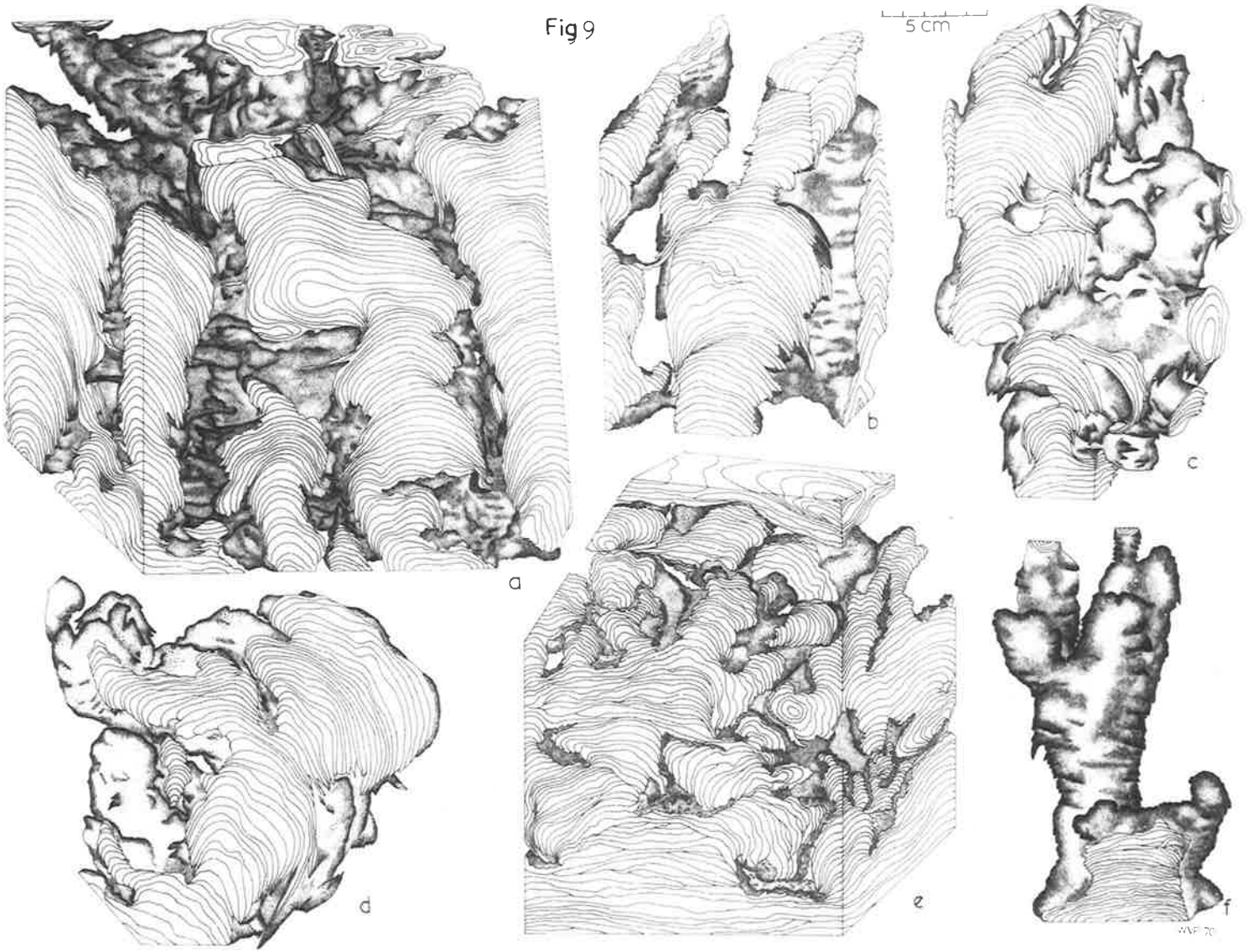


Fig. 10

All reconstructions x $^{1}/_{3}$

(a) to (h) : *Boxonia melrosa*: Brighton Limestone equivalent, Umberatana Group; ½ mile west of Melrose

(a),(e),(g) & (h) : S502

(b),(c) & (d) : Holotype, S503

(f) : S504

(i) : *Conophyton garganicum garganicum*: from a dolomite raft in the Paratoo Diapir. Part of a large column, S528

(j) to (o) : *Gymnosolen ramsayi*: limestone boulders in conglomerate, Tapley Hill Formation, Umberatana Group; 5 miles east of Wilson

(j) : S390

(k),(l),(m),(n) & (o) : S388; vertical columns are interpreted to be derived from a bioherm centre

Fig. 10

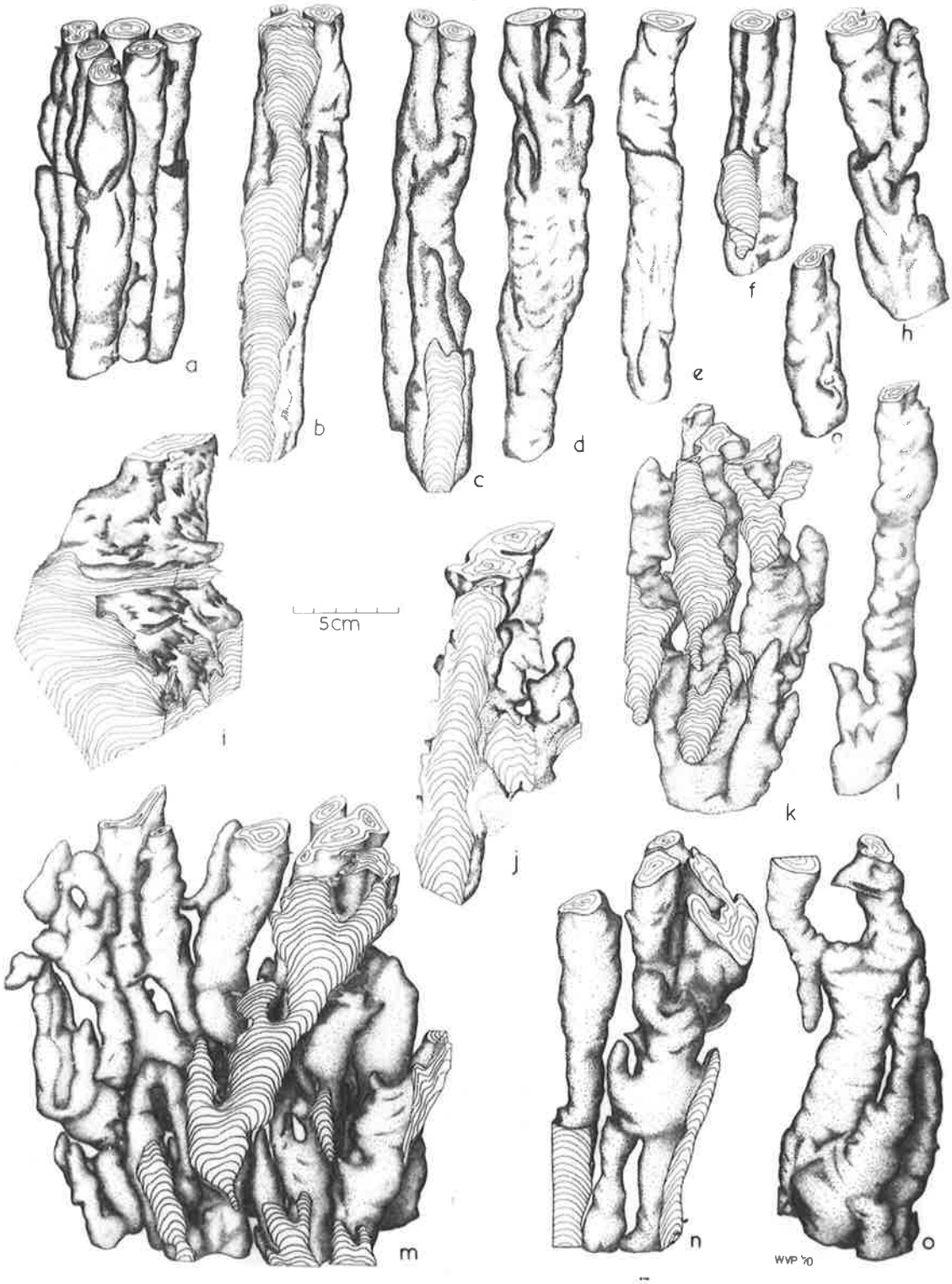


Fig. 11

All reconstructions x $^{1}/_{3}$

(a) to (e) : *Gymnosolen ramsayi*: limestone boulders in a conglomerate, Tapley Hill Formation, Umberatana Group; 5 miles east of Wilson

(a) : S388; vertical columns are interpreted to be derived from a bioherm centre

(b) & (d) : S387; inclined columns interpreted to be derived from a bioherm margin

(c), (e) : S389, S390 } Irregular and frequently coalescing columns

(f) & (g) : *Inzeria* cf. *tjomusi*: Wundowie Limestone, Umberatana Group; Burr Well, Northern Flinders Ranges. S479

Fig. 11

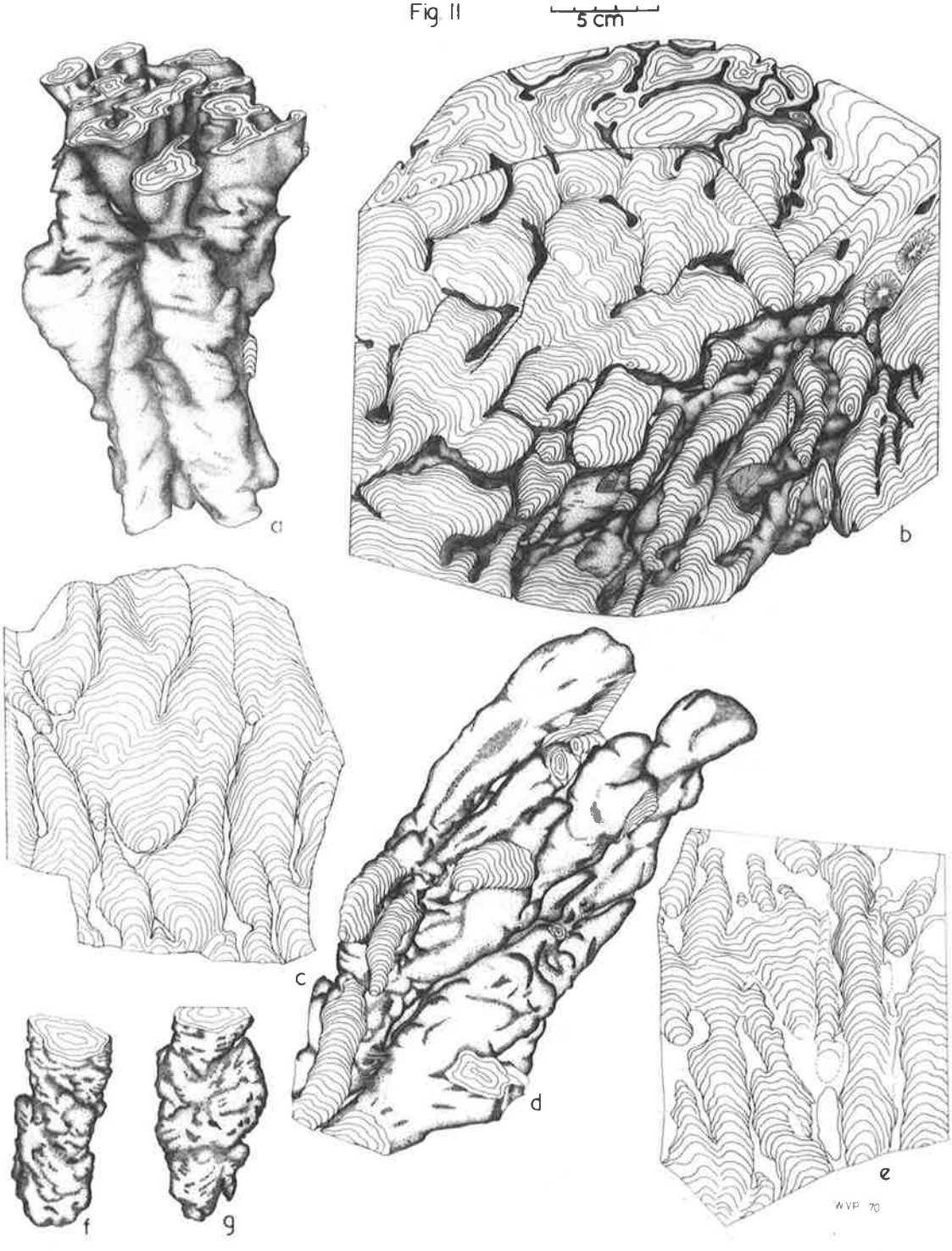


Fig. 12

All reconstructions x $^{1}/_{3}$

(a) to (g) : *Inzeria* cf. *tjomusi*: Wundowie Limestone, Umberatana Group; Burr Well, Northern Flinders Ranges

(a),(b) & (c) : S542

(d),(f) & (g) : S480

(e) : S479

(h) to (m) : *Inzeria conjuncta*: Brighton Limestone equivalent, Umberatana Group; Depot Creek

(h),(i) & (j) : Holotype S402; broad, basal columns, branching into narrow columns

(k) : S403; elongated inclined columns from bioherm margin

(l) & (m) : S398; narrow, upper columns

Fig. 12

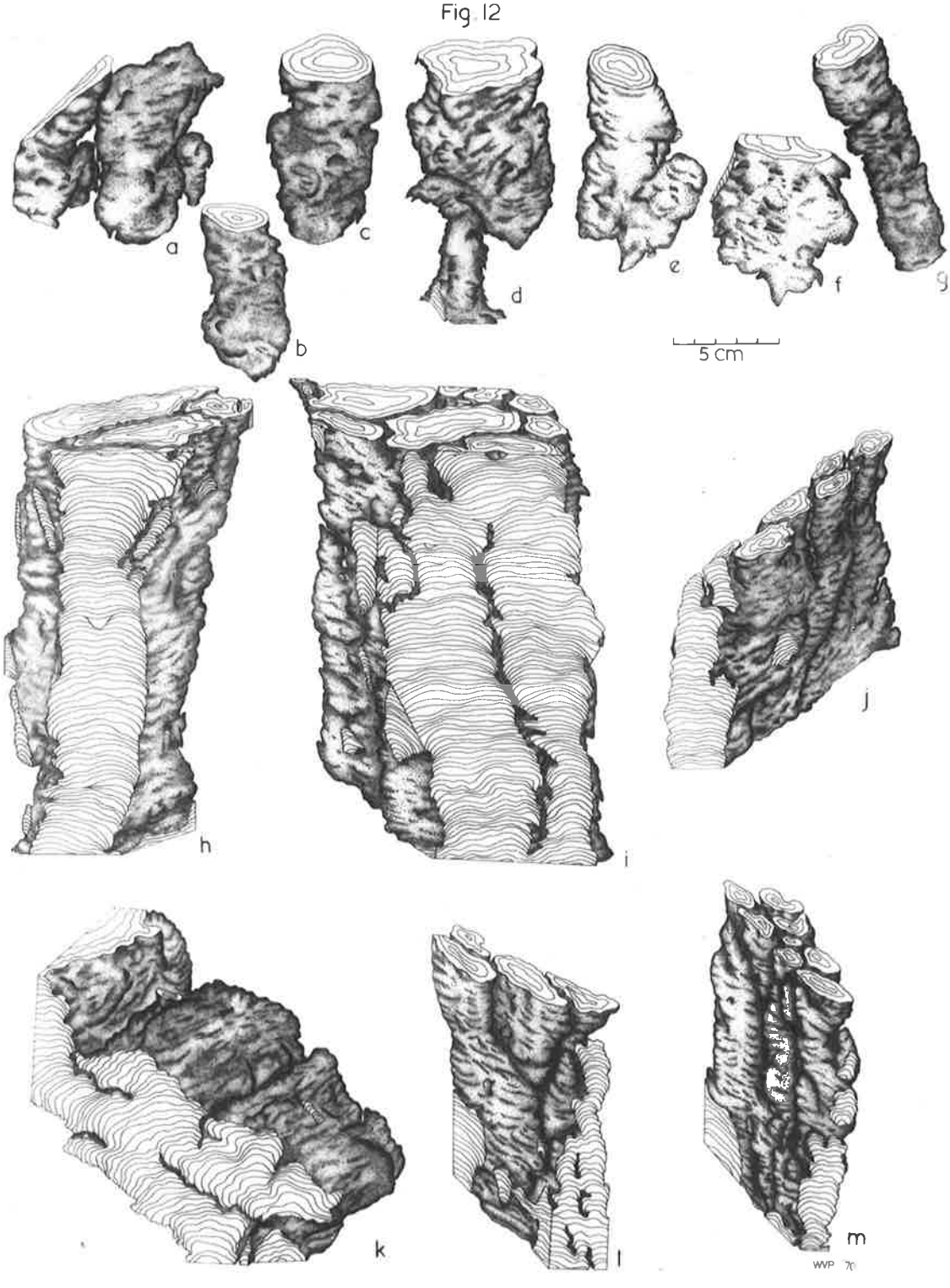


Fig. 13

All reconstructions x $^1/_3$

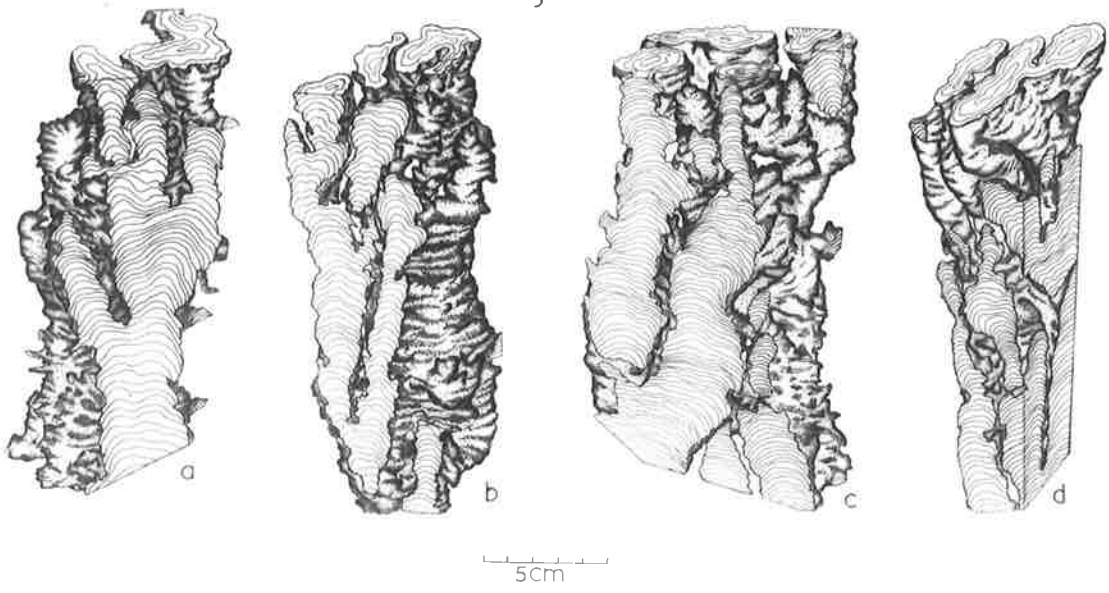
(a) to (m) : *Inzeria multiplex*: Brighton Limestone equivalent, Southern Flinders Ranges

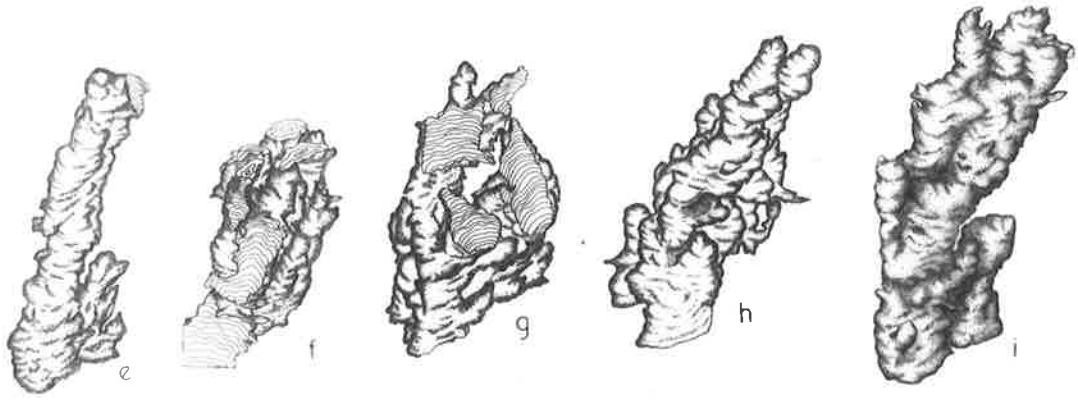
(a),(b),(c), (d),(e),(f), (g),(h),(i) : Holotype, S385; 5 miles north-west of Mt Remarkable

(j) & (k) : S499; float specimen, 7½ miles east of Yednalue H.S.

(l) & (m) : S498; 7½ miles east of Yednalue H.S.

Fig.13





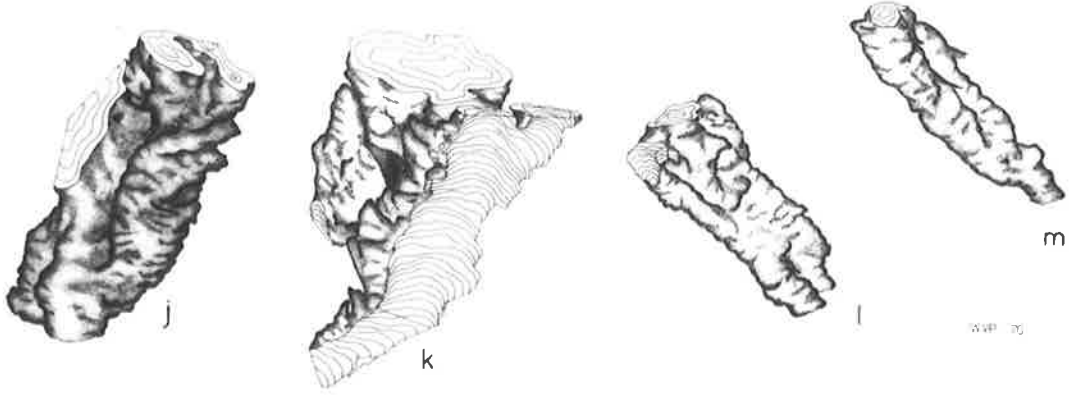


Fig. 14

All reconstructions x $^{1}/_{3}$

(a) to (h) : Jurusania burrensis: Wundowie Limestone, Umberatana Group, Burr Well; Northern Flinders Ranges

(a) : S481; basal columns arising from undulatory stromatolite

(b) & (c) : S483; irregular columns at bioherm margin

(d),(e) & (f) : Holotype, S543; regular, narrow, upper columns

(g) & (h) : S482; regular, broad basal columns

(i) to (o) : Katavia costata: Brighton Limestone, Umberatana Group; Depot Creek, Southern Flinders Ranges

(i),(j),(l), (m),(n) & (o) : Holotype, S175; narrow, subcylindrical columns

(k) : S519; basal columns arising from undulatory stromatolite

Fig. 14 5 cm

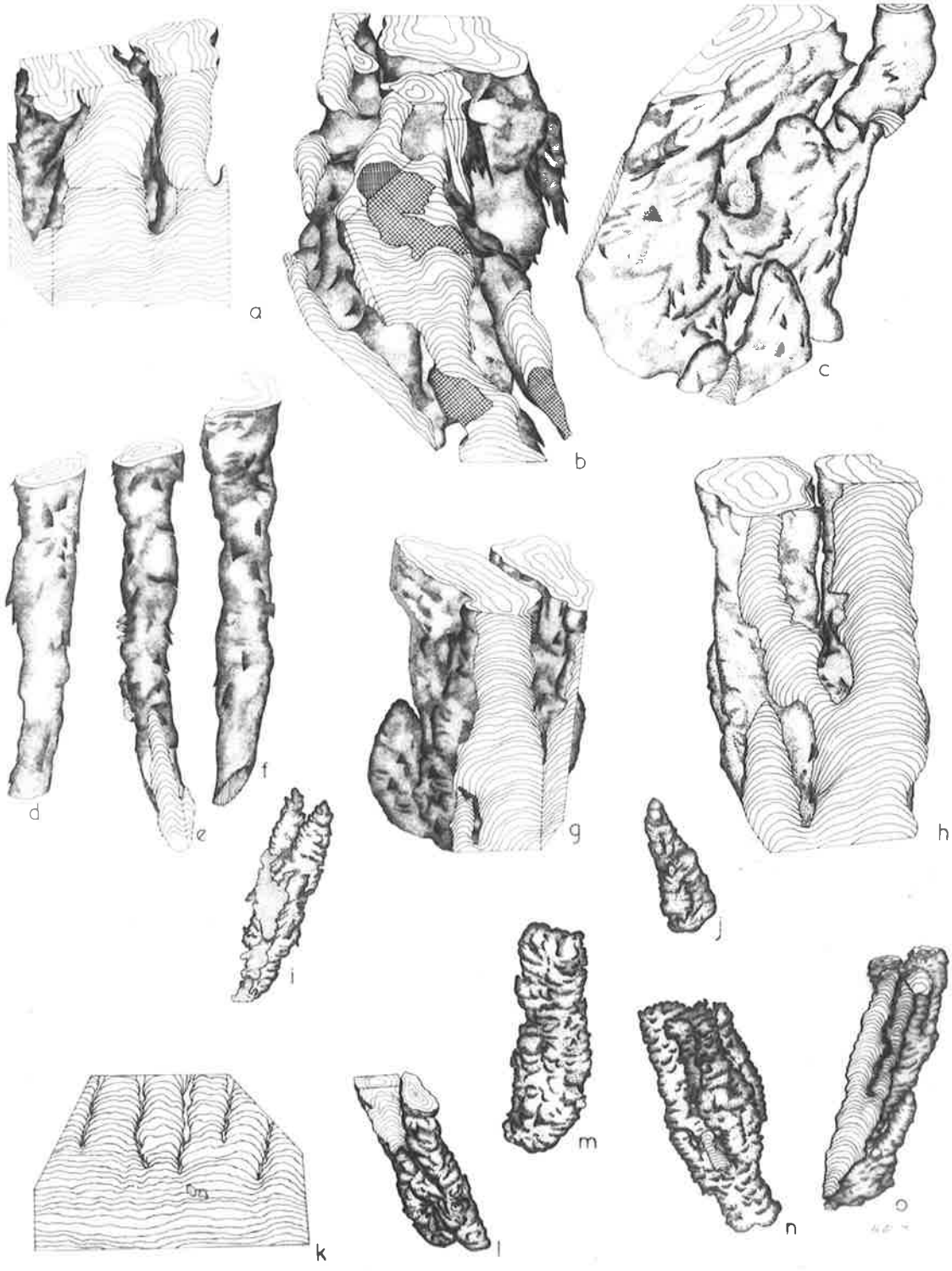


Fig. 15

All reconstructions x $^{1}/_{3}$

(a) to (m) : Kulparia kulparensis: Etina Formation equivalent, Umberatana Group; 4 miles south of Kulpara, Northern Yorke Peninsula

(a),(b),(c), (e) & (i) : Holotype, S380; from unit C (Fig.29j)

(d) & (m) : S419; junctions between contiguous domes, unit C (Fig.29j). (m) is cut by a sand-dyke, including stromatolitic fragments

(f) & (g) : S420; from unit E (Fig.29j)

(h) : S271; from unit C (Fig.29j)

(j) (k) & (l) : S381, S270 } from unit A (Fig.29j)

Fig 15

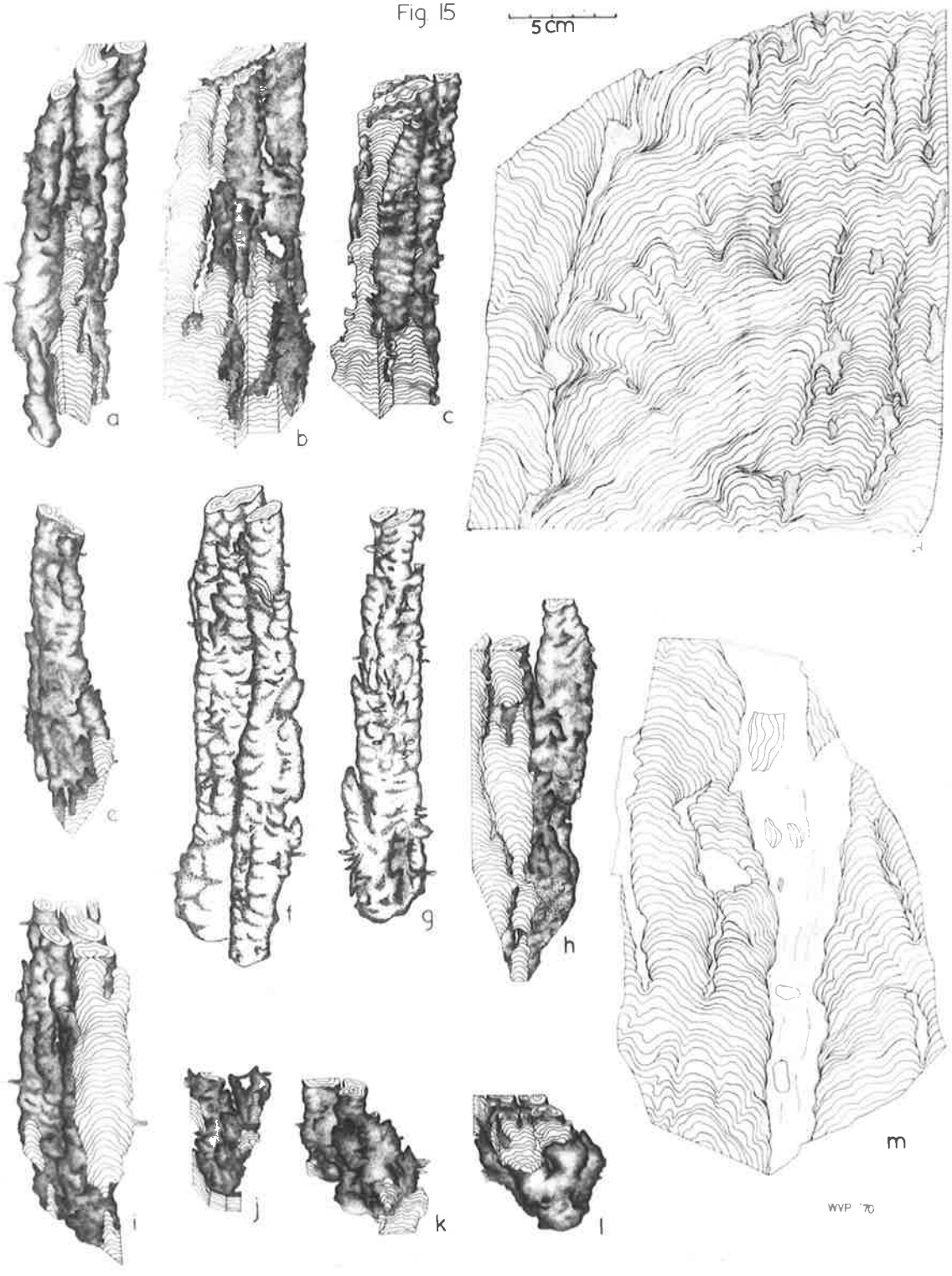


Fig. 16

All reconstructions x $^{1}/_{3}$

(a) to (h) : *Linella ukka*: Balcanoona Formation, Umberatana Group; Burr Well, Northern Flinders Ranges

(a),(b), (e) & (g) : S478

(c),(d) & (h) : S477

(f) : S541

(i) to (q) : *Linella munyallina*: Wundowie Limestone, Umberatana Group; Roebuck Bore, Northern Flinders Ranges

(i),(j),(k) (m) & (n) : S431

(l) : S430

(o) & (p) : S428

(q) : S427

Fig 16

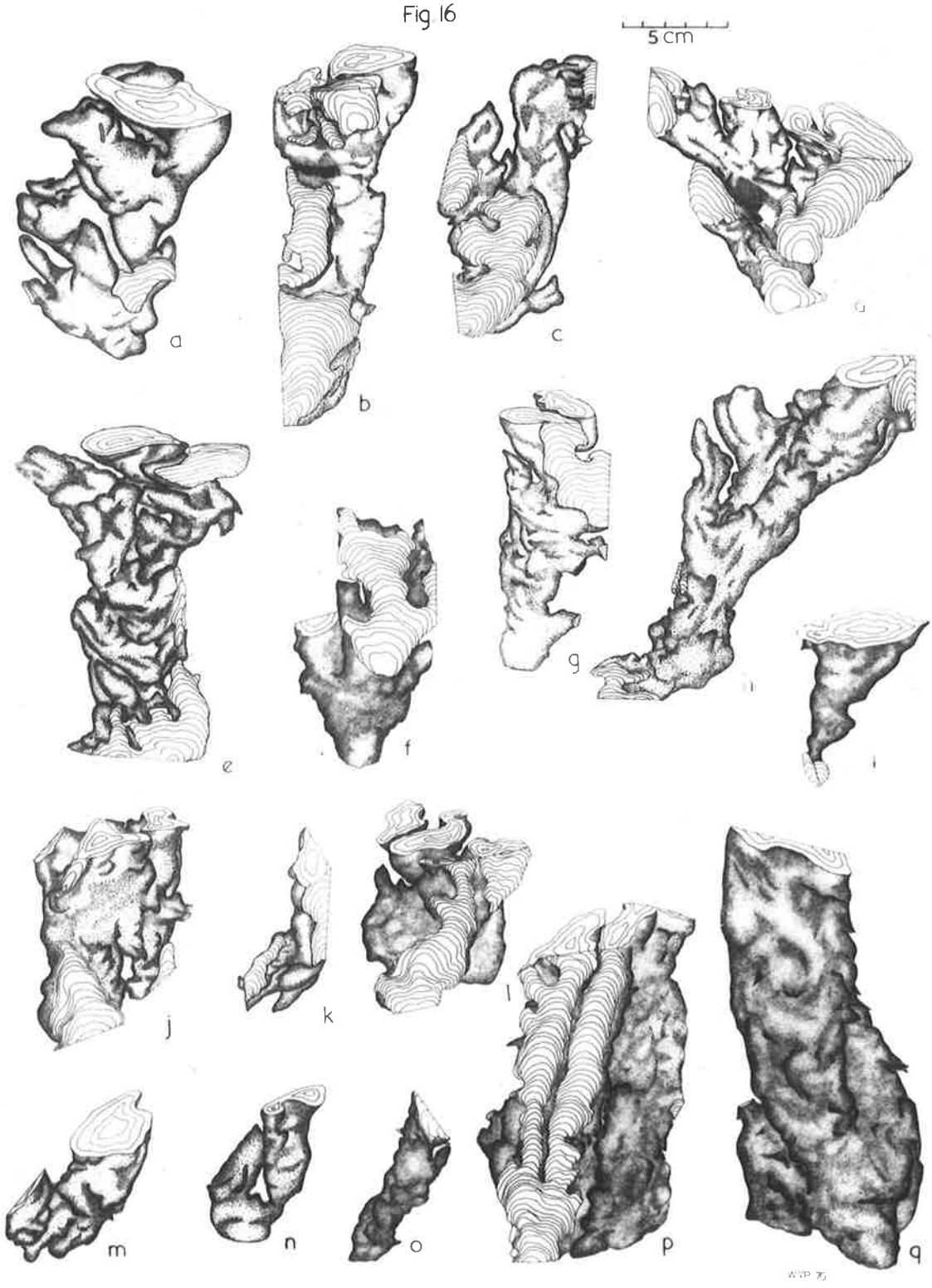


Fig. 17

All reconstructions x $^{1}/_{3}$

(a) to (v) : Linella munyallina: Wundowie Limestone, Umberatana Group, Northern Flinders Ranges

(a),(c),(d) (m) & (o) : S486; Burr Well

(b) : S485; Burr Well

(e) & (h) : S484; inclined columns from the bioherm margin; Burr Well

(f),(g),(i) (j),(k),(l) : Holotype, S495; 5 miles east of Myrtle Springs H.S.

(n) & (p) : S549; Lake Arthur, south-western Willouran Ranges (collected by Mr. B. Murrell)

(q) : S556; West Mount Hut, Willouran Ranges (collected by Mr. B. Murell)

(r) : S552; Lake Arthur, south-west Willouran Ranges (collected by Mr. B. Murrell)

(s) : S555; West Mount Hut, Willouran Ranges (collected by Mr. B. Murrell)

(t) : S566; 6 miles NW of Termination Hill (collected by Mr. B. Murrell)

(u) : S544; 2 miles east of Copley

(v) : S294; Munyallina Valley, 9 miles south of Arkaroola

Fig 17

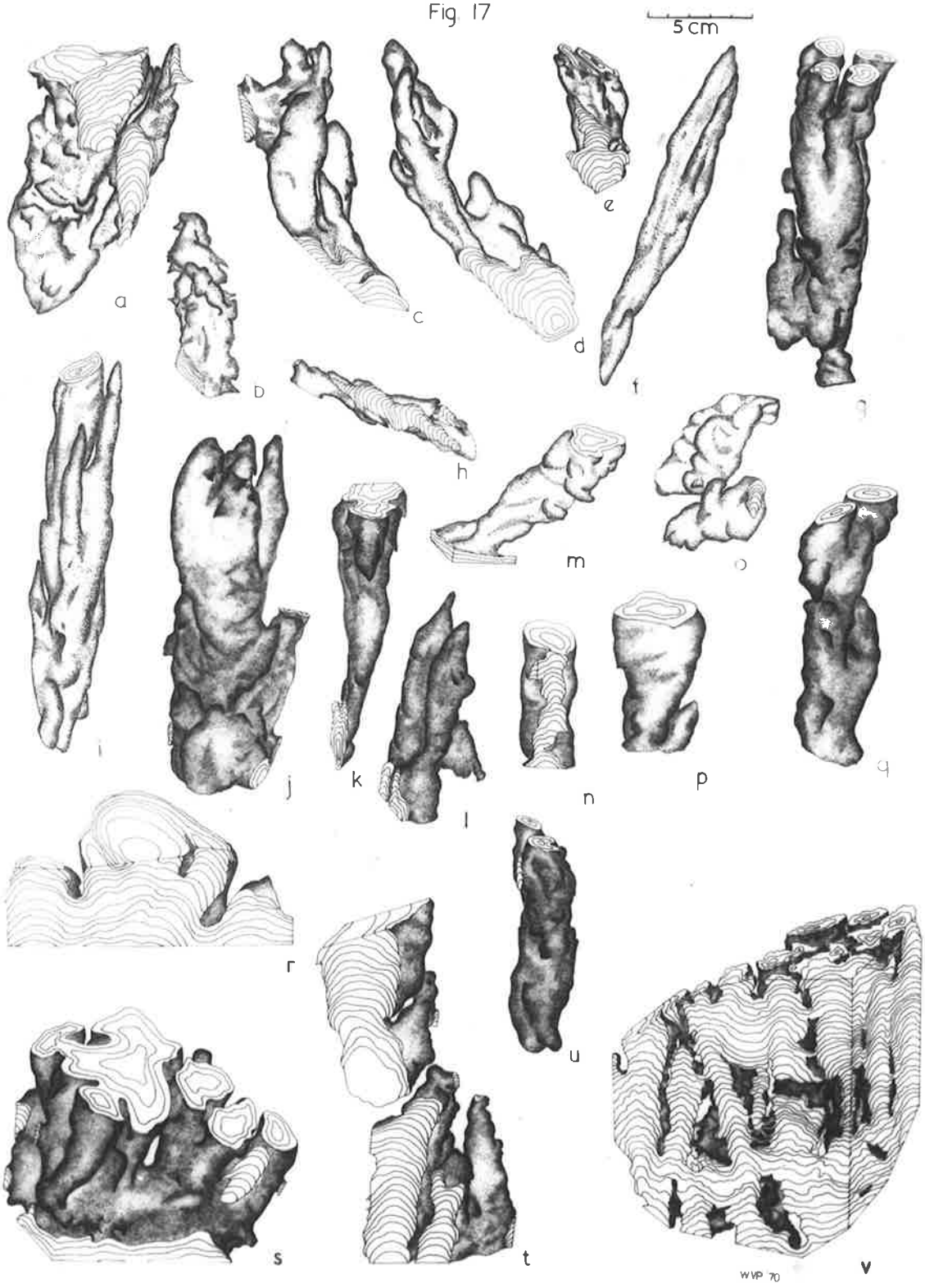


Fig. 18

All reconstructions x $^1/_3$

(a) to (c) : S471; possible Linella munyallina: Wundowie Limestone, Umberatana Group; Wundowie Bore, Northern Flinders Ranges. Column margins have been obliterated by stylolites (shown by cross-hatching)

(d) to (g) : Omachtenia utschurica: Brighton Limestone equivalent, Umberatana Group; Depot Creek, Southern Flinders Ranges (not all bridges could be shown on the diagrams)

(d),(e) & (f) : S399

(g) : S392

(h) to (n) : Tungussia etina, Umberatana Group, Northern and Central Flinders Ranges

(h) : S157; Etina Formation, Enorama Creek

(i) & (j) : S158; irregular, tuberous columns, Etina Formation, 3 miles east of Blinman

(k) : S286; Wundowie Limestone; Teatree O.S.

(l) : S522; Etina Formation; Arkaba Hills

(m) : S526; Balcanoona Formation, 1½ miles east of Mt Chambers

(n) : S561; Etina Formation, SW of the Enorama Diapir

Fig 18

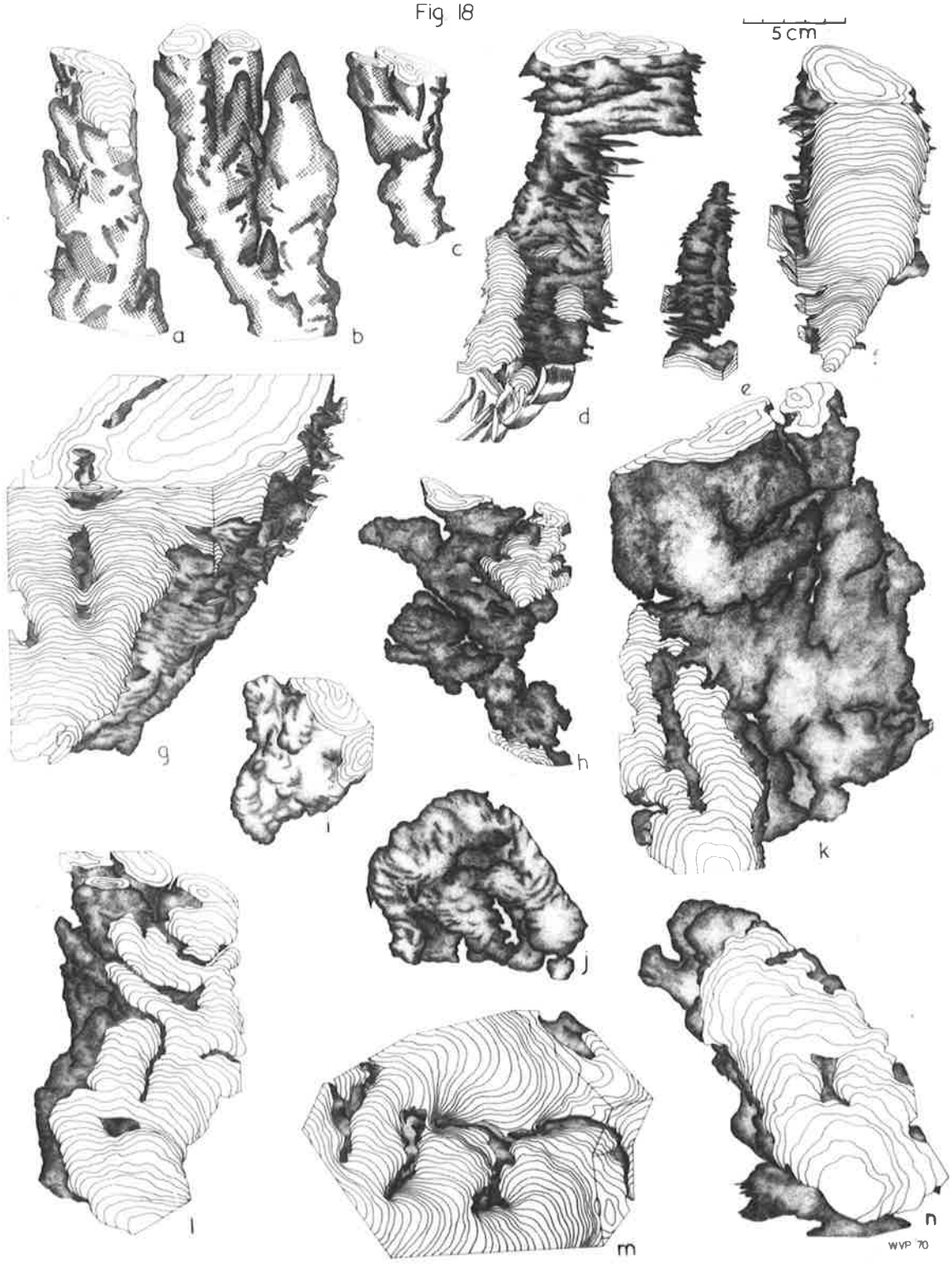


Fig. 19

All reconstructions x $^{1}/_{3}$

(a) to (i) : *Tunqussia etina*: Umberatana Group, Northern Flinders Ranges

(a) : S444; Wundowie Limestone, Teatree O.S.

(b) : S440; Wundowie Limestone, Teatree O.S.

(c),(e),(i) & (j) : Holotype, S435; Balcanoona Formation, 1½ miles east of Mt Chambers

(d) : S441; Wundowie Limestone, Teatree O.S.

(f) : S436; Balcanoona Formation; 1½ miles east of Mt Chambers

(g) : S525; Balcanoona Formation; 1½ miles east of Mt Chambers

(h) : S524; Balcanoona Formation; 1½ miles east of Mt Chambers

Fig. 19

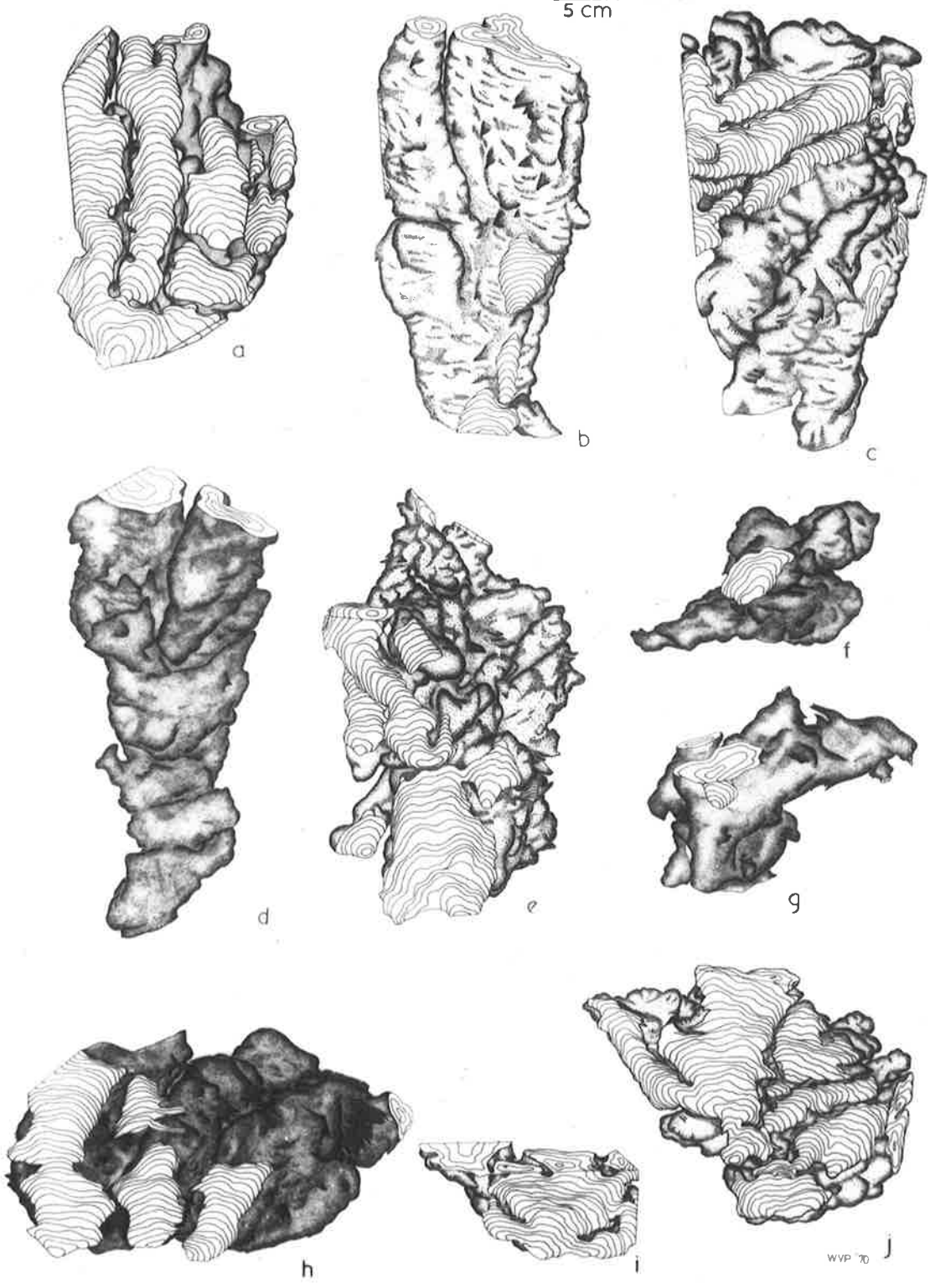


Fig. 20

All reconstructions x $^{1}/_{3}$

(a) to (g) : *Tungussia wilkatanna*: Skillogalee Dolomite, Burra Group, Southern Flinders Ranges

(a) : Holotype, S412; Depot Creek

(b) & (e) : S169; Depot Creek

(c) : S209; Depot Creek

(d) : S410; Depot Creek

(f) : S323; Mundallio Creek

(g) : S408; Depot Creek

Fig 20 5 cm

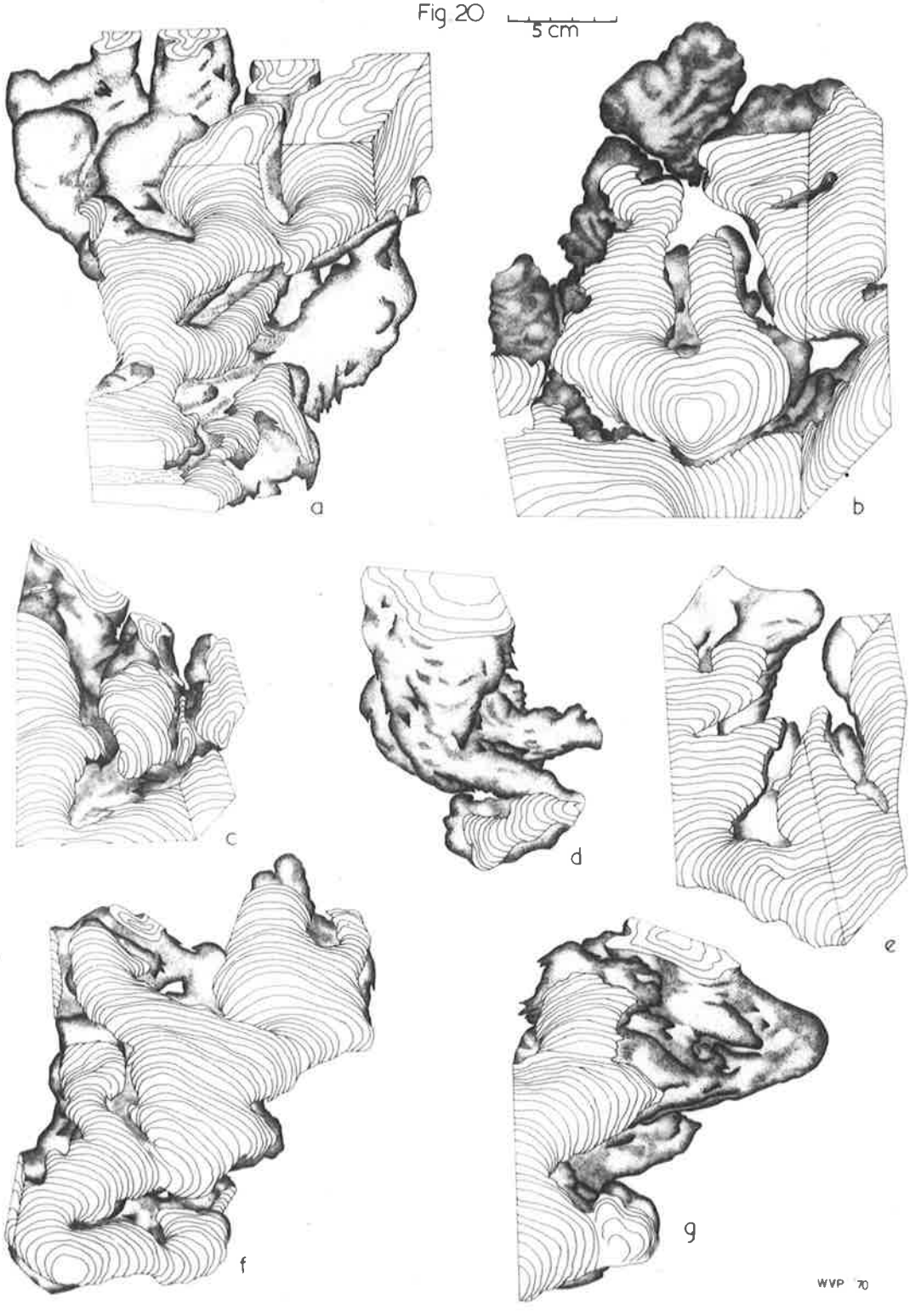


Fig. 21

Representative examples of lamina shape

(a) Acaciella augusta; (b) Acaciella f. indet.;
(c) Acaciella angepena; (d) Baicalia burra;
(e) Boxonia melrosa; (f) Conophyton garganicum garganicum;
(g) Gymnosolen ramsayi; (h) Inzeria cf. tjomusi;
(i) Inzeria conjuncta; (j) Inzeria multiplex;
(k) Jurusania burrensis; (l) Katavia costata;
(m) Kulparia kulparensis; (n) Linella ukka;
(o) Linella munyallina; (p) Omachtenia utschurica;
(q) Tungussia etina; (r) Tungussia wilkatanna

Fig 21 REPRESENTATIVE EXAMPLES OF LAMINA SHAPE

SOUTH AUSTRALIAN COLUMNAR STROMATOLITES

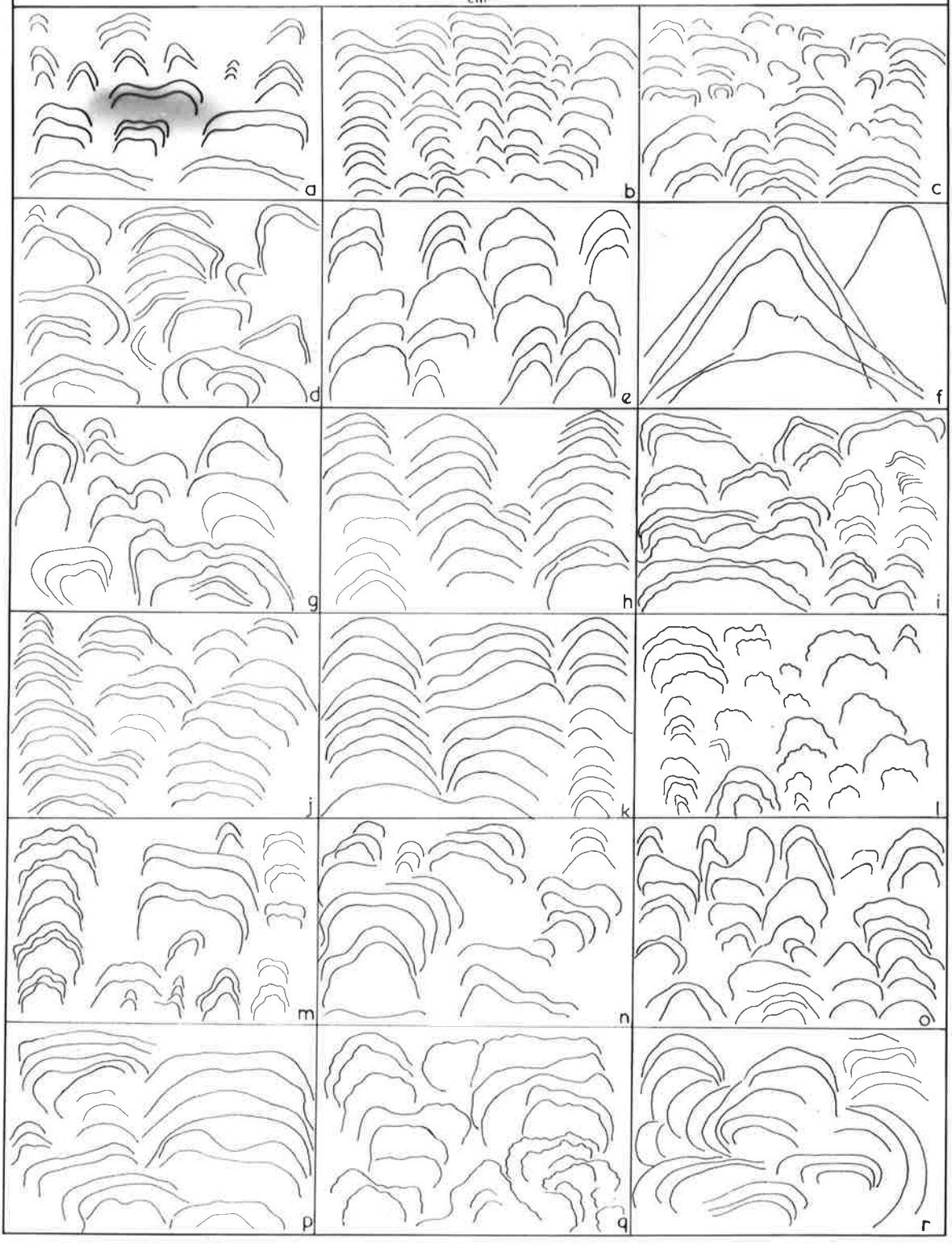


Fig. 22

Histograms of lamina convexities. The convexity of a lamina is the ratio of the height of that lamina to its diameter ($^{h}/_{d}$). Histograms are plotted for each stromatolite form at intervals of 0.1. n is the number of measurements made for each form.

(a) Acaciella augusta; (b) Acaciella f. indet.;

(c) Acaciella angepena; (d) Baicalia burra;

(e) Boxonia melrosa; (f) Conophyton garganicum garganicum, not measured;

(g) Gymnosolen ramsayi; (h) Inzeria cf. tjomusi;

(i) Inzeria conjuncta; (j) Inzeria multiplex;

(k) Jurusania burrensis; (l) Katavia costata;

(m) Kulparia kulparensis; (n) Linella ukka;

(o) Linella munyallina (p) Omachtenia utsohurica;

(q) Tungussia etina; (r) Tungussia wilkatanna

Fig. 22. HISTOGRAMS OF LAMINA CONVEXITIES

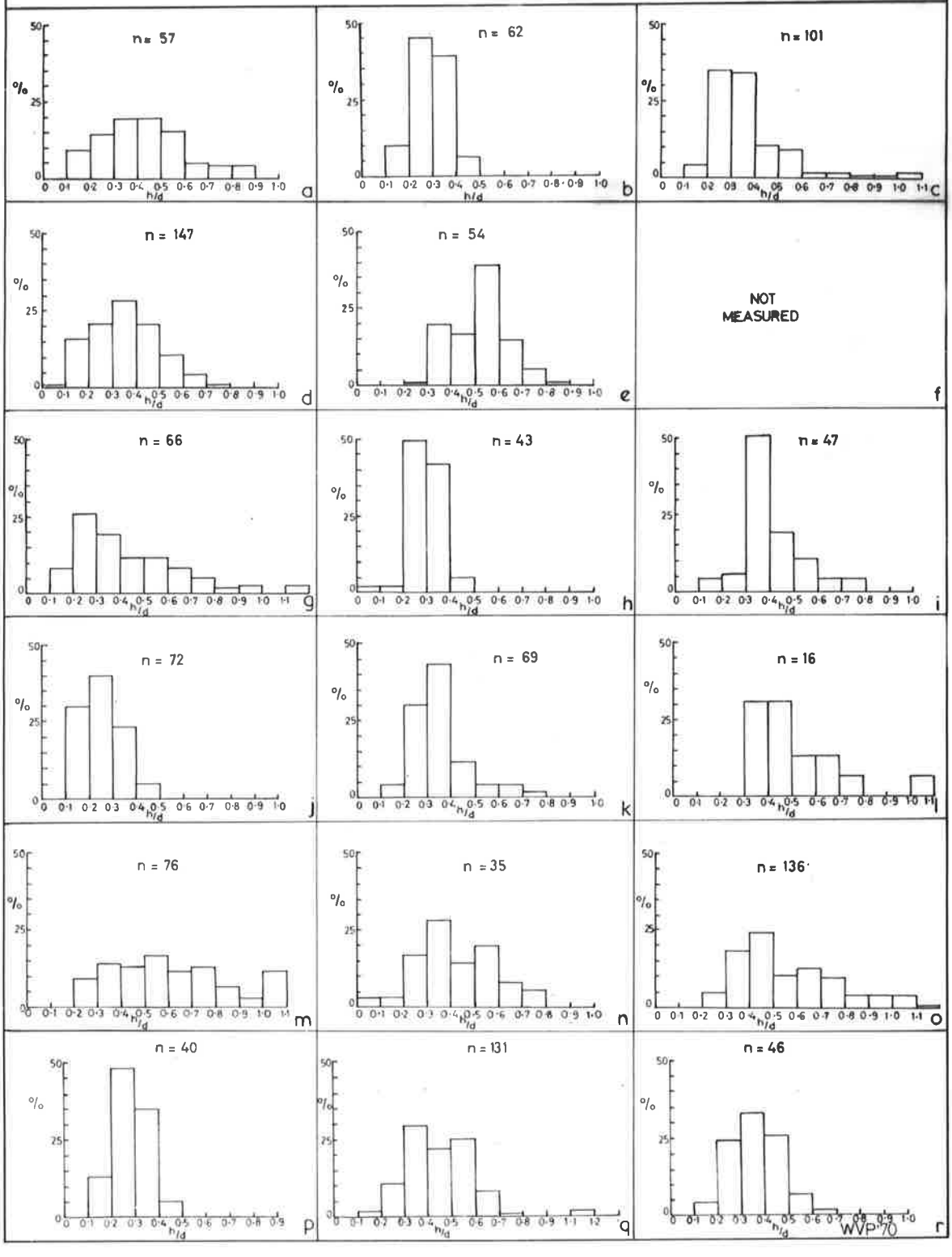


Fig. 23

The diagnostic characters of Conophyton garganicum garganicum

(a) The traces of the crestal lines of two specimens (S214 at left and S532 at right) drawn from thin sections (x $\frac{1}{2}$)

(b) to (g) Frequency distributions of thicknesses of light laminae L_1 and dark laminae L_2 for six separate specimens

(h) Pooled frequency distributions of lamina thicknesses for all six specimens. The overlay shows the corresponding distributions for Russian Conophyton garganicum garganicum

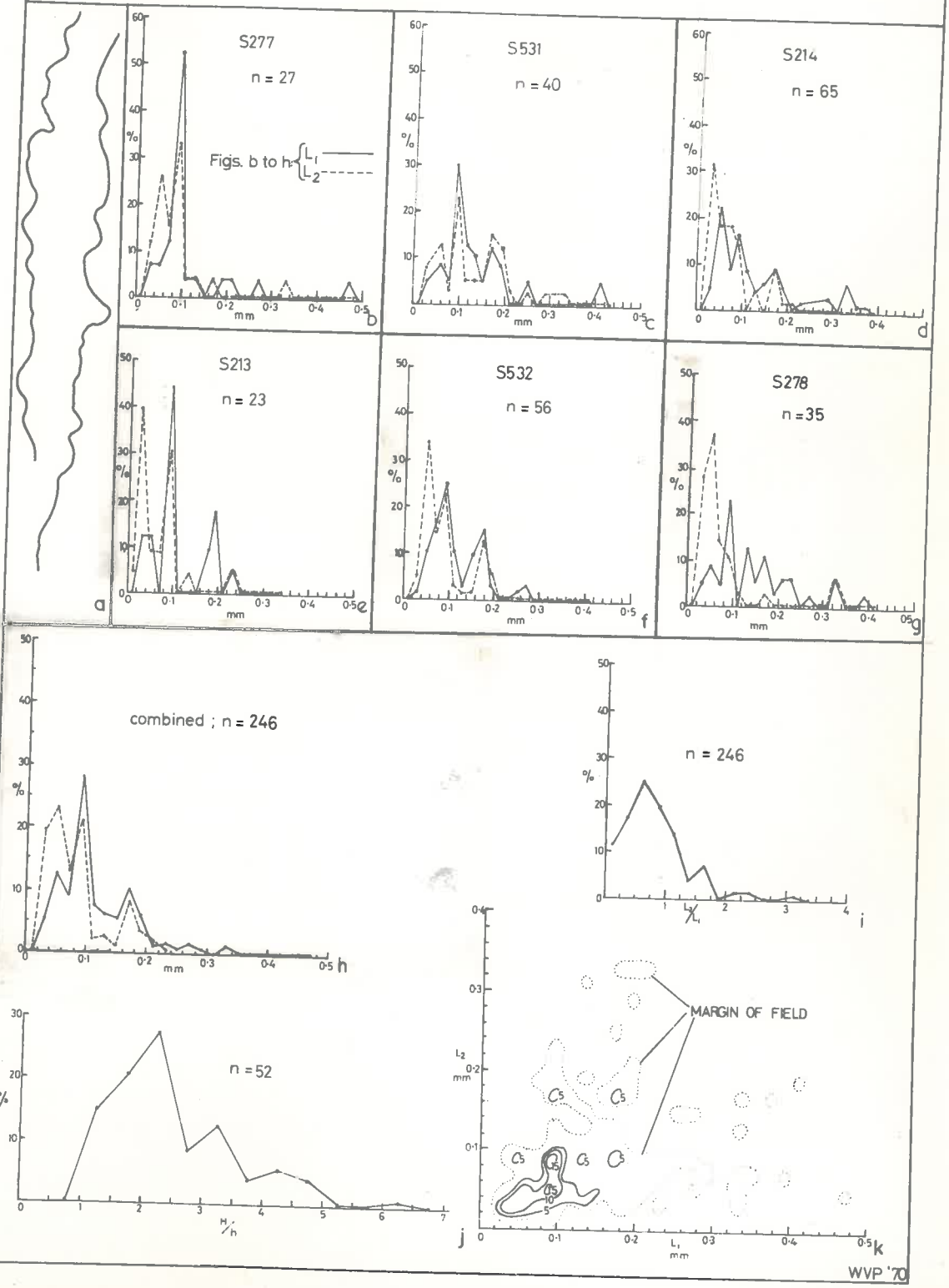
(i) The frequency distribution of the ratio of thicknesses of adjacent dark and light laminae (L_2/L_1), pooled for all specimens. The overlay shows the corresponding distribution for Russian Conophyton garganicum garganicum

(j) The frequency distribution of the coefficient of thickening of laminae in the crestal zone, compared with the corresponding distribution for Russian Conophyton garganicum garganicum on the overlay

(k) Contour diagram of the frequency distribution of dark and light laminae (contoured in numbers of measurements). A corresponding plot for Russian Conophyton garganicum garganicum is shown on the overlay

Fig. 23. **DIAGNOSTIC CHARACTERS OF CONOPHYTON**

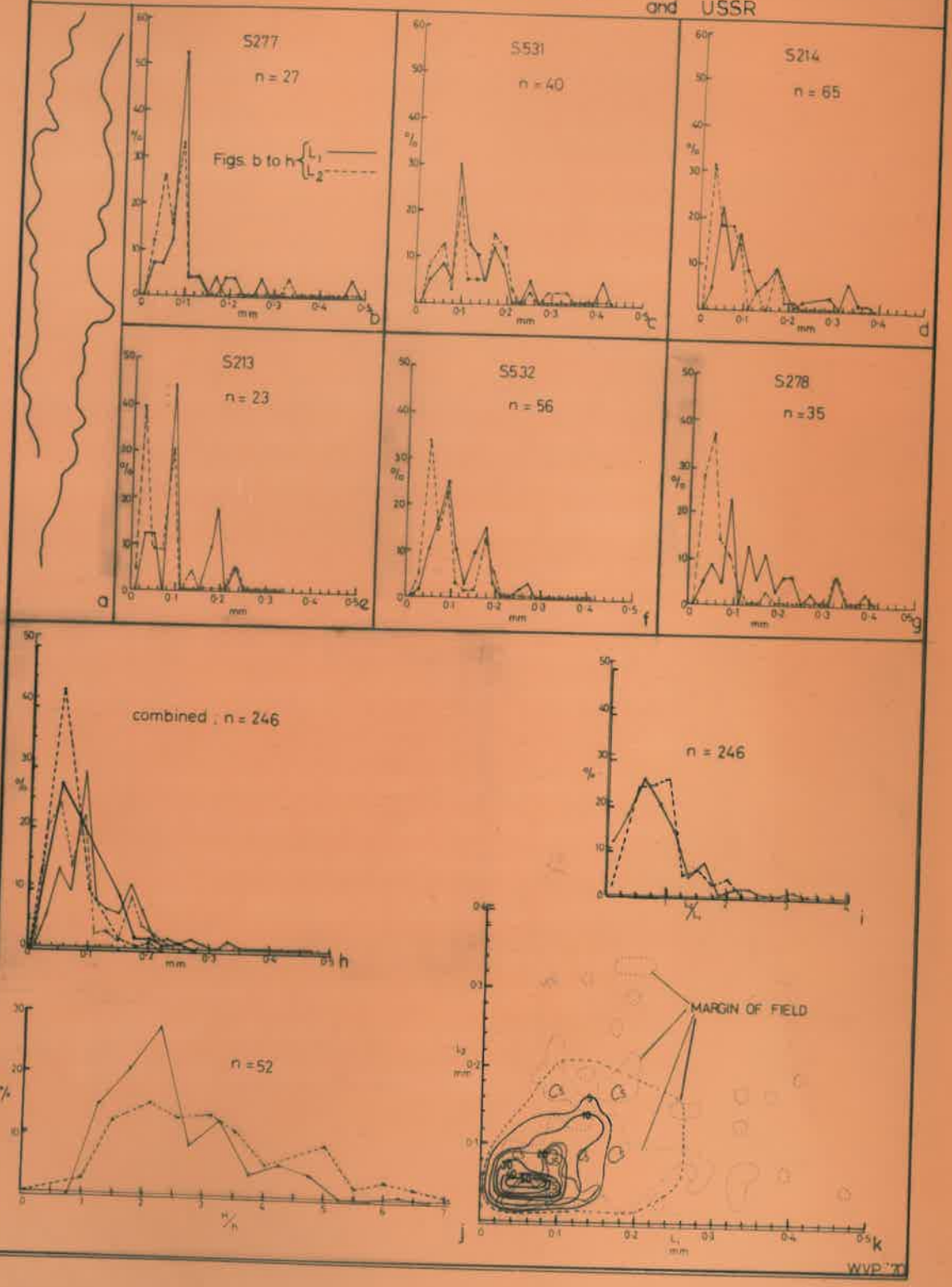
CONOPHYTON GARGANICUM GARGANICUM, S.A.



WVP '70

Fig. 23 DIAGNOSTIC CHARACTERS OF CONOPHYTON

(i) CONOPHYTON GARGANICUM GARGANICUM, S.A. and USSR



WVP '77

Fig. 24

The geology of the Brighton Limestone equivelent, Depot Creek, based on detailed mapping. For the location of the area, see Fig.28. Note that only the larger bioherms, including all from which specimens have been taken, are shown on the map. The numbers prefixed S- refer to specimens collected

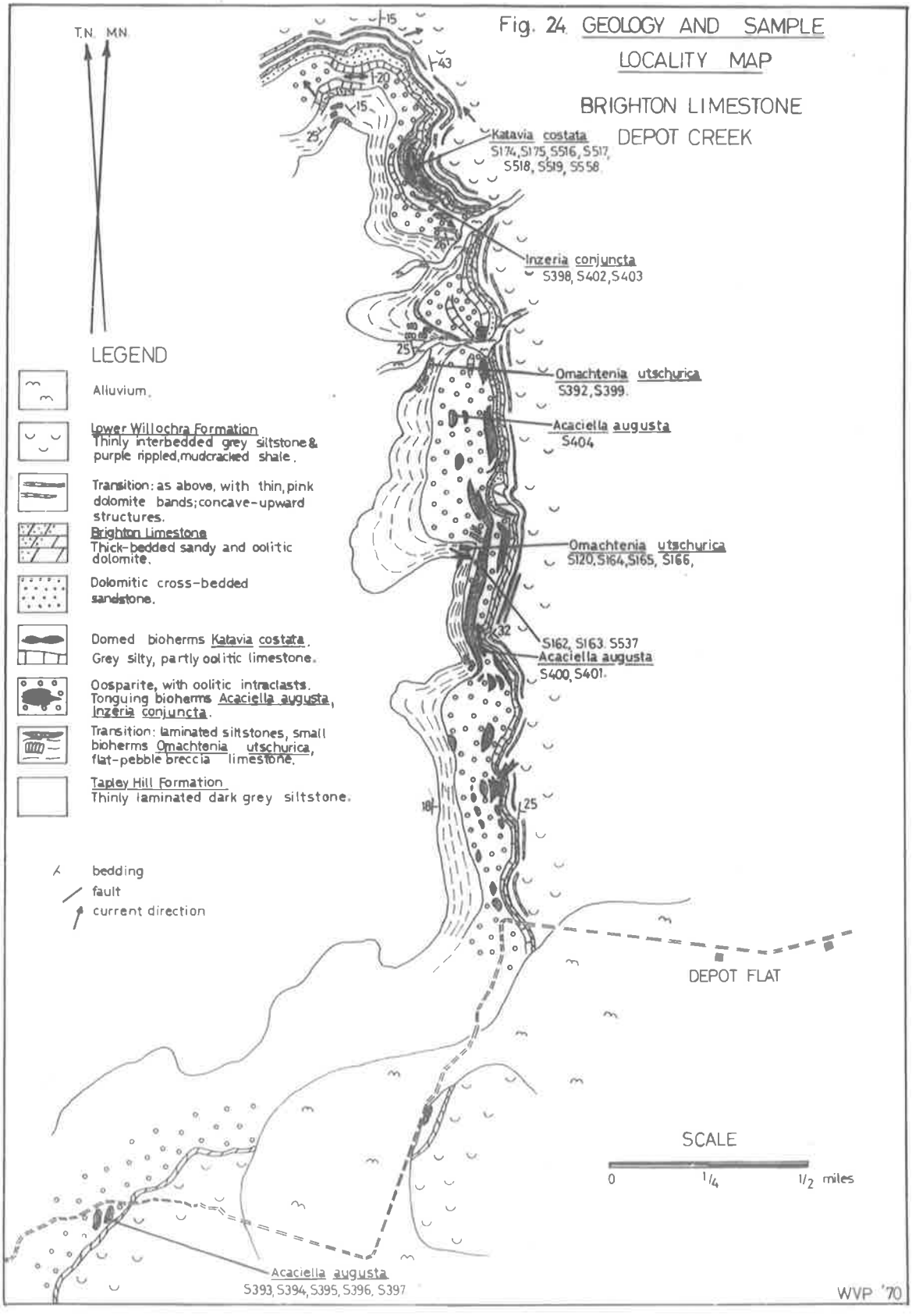


Fig. 24 GEOLOGY AND SAMPLE LOCALITY MAP
BRIGHTON LIMESTONE
DEPOT CREEK
T.N.
M.N.
Katavia costata
S174, S175, S516, S517, S518, S519, S558
Inzeria conjuncta
S398, S402, S403
Omachtenia utschurica
S392, S399.
Acaciella augusta
S404
Omachtenia utschurica
S120, S164, S165, S166,
S162, S163, S537
Acaciella augusta
S400, S401.
Acaciella augusta
S393, S394, S395, S396, S397
DEPOT FLAT
LEGEND
Alluvium.
Lower Willochra Formation
Thinly interbedded grey siltstone & purple rippled, mudcracked shale.
Transition: as above, with thin, pink dolomite bands; concave-upward structures.
Brighton Limestone
Thick-bedded sandy and oolitic dolomite.
Dolomitic cross-bedded sandstone.
Domed bioherms Katavia costata.
Grey silty, partly oolitic limestone.
Oosparite, with oolitic intraclasts. Tonguing bioherms Acaciella augusta, Inzeria conjuncta.
Transition: laminated siltstones, small bioherms Omachtenia utschurica, flat-pebble breccia limestone.
Tapley Hill Formation
Thinly laminated dark grey siltstone.
bedding
fault
current direction
SCALE
0
1/4
1/2 miles
WVP '70

Figs. 25 to 29 (see map pocket)

Geology and specimen locality maps of parts of the Adelaide Geosyncline, based on Mines Department maps. The numbers prefixed S- refer to specimens collected.

In Fig.29, (a) refers to part of the Peake and Denison Ranges, (b) to the south-western Willouran Ranges, (c) to the Beltana area, (d) to the Spalding area, (e) to the Weekeroo area, (f) to the Paratoo area, (g) to the Pernatty Lagoon area, (h) to the Burra-Robertstown area, (i) & (j) to the Kulpara-Port Wakefield area and (k) to the Adelaide Hills area

Fig. 30

Isopach map of the Skillogalee Dolomite. This map is compiled from maps by Forbes (1955). The outcrop pattern of the formation is taken from more recent Mines Department maps, and my stromatolite localities are also shown

Fig.30.

ISOPACH MAP OF THE SKILLOGALEE DOLOMITE

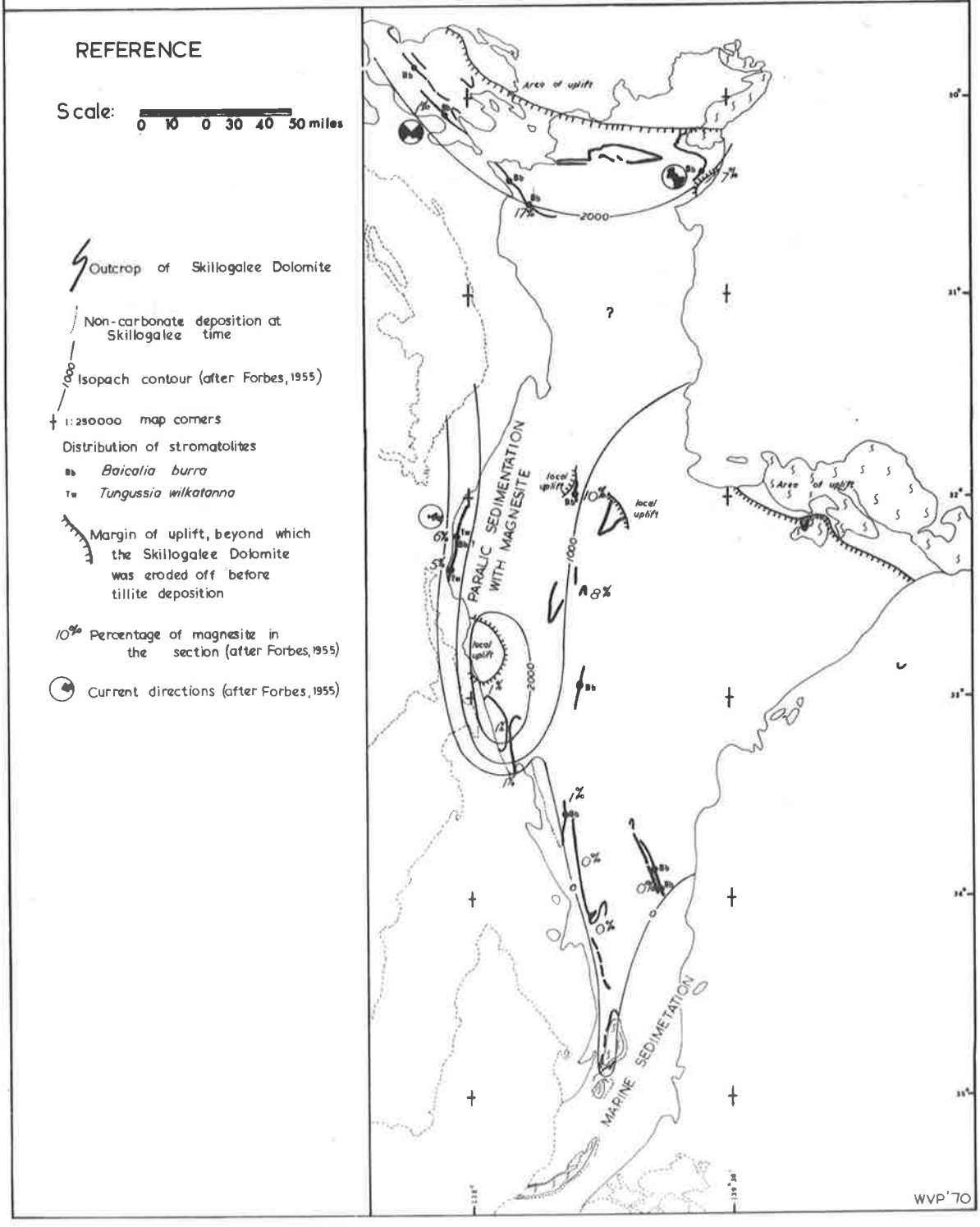


Fig. 31

The thicknesses of part of the Umberatana Group between the top of the lower glacials and the top of the upper glacials were measured approximately from Mines Department maps. Thickness measurements in the southern part of the area are especially unreliable, due to tight folding

Fig. 31

ISOPACH MAP OF PART OF THE UMBERATANA GROUP

between the top of the lower glacials and the top of the upper glacials

REFERENCE

Scale: 0 10 20 30 40 50 miles

•7500 Thickness measurement

7500 Isopach contour

\+ 1:250000 map corners

A B C Line of section

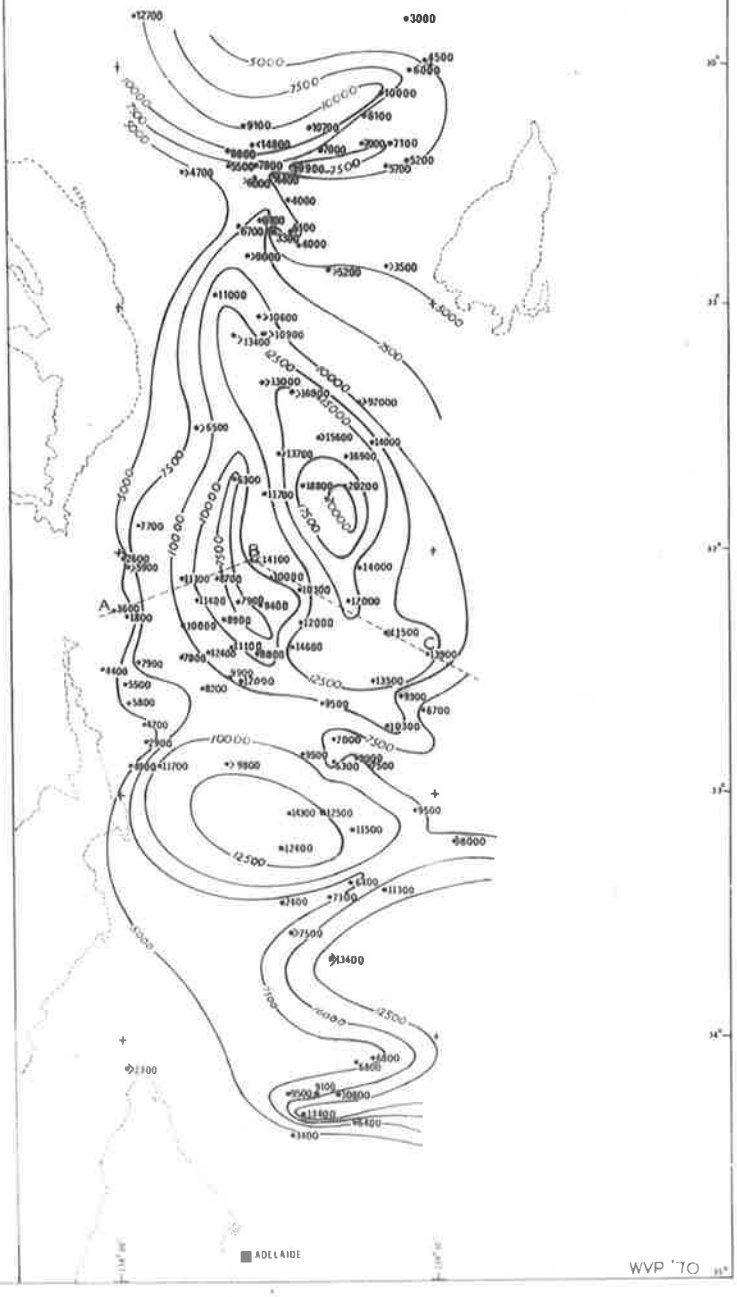


Fig. 32

An interpretative cross-section, Orroroo 1:250,000 Sheet (along the line of section A-B-C on Fig.31), based on stratigraphic sections measured at the localities shown. At Yednalue, the thickness of the Tapley Hill Formation is uncertain, due to folding. At Melton, the top of the section is not exposed

FIG. 32. INTERPRETATIVE CROSS-SECTION, ORROROO 1:250000 SHEET

FOR PART OF THE UMBERATANA GROUP (DIPS RESTORED TO HORIZONTAL)

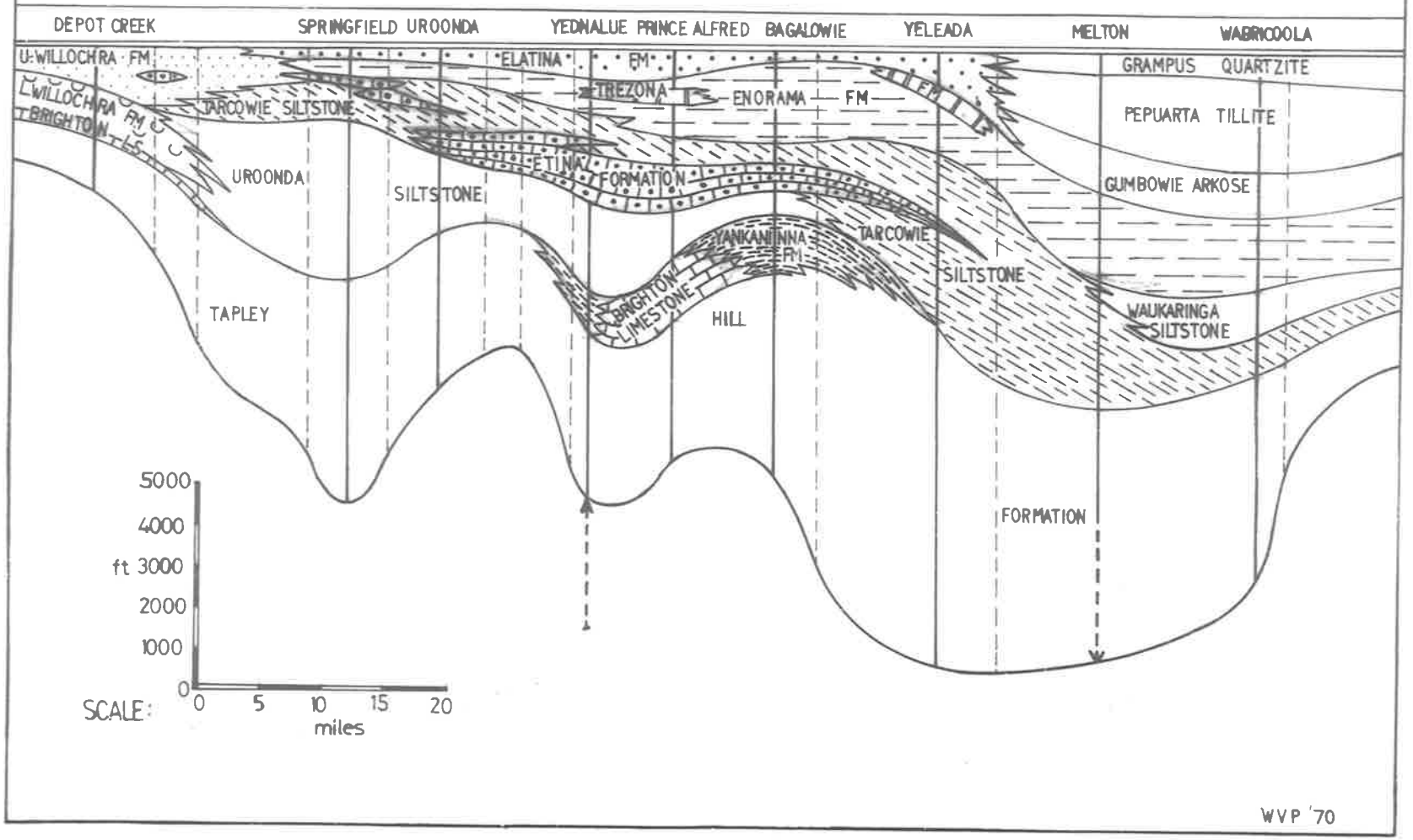


Fig. 33

The outcrop pattern of the Brighton Limestone and its equivalents was deduced from Mines Department maps. Thicknesses were partly measured accurately in the field and partly estimated from the maps. Current directions were measured from the Brighton Limestone, the overlying Willochra Formation and the underlying Tapley Hill Formation

Fig.33.

ISOPACH MAP OF THE BRIGHTON LIMESTONE

Umberatana Group

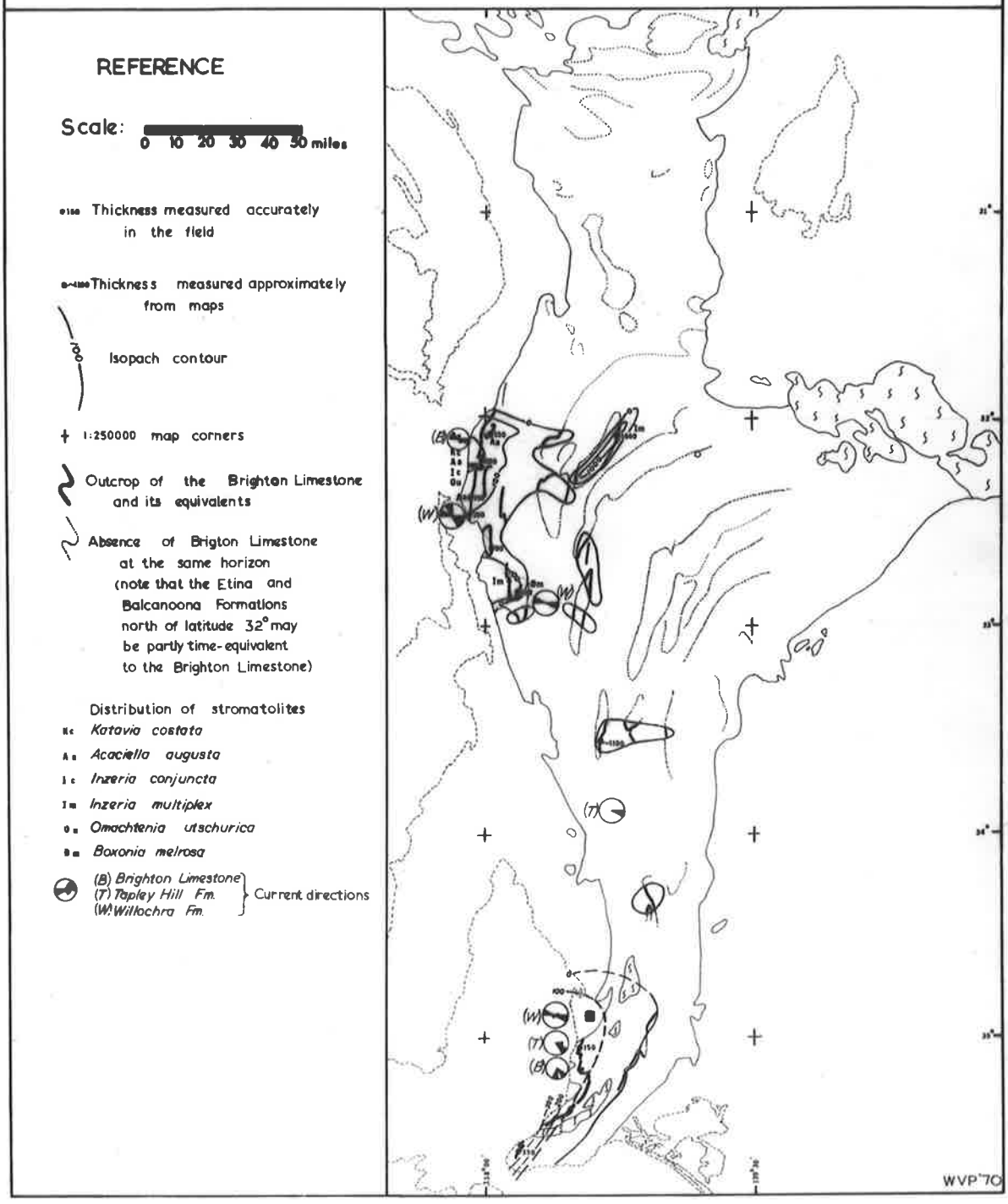


Fig. 34

Outcrop patterns and thicknesses were deduced in the same way as for the Brighton Limestone (Fig.33). The overlay compares the distribution of diapirs with that of the Etina Formation and its equivalents. Also shown on the overlay are the distributions of red-beds and of stromatolites

(1)

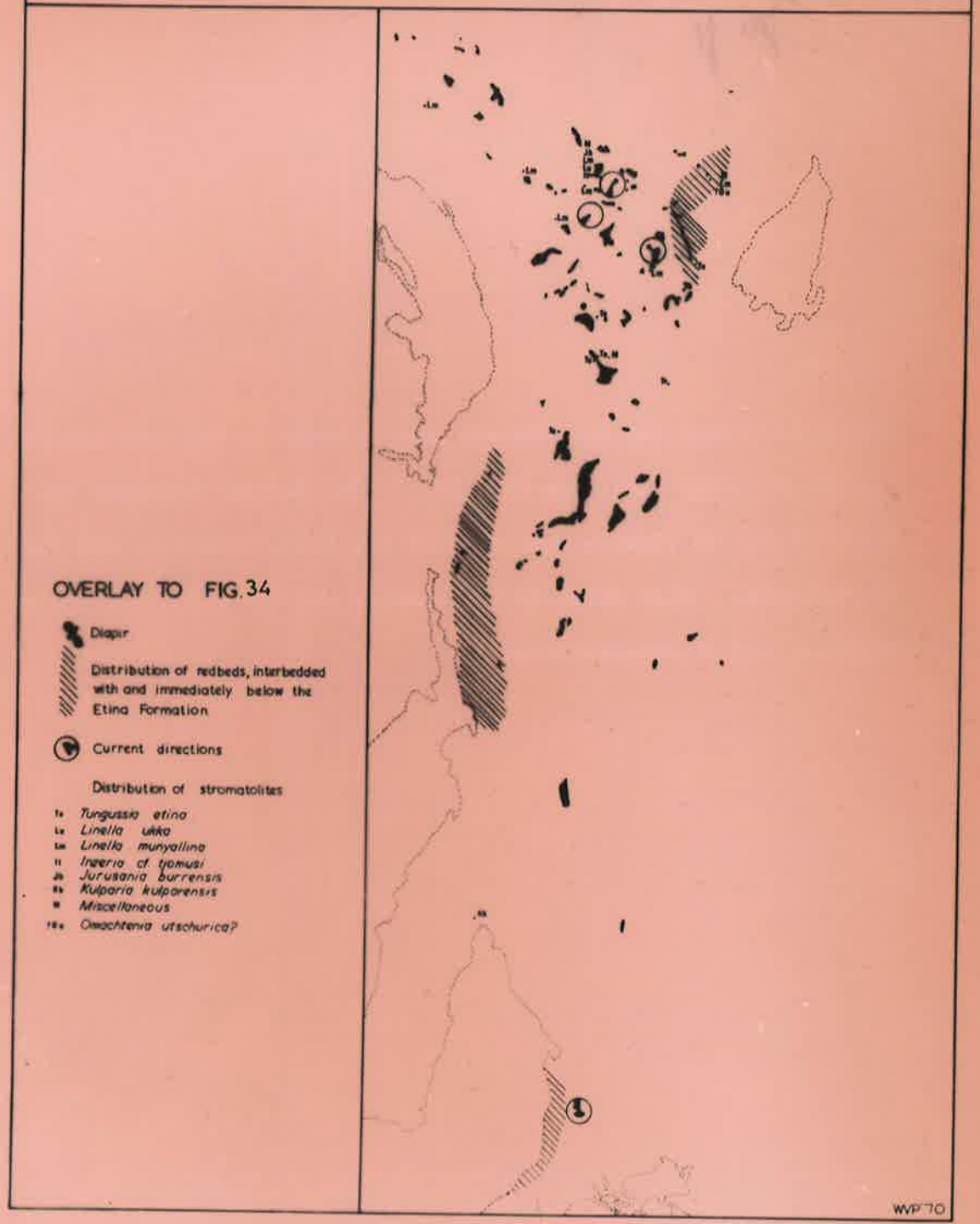

OVERLAY TO FIG. 34
Diapir
Distribution of redbeds, interbedded with and immediately below the Etina Formation
Current directions
Distribution of stromatolites
Tungussia etina
Linella ukka
Linella munyallina
Inzeria cf. tjomusi
Jurusania burrensis
Kulparia kulparensis
Miscellaneous
Omachtenia utschurica?
WVP 70

Fig.34.

ISOPACH MAP OF THE ETINA FORMATION AND ITS EQUIVALENTS

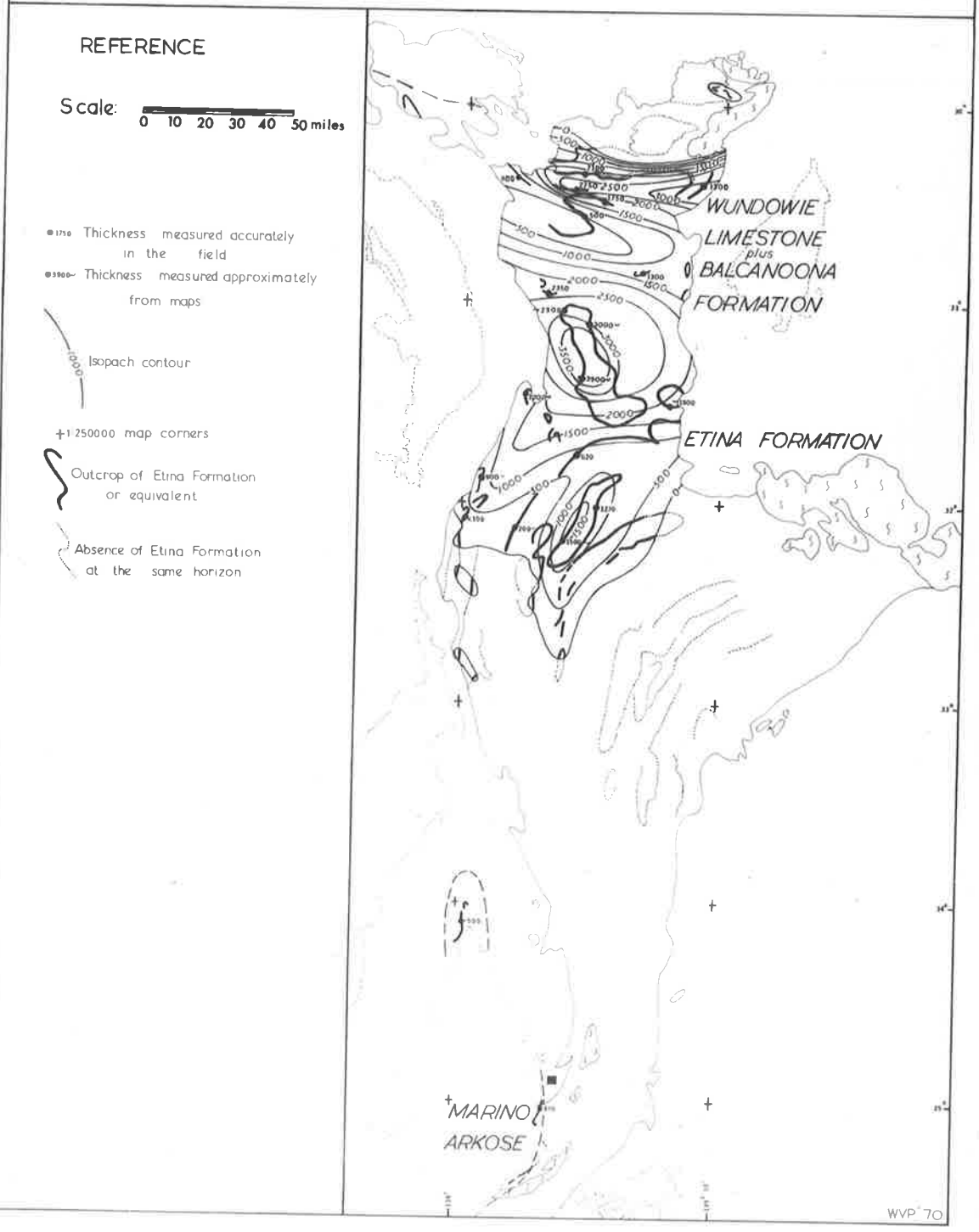
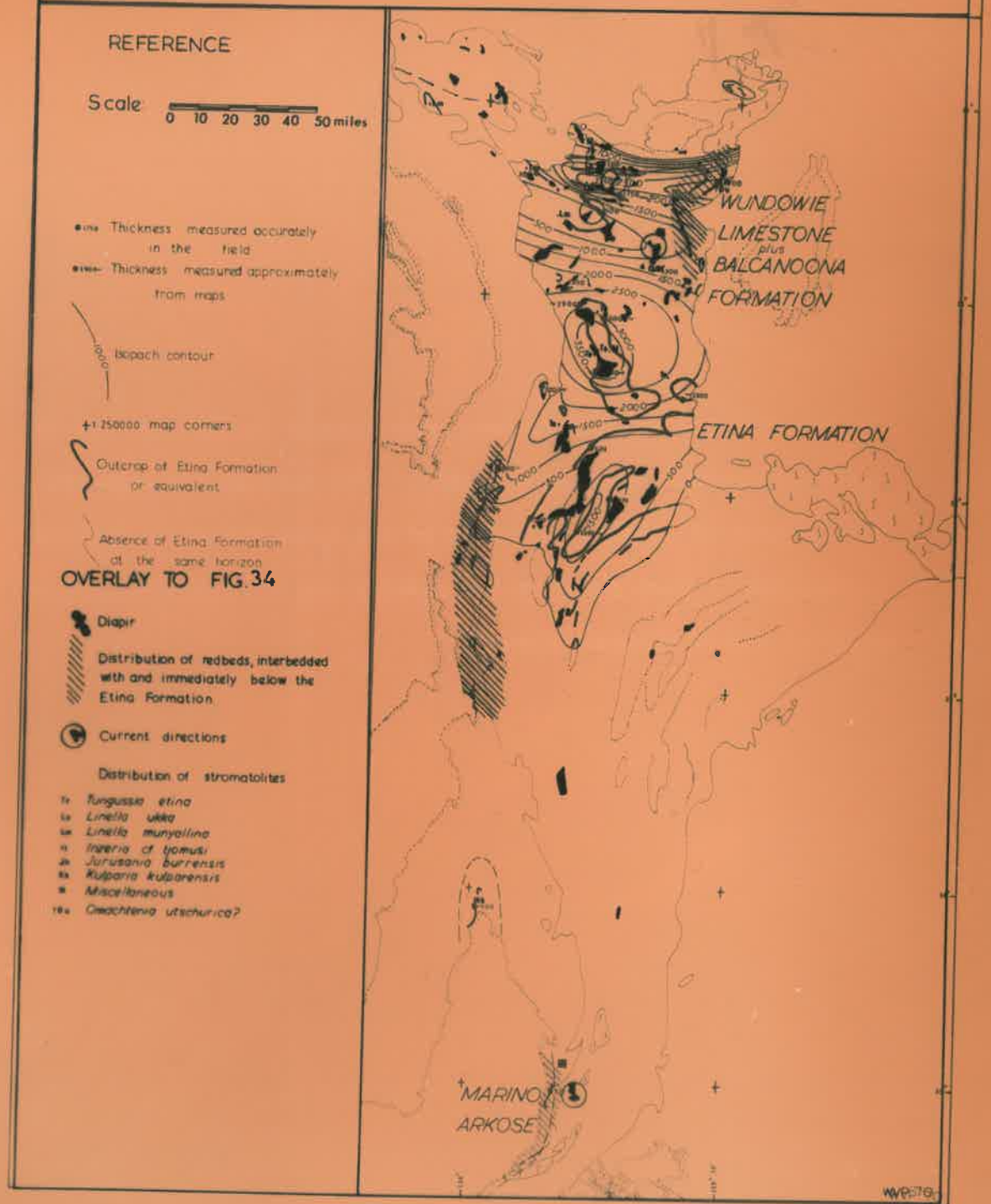


Fig. 34 (i)

ISOPACH MAP OF THE ETINA FORMATION AND ITS EQUIVALENTS



Figs. 35 to 38 (Maps A to H)

Palaeogeographic reconstructions of the Adelaide Geosyncline during the time interval between the two Late Precambrian glaciations. The interpretations are discussed in Ch.11

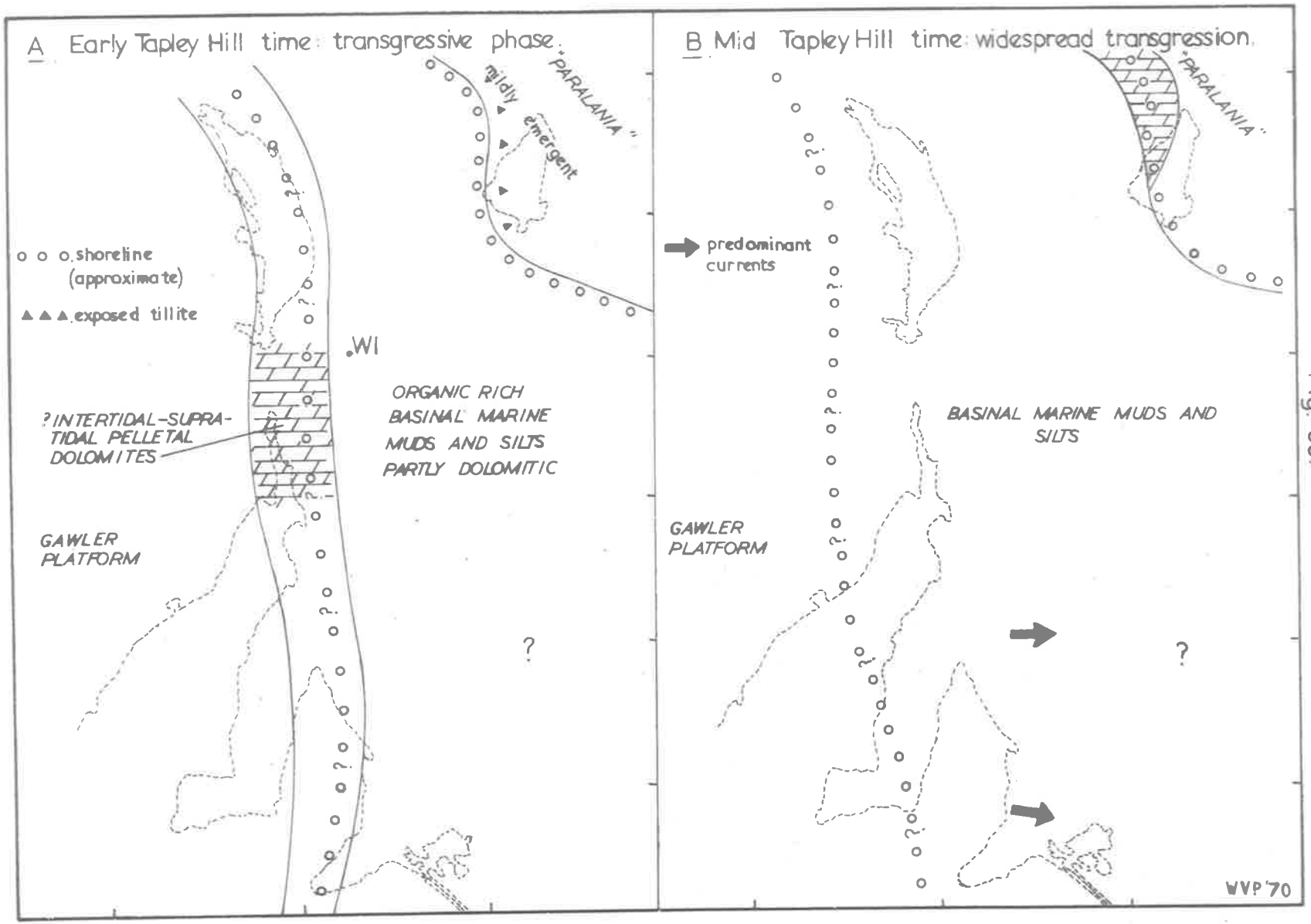

A Early Tapley Hill time: transgressive phase.
"PARALANIA"
mildly emergent
o o o shoreline (approximate)
▲▲▲ exposed tillite
WI
? INTERTIDAL-SUPRA-TIDAL PELLETAL DOLOMITES
ORGANIC RICH BASINAL MARINE MUDS AND SILTS PARTLY DOLOMITIC
GAWLER PLATFORM
?
B Mid Tapley Hill time: widespread transgression.
"PARALANIA"
predominant currents
BASINAL MARINE MUDS AND SILTS
GAWLER PLATFORM
?
WVP '70

Fig. 35.

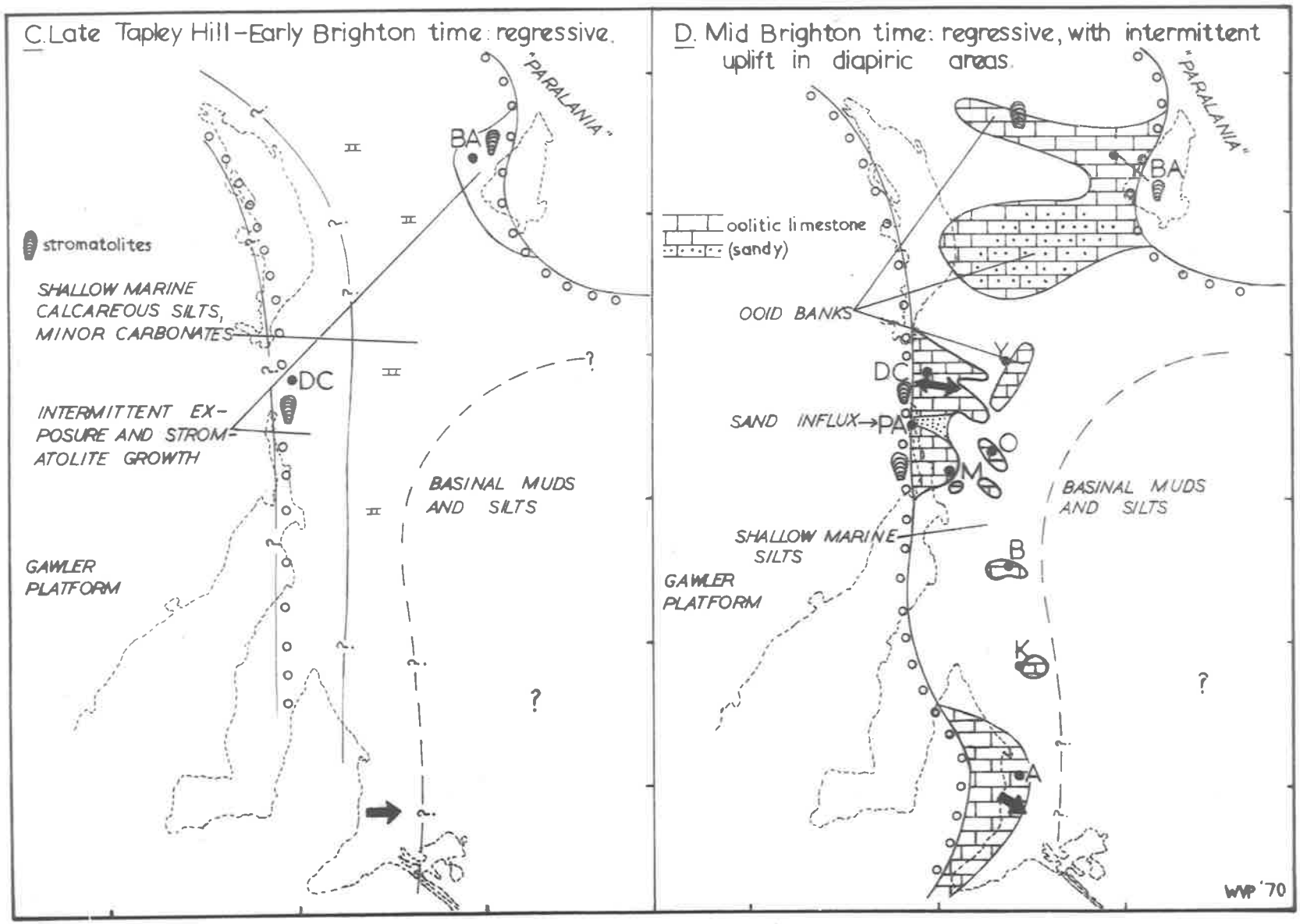

C. Late Tapley Hill – Early Brighton time: regressive.
"PARALANIA"
BA
stromatolites
SHALLOW MARINE CALCAREOUS SILTS, MINOR CARBONATES
DC
INTERMITTENT EXPOSURE AND STROMATOLITE GROWTH
BASINAL MUDS AND SILTS
GAWLER PLATFORM
?
D. Mid Brighton time: regressive, with intermittent uplift in diapiric areas.
"PARALANIA"
BA
oolitic limestone
(sandy)
OOID BANKS
V
DC
SAND INFLUX→PA
O
M
BASINAL MUDS AND SILTS
SHALLOW MARINE SILTS
B
GAWLER PLATFORM
K
A
?
WMP '70

Fig. 36.

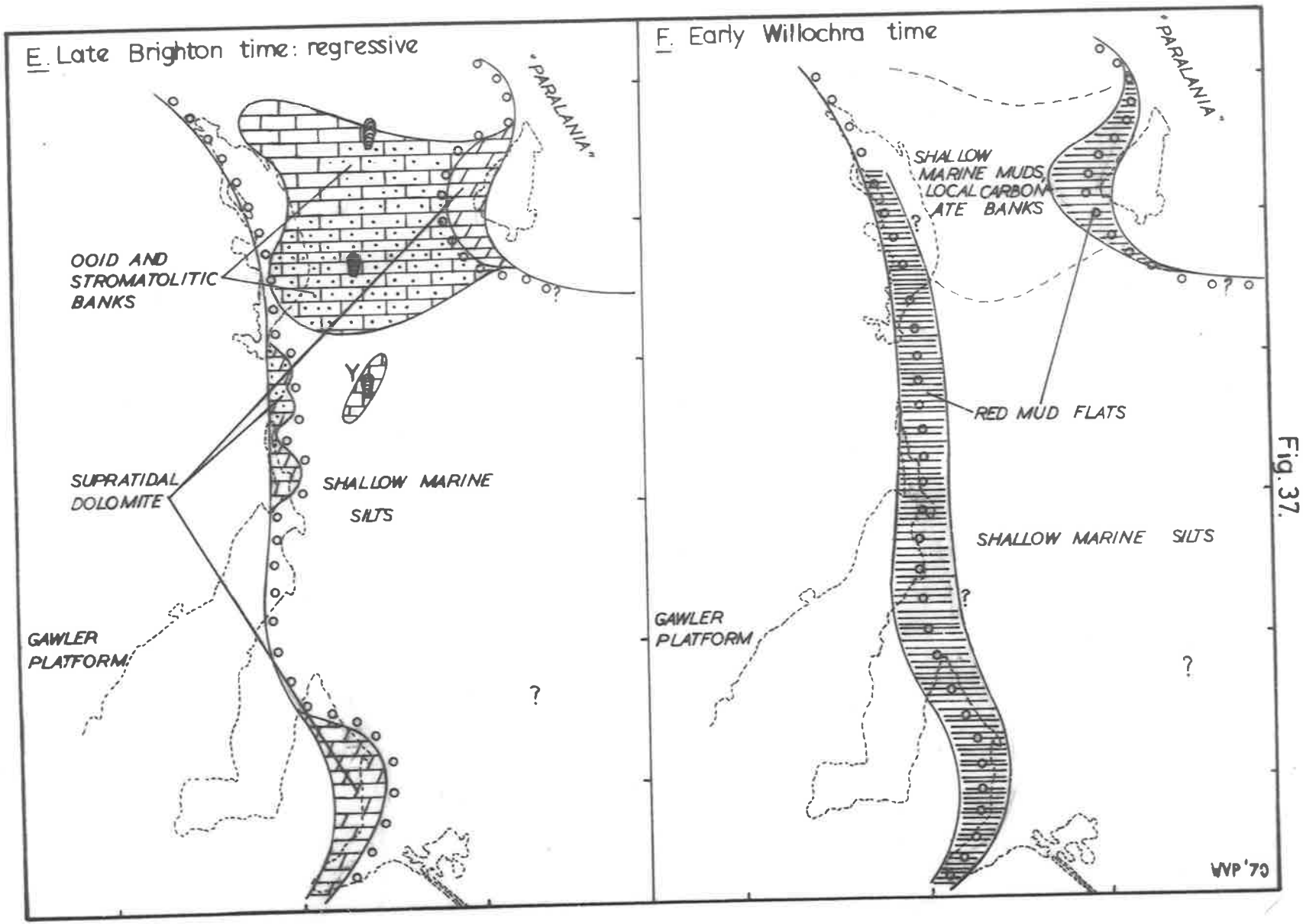

E. Late Brighton time: regressive
"PARALANIA"
OOID AND STROMATOLITIC BANKS
Y
SUPRATIDAL DOLOMITE
SHALLOW MARINE SILTS
GAWLER PLATFORM
?
F. Early Willochra time
"PARALANIA"
SHALLOW MARINE MUDS, LOCAL CARBONATE BANKS
?
RED MUD FLATS
SHALLOW MARINE SILTS
GAWLER PLATFORM
?
WP '79

Fig. 37.

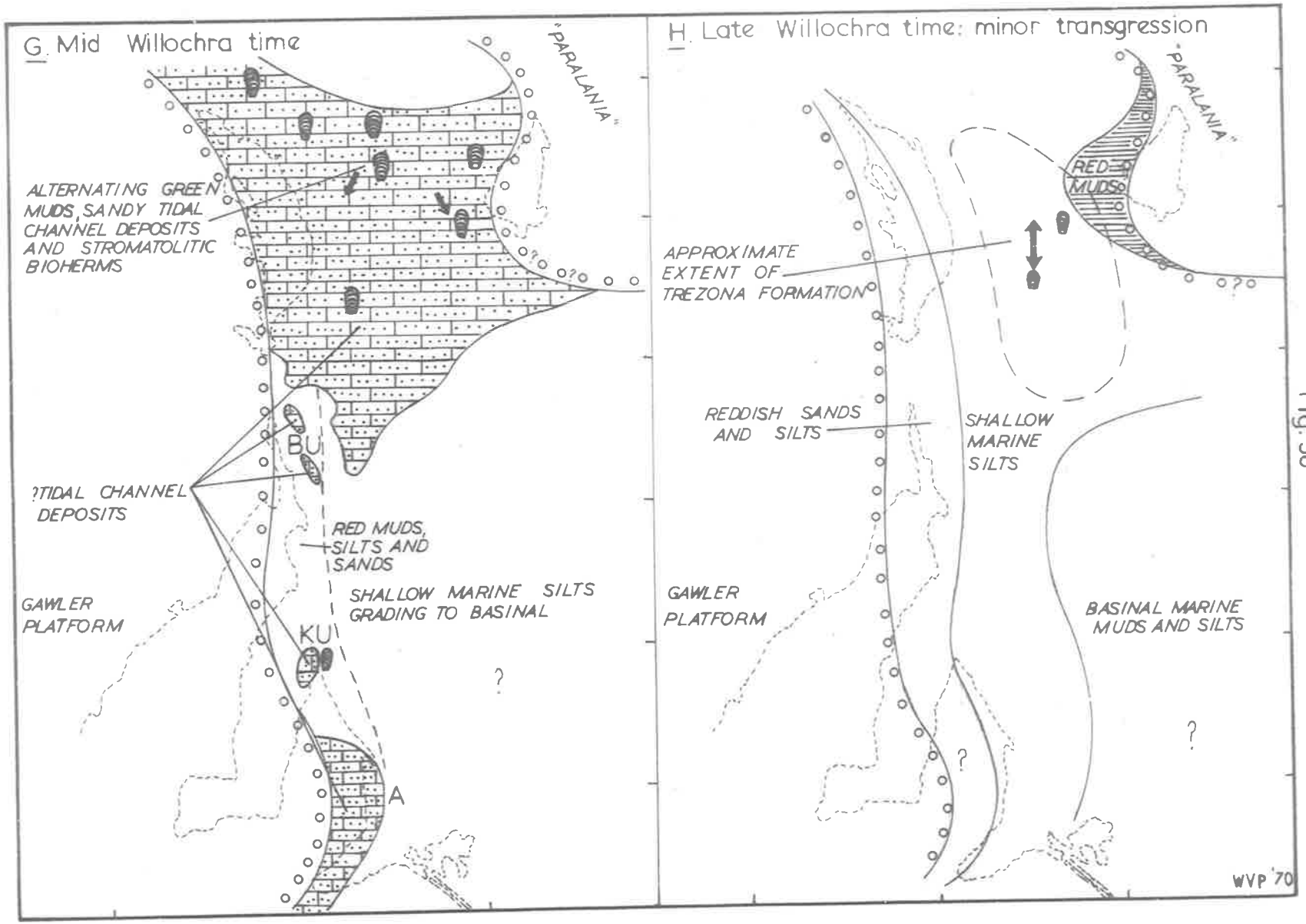

G. Mid Willochra time
"PARALANIA"
ALTERNATING GREEN MUDS, SANDY TIDAL CHANNEL DEPOSITS AND STROMATOLITIC BIOHERMS
BU
?TIDAL CHANNEL DEPOSITS
RED MUDS, SILTS AND SANDS
SHALLOW MARINE SILTS GRADING TO BASINAL
GAWLER PLATFORM
KU
A
?
H. Late Willochra time: minor transgression
"PARALANIA"
RED MUDS
APPROXIMATE EXTENT OF TREZONA FORMATION
REDDISH SANDS AND SILTS
SHALLOW MARINE SILTS
GAWLER PLATFORM
BASINAL MARINE MUDS AND SILTS
?
WVP '70

Fig. 38

Fig. 39 (see map pocket)

Fence diagram based on sections measured accurately in the field. All locations are on the Copley 1:250,000 Sheet. Important facies changes are the change from green and grey shales and siltstones in the west to red in the north-east, the lensing out to the west of the Weetootla Dolomite and the intertonguing of the Wundowie Limestone with shales. An unconformity possibly exists below the Elatina Formation in some areas. The predominantly oolitic Balcanoona Formation is secondarily dolomitized in its very thick sections at Wundowie Bore, Burr Well and Angepena, but not at Myrtle Springs or Maynards Well where the thickness is reduced. The possibly early diagenetic (? supratidal) dolomites of the Arkaroola-Balcanoona region do not occur elsewhere