The taxonomy and palaeoecology of Bryozoa from the upper Permian zechstein reef of N.E. Eng1and

Southwood, David Ashley

THE TAXONOMY AND PALAEOECOLOGY OF BRYOZOA FROM THE UPPER PERMIAN ZECHSTEIN REEF OF N.E. ENGLAND

by

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A thesis presented for the degree of Doctor of Philosophy in the University of Durham

Volume 2 - Figures and Plates

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University of Durham

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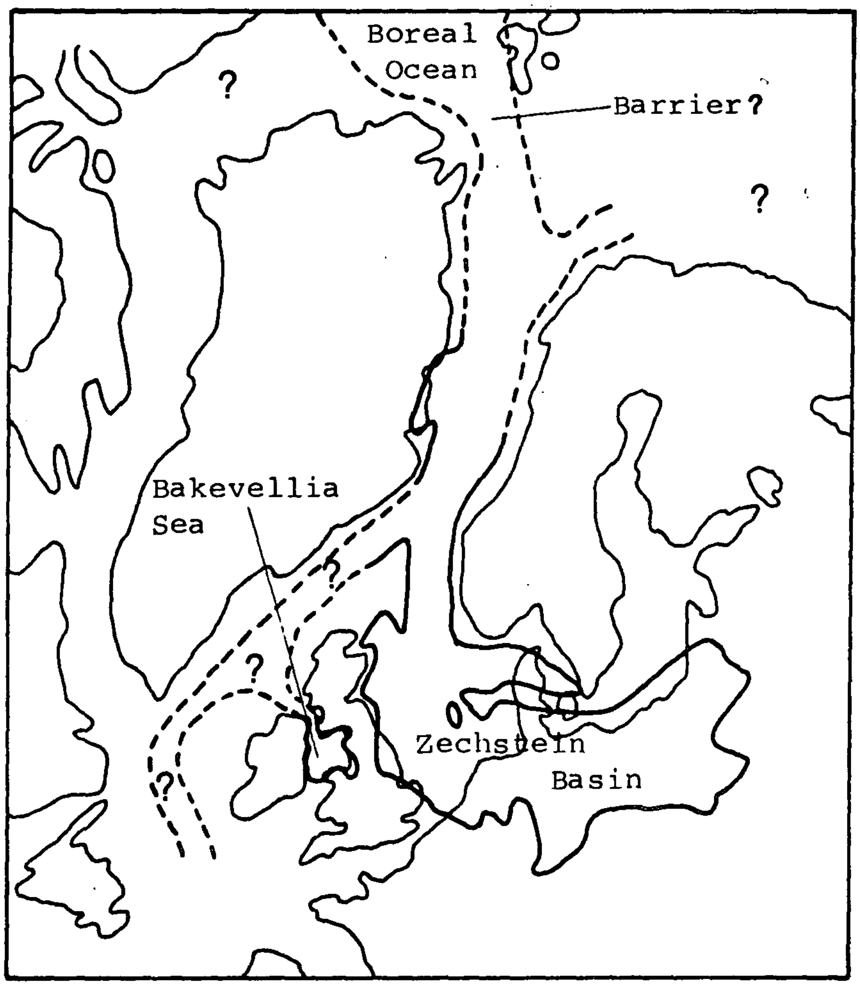
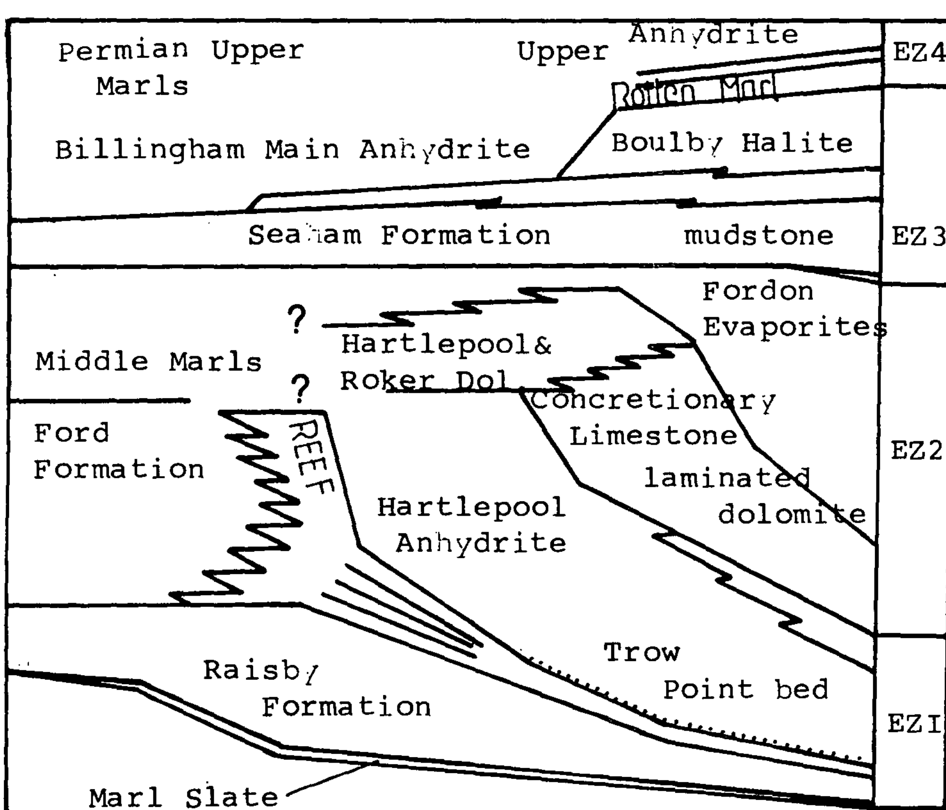
Figure I. A. Zechstein palaeogeography of N.W.Europe. (From Taylor(1984))

B. Diagrammatic representation of the relationships of the main lithostratigraphic units in the Permian of N.W.Europe. (After Smith(I98I))


Boreal
Ocean
Barrier?
?
?
Bakevellia
Sea
?
?
?
Zechstein
Basin

A


Permian Upper
Marls
Upper
Anhydrite
Rotten Marl
Billingham Main Anhydrite
Boulby Halite
Seaham Formation
mudstone
Fordon
Evaporites
?
Hartlepool &
Roker Dol
Middle Marls
?
Concretionary
Limestone
Ford
Formation
REEF
laminated
dolomite
Hartlepool
Anhydrite
Trow
Point bed
Raisby
Formation
Marl Slate
EZ4
EZ3
EZ2
EZI

B

Figure 2. Map showing crest of shelf-edge reef and main localities(From Smith(I98I)).

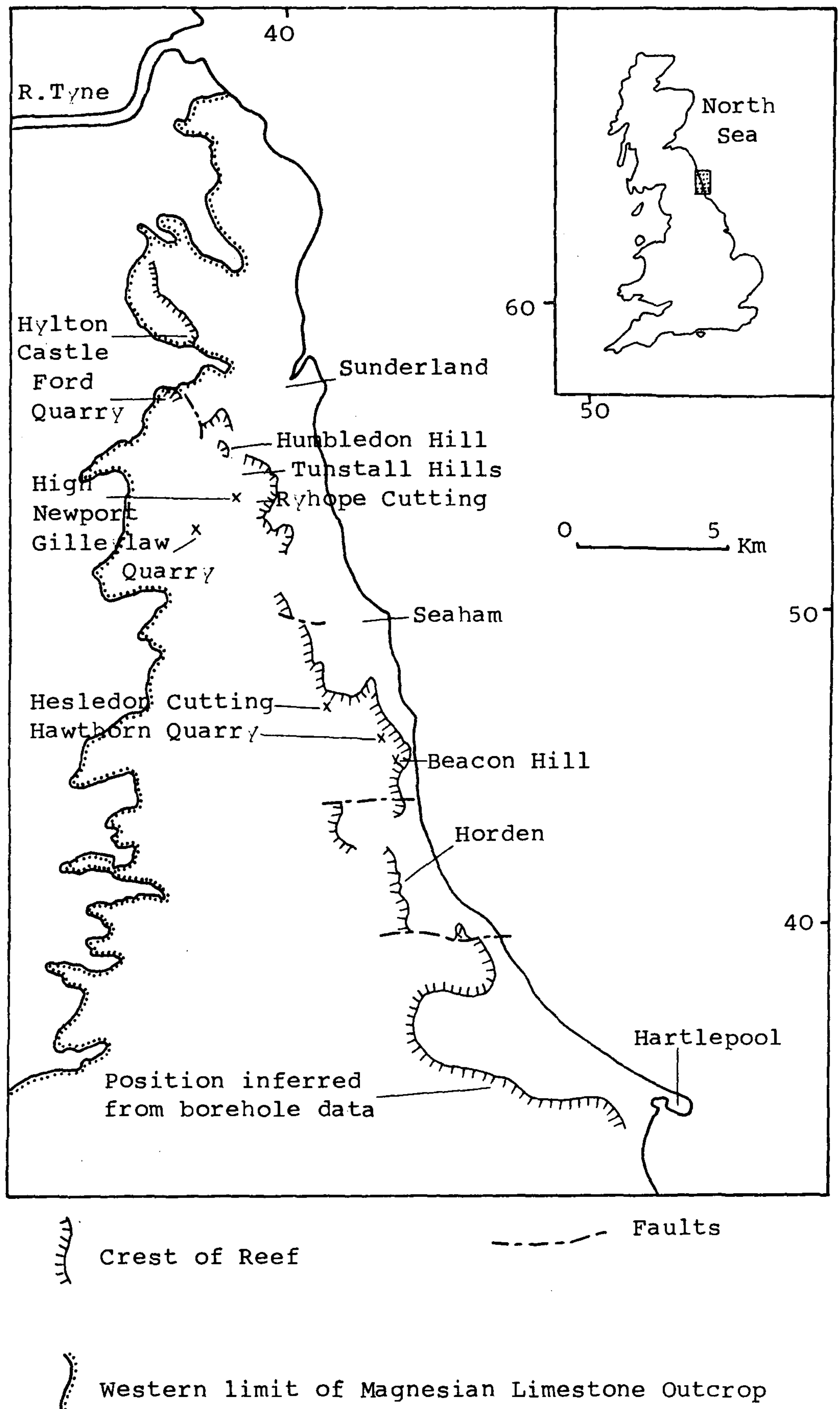
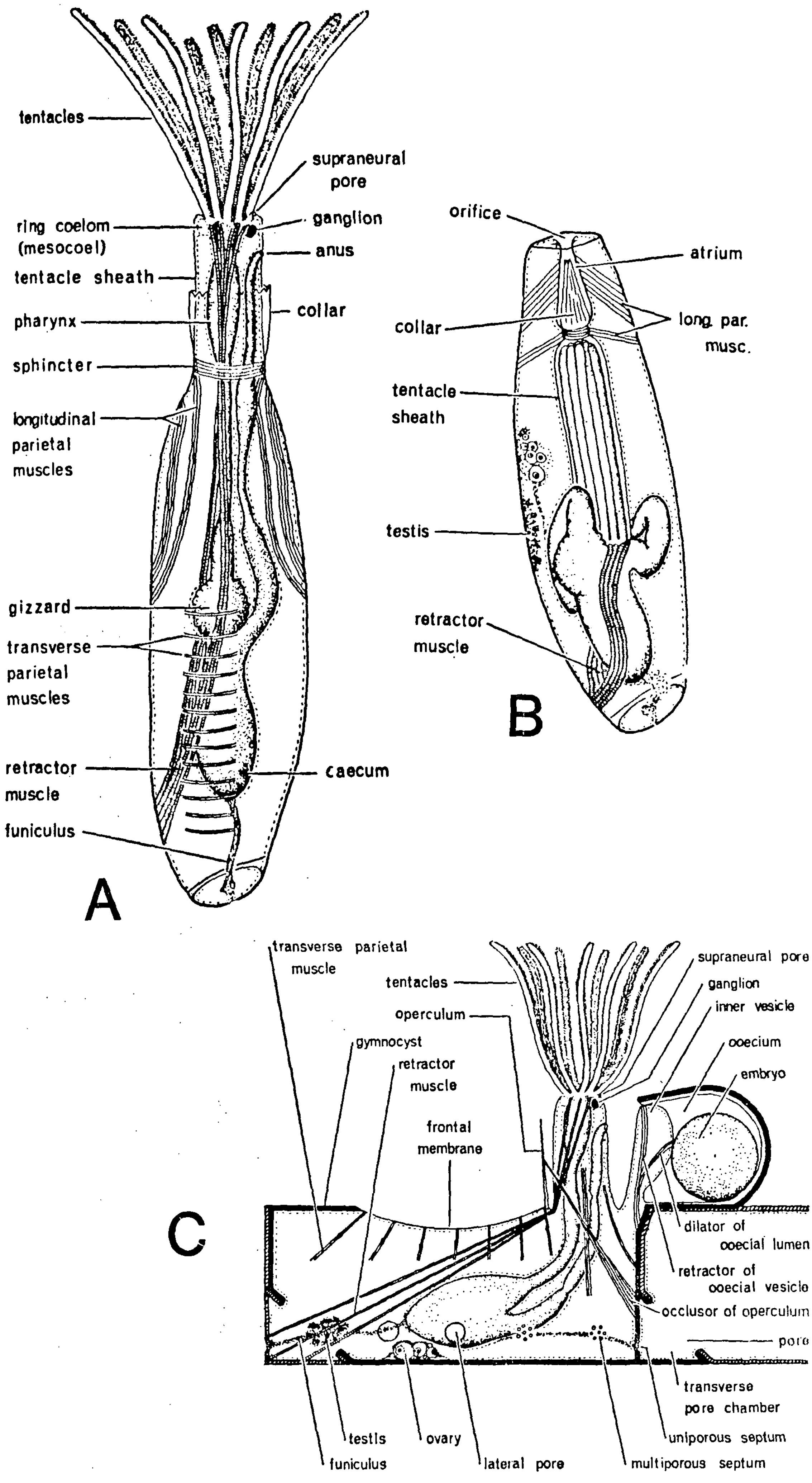

R.Tyne
40
60
50
50
40
North
Sea
Hylton
Castle
Ford
Quarry
Sunderland
Humbledon Hill
Tunstall Hills
High
Newport
Ryhope Cutting
Gilleylaw
Quarry
0
5
Km
Seaham
Hesledon Cutting
Hawthorn Quarry
Beacon Hill
Horden
Hartlepool
Position inferred
from borehole data
Crest of Reef
Faults
Western limit of Magnesian Limestone Outcrop

Figure 3. A. Ctenostome zooid with tentacles expanded. (From Ryland(I970))

B. Ctenostome zooid (fully retracted). (From Ryland(I970))

C. Cheilostome zooid with tentacles expanded. (From Ryland(I970))


tentacles
supraneural pore
ring coelom (mesocoel)
ganglion
anus
tentacle sheath
collar
pharynx
sphincter
longitudinal parietal muscles
gizzard
transverse parietal muscles
retractor muscle
caecum
funiculus
A
orifice
atrium
collar
long. par. musc.
tentacle sheath
testis
retractor muscle
B
transverse parietal muscle
tentacles
supraneural pore
ganglion
operculum
inner vesicle
ooecium
gymnocyst
retractor muscle
embryo
frontal membrane
C
dilator of ooecial lumen
retractor of ooecial vesicle
occlusor of operculum
pore
transverse pore chamber
testis
ovary
uniporous septum
funiculus
lateral pore
multiporous septum

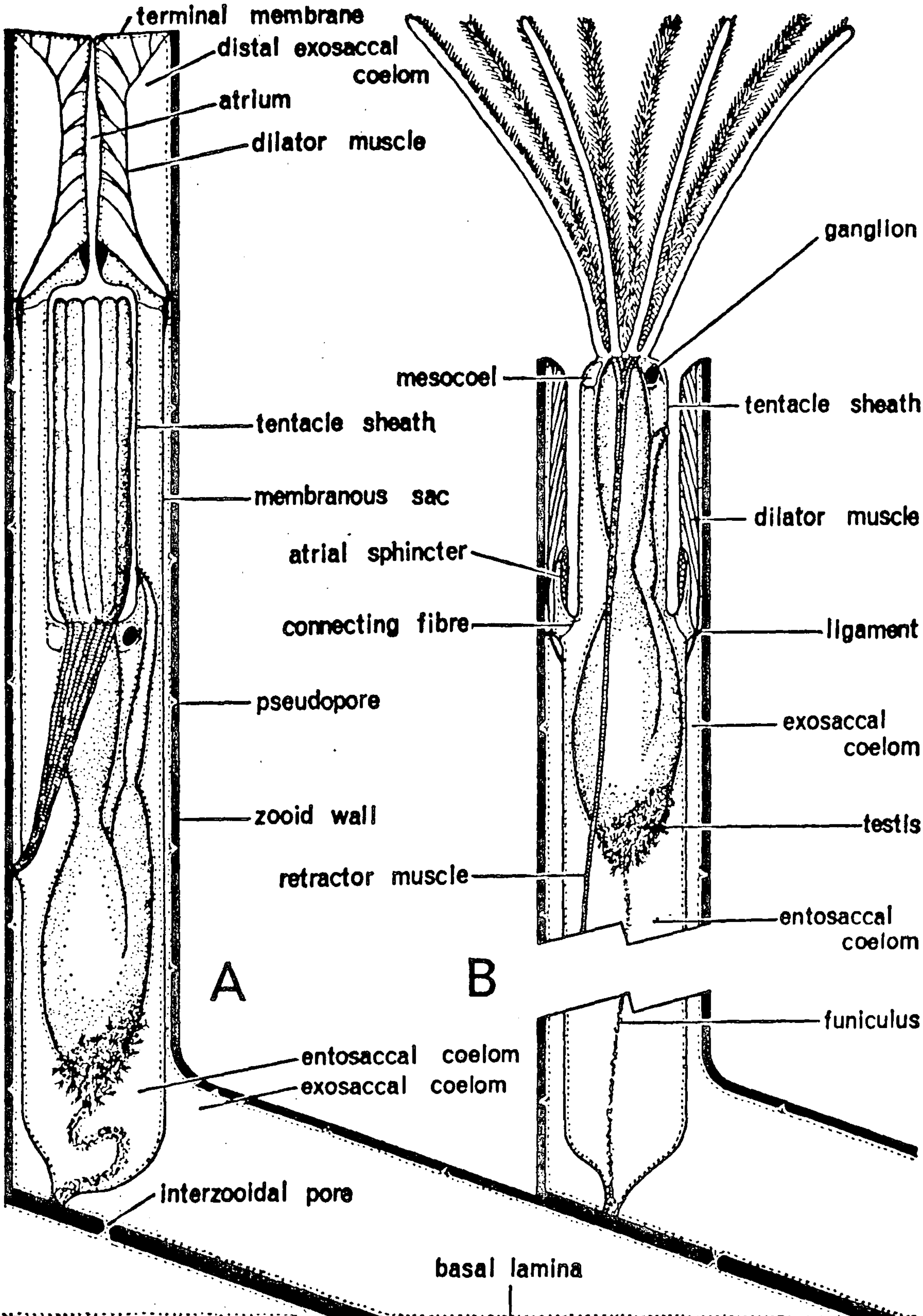

terminal membrane
distal exosaccal coelom
atrium
dilator muscle
tentacle sheath
membranous sac
pseudopore
zoid wall
A
entosaccal coelom
exosaccal coelom
interzooidal pore
basal lamina
ganglion
mesocoel
tentacle sheath
dilator muscle
atrial sphincter
connecting fibre
ligament
exosaccal coelom
testis
retractor muscle
entosaccal coelom
B
funiculus

Figure 5. Stylized diagram of the relationship between hard and soft parts in a free-walled stenolaemate(Modified from Boardman(I97I)).Tentacles retracted but not shown.

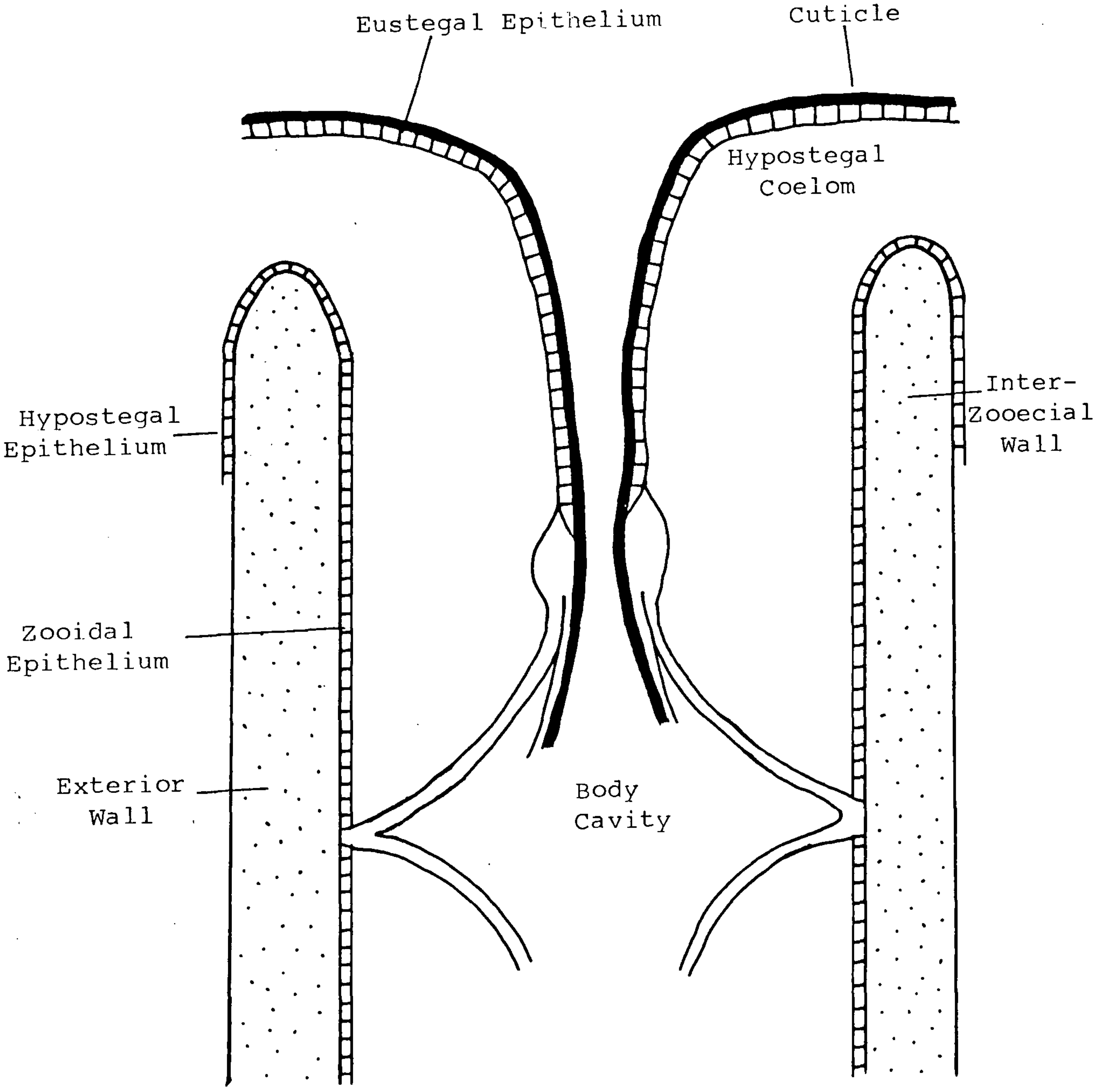
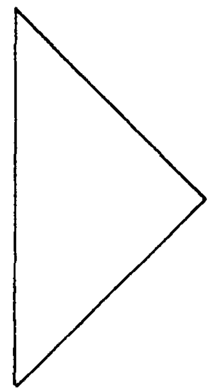
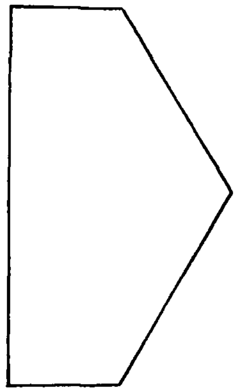

Eustegal Epithelium
Cuticle
Hypostegal
Coelom
Hypostegal
Epithelium
Inter-
Zooecial
Wall
Zooidal
Epithelium
Exterior
Wall
Body
Cavity

Figure 6. Examples of shapes used in the description of zooecial chambers.

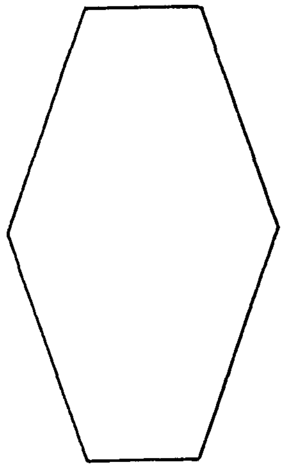
(a) Triangular
(b) Pentagonal, Hemi-hexagonal
(c) Elongate hexagonal
(d) Rhombic
(e) Oval
(f) Circular



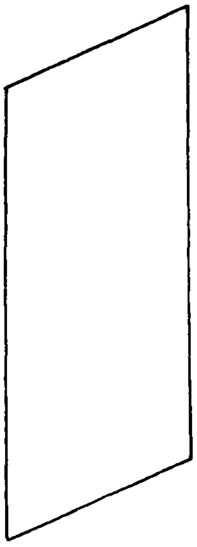
a



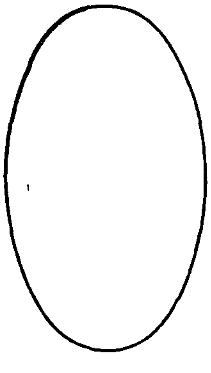
b



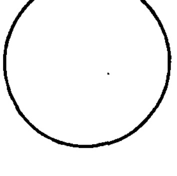
c



d



e



f

Figure 7. Inferred relationship of soft-parts to fossula.Fossula interpreted as anal opening.Stippled ornament=skeletal tissue.(From Gautier(I972)).

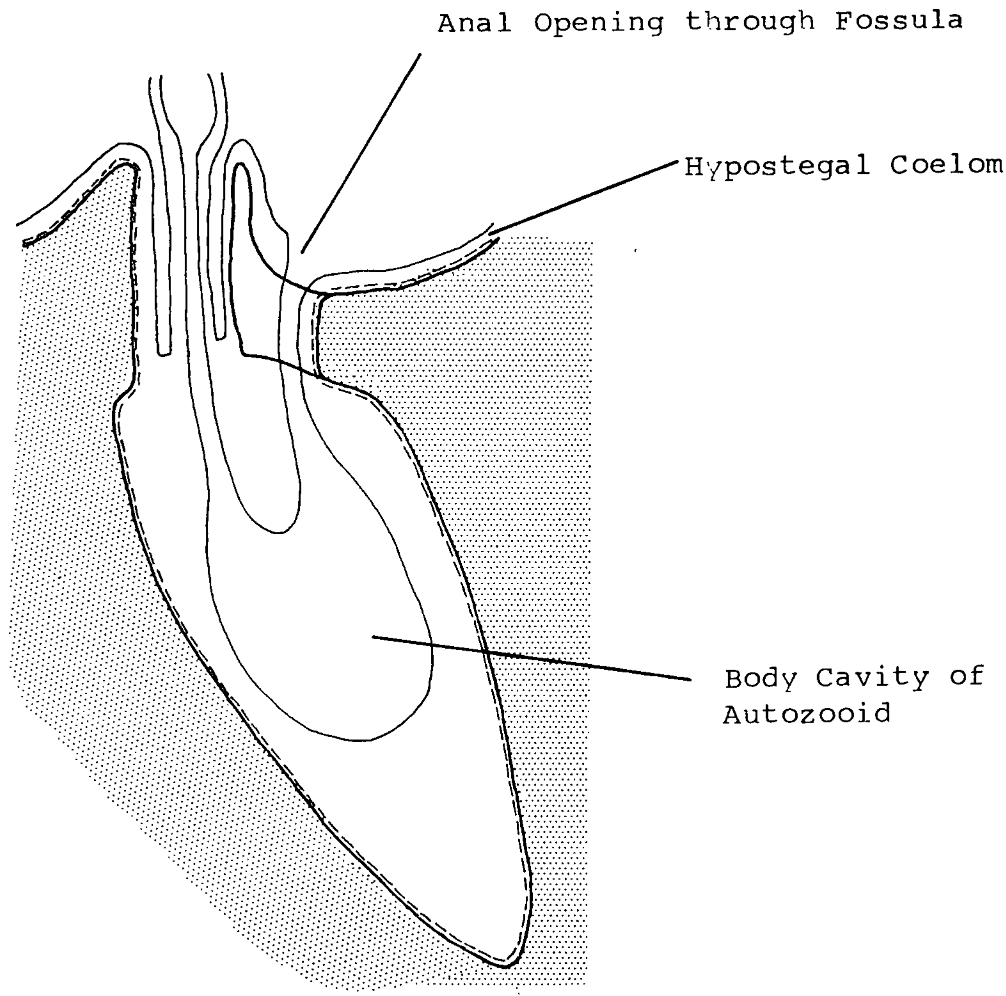

Anal Opening through Fossula
Hypostegal Coelom
Body Cavity of Autozooid

Figure 8. Transverse section of fenestellid branch to show elements of microstructure. The true extent of the primary granular layer in carinal nodes is not known and may be more restricted than is shown. It is not known if the 'Inner platy core' extends for the height of a node.

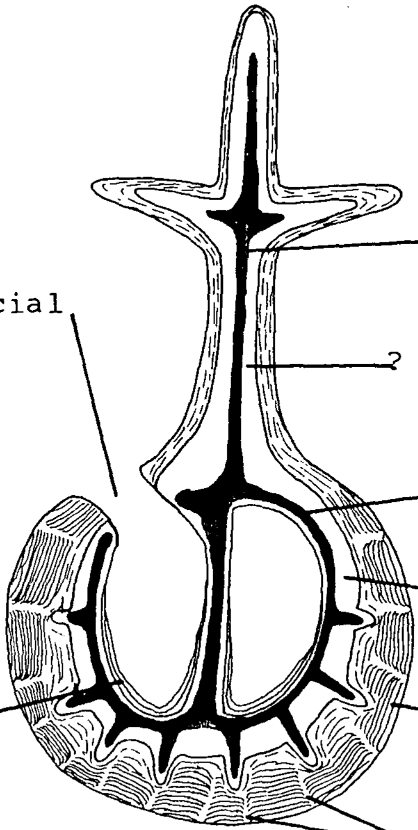
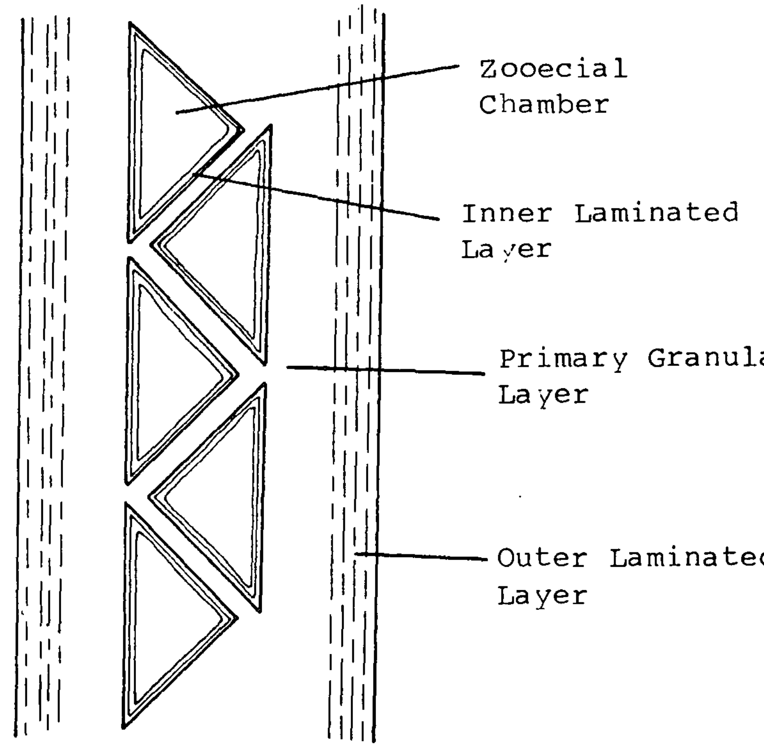

? 'Inner Platy Core'
Autozooecial Aperture
? Primary Granular Layer
'Inner Platy Core'
Primary Granular Layer
Inner Laminated Layer
Outer Laminated Layer
Skeletal Rods

Figure 9. A. Tangential section of a fenestellid branch (close to zooecial chamber base), showing elements of microstructure.

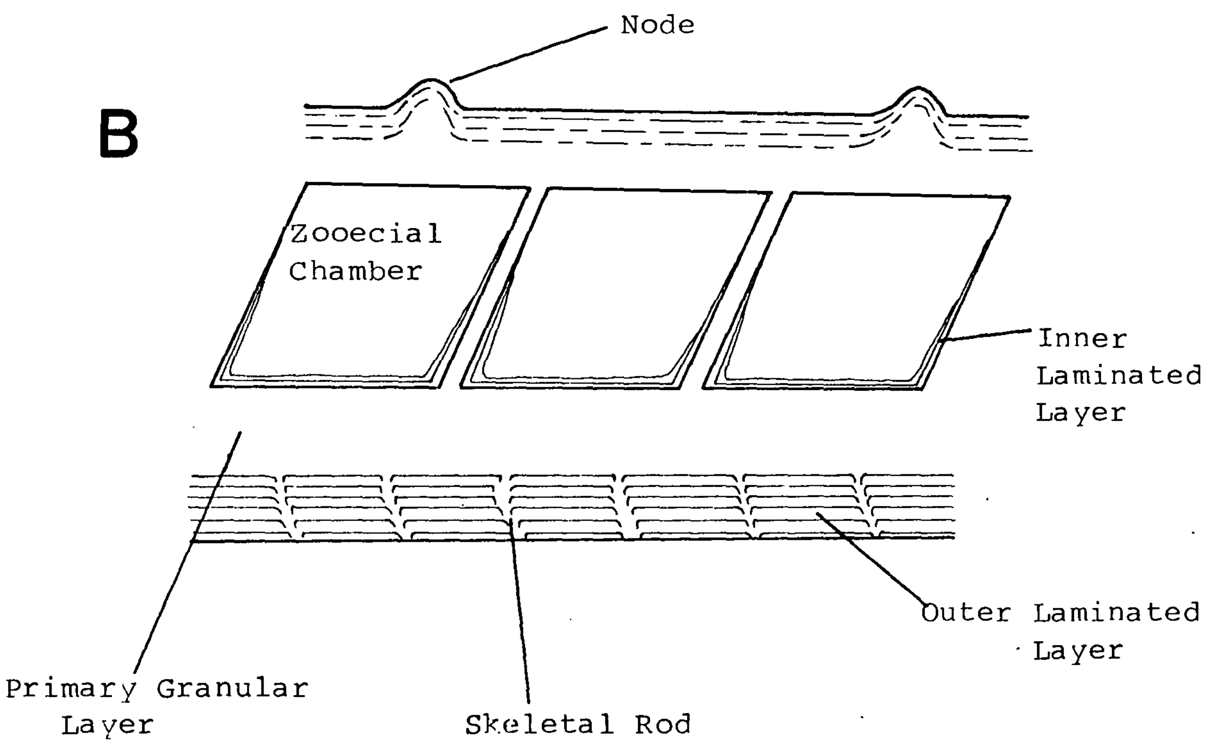
B. Longitudinal section of a fenestellid branch showing elements of microstructure.

A



Zooecial Chamber
Inner Laminated Layer
Primary Granula
Layer
Outer Laminatec
Layer

B



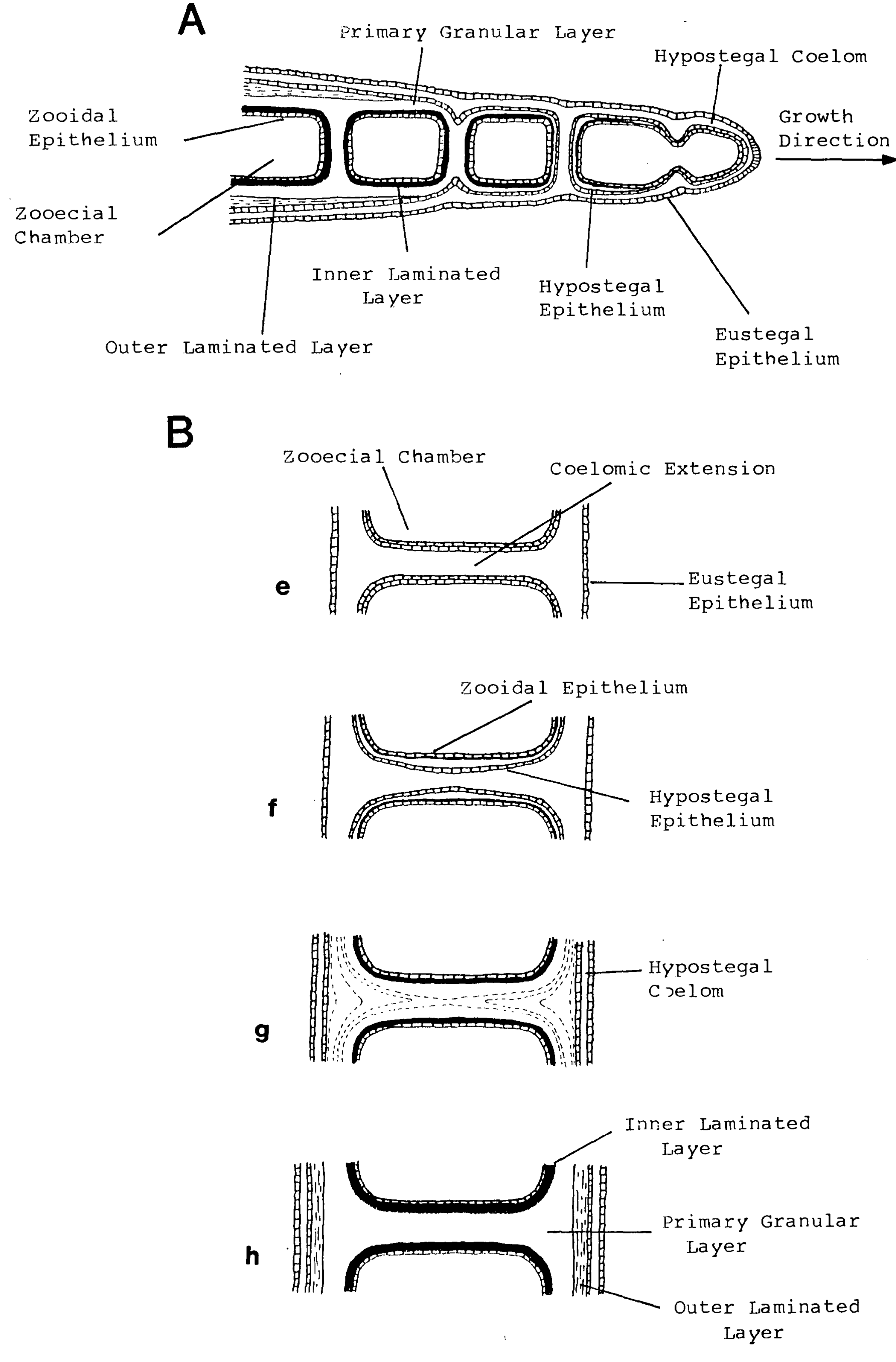
Node
Zooecial Chamber
Inner Laminated Layer
Outer Laminated Layer
Primary Granular Layer
Skeletal Rod

Figure IO. Tavener-Smith's (I969a) growth model for fenestellids.

A. Longitudinal section showing hard and soft parts in the "Double-walled" arrangement. Developing zooids attain adult size and shape prior to calcification(see text for discussion,p.4I).

B. Tangential section showing stages in the formation of a calcareous inter-zooecial wall(see text for discussion p.4I).

Figures'A' and'B' from Tavener-Smith(I969a).



A
Primary Granular Layer
Hypostegal Coelom
Zooidal Epithelium
Growth Direction
Zooecial Chamber
Inner Laminated Layer
Hypostegal Epithelium
Eustegal Epithelium
Outer Laminated Layer
B
Zooecial Chamber
Coelomic Extension
e
Eustegal Epithelium
Zooidal Epithelium
f
Hypostegal Epithelium
g
Hypostegal Coelom
Inner Laminated Layer
h
Primary Granular Layer
Outer Laminated Layer

Figure II. Modified growth model. Longitudinal section through a branch showing hard and soft parts - calcification of zooecial chambers commences prior to the complete development of a daughter zooid.
(Zooid omitted).

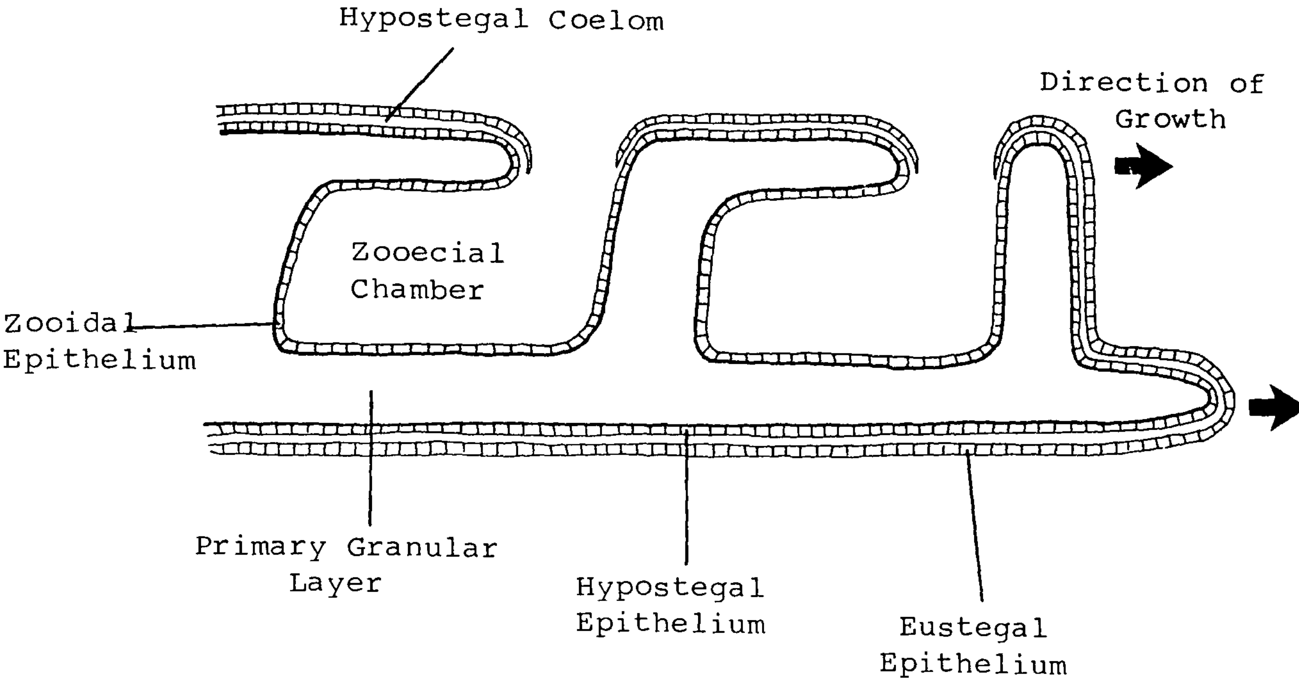

Hypostegal Coelom
Direction of Growth
Zooecial Chamber
Zooidal Epithelium
Primary Granular Layer
Hypostegal Epithelium
Eustegal Epithelium

Figure I2. Growth model (Modified after Tavener-Smith (I969a)).

A. Figure shows the ancestrula - evagination of the ancestrular epithelium creates a doubled epithelial layer.

B. Epithelia extend by intussusception - calcification commences.

C. Calcification of the first zooecial chamber distal to the ancestrula commences.

D. The first asexually budded zooid is produced.

See text, p.4I. for discussion.

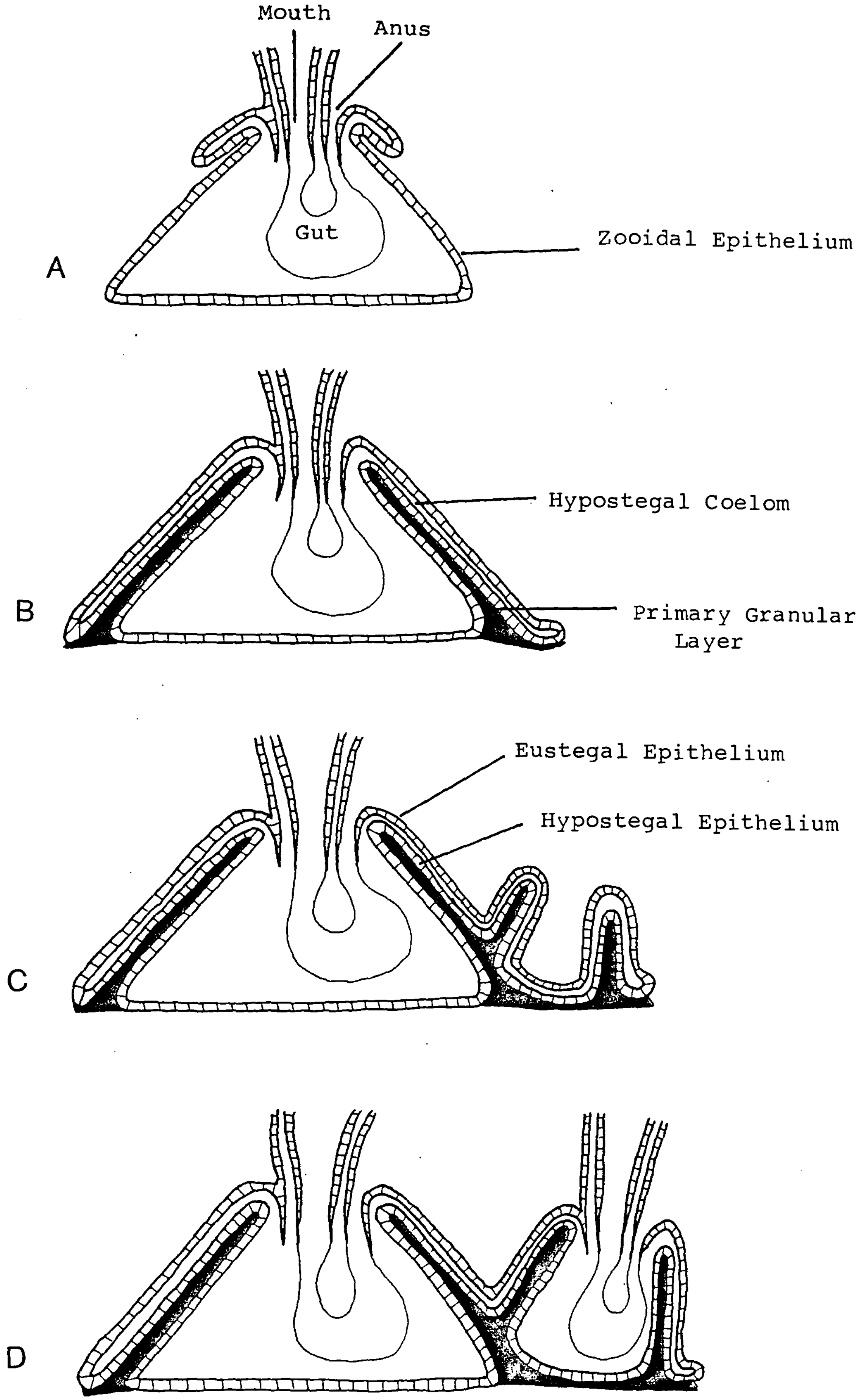

Mouth
Anus
Gut
Zooidal Epithelium
A
Hypostegal Coelom
B
Primary Granular Layer
Eustegal Epithelium
Hypostegal Epithelium
C
D

Figure I3. Ovicells in Palaeozoic Fenestrates.

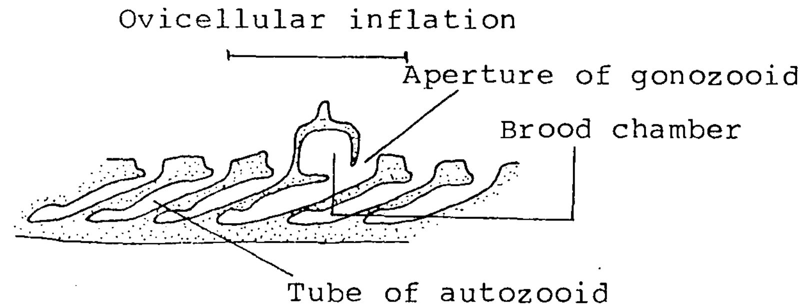
A. Longitudinal section through a branch of *Fenestella cf. fanata* Whidborne showing ovicellular inflation. (From Tavener-Smith(I966a)).

B. Plan view of obverse surface of 'A'. (From Tavener-Smith(I966a)).

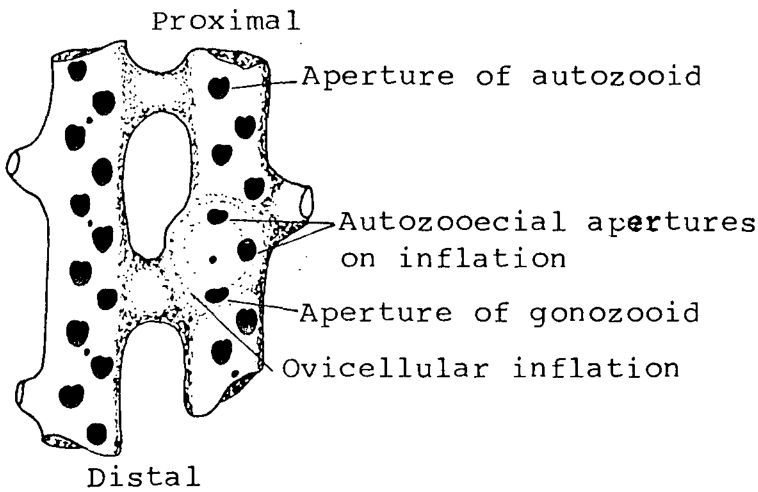
C. Longitudinal section through a branch of *Septatopora flemingi* Engel showing ovicellular depression. (From Engel(I975)).

D. Longitudinal section through a branch of *Septatopora acarinata* Crockford showing ovicellular pit. (From Engel(I9⁷5)).

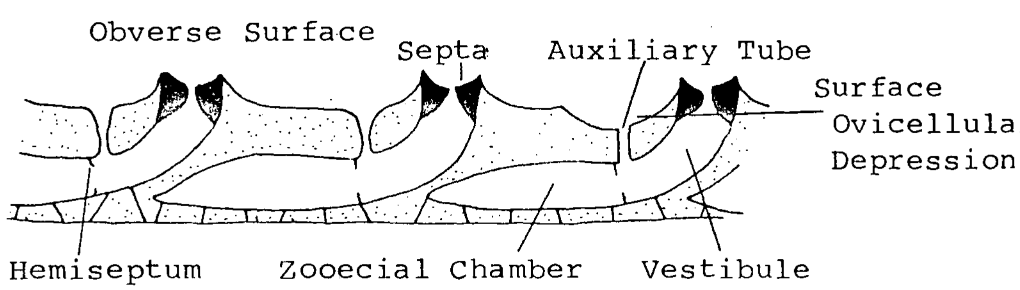
A


Ovicellular inflation
Aperture of gonozooid
Brood chamber
Tube of autozooid

B


Proximal
Aperture of autozooid
Autozooecial apertures on inflation
Aperture of gonozooid
Ovicellular inflation
Distal

C


Obverse Surface
Septa
Auxiliary Tube
Surface Ovicellular Depression
Hemiseptum
Zooecial Chamber
Vestibule

D

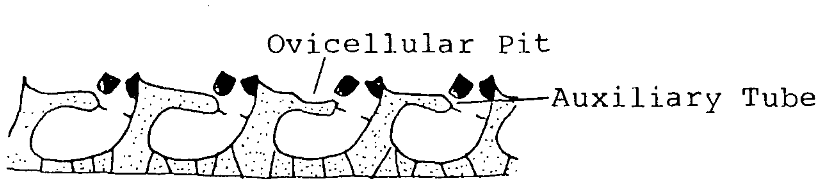

Ovicellular Pit
Auxiliary Tube

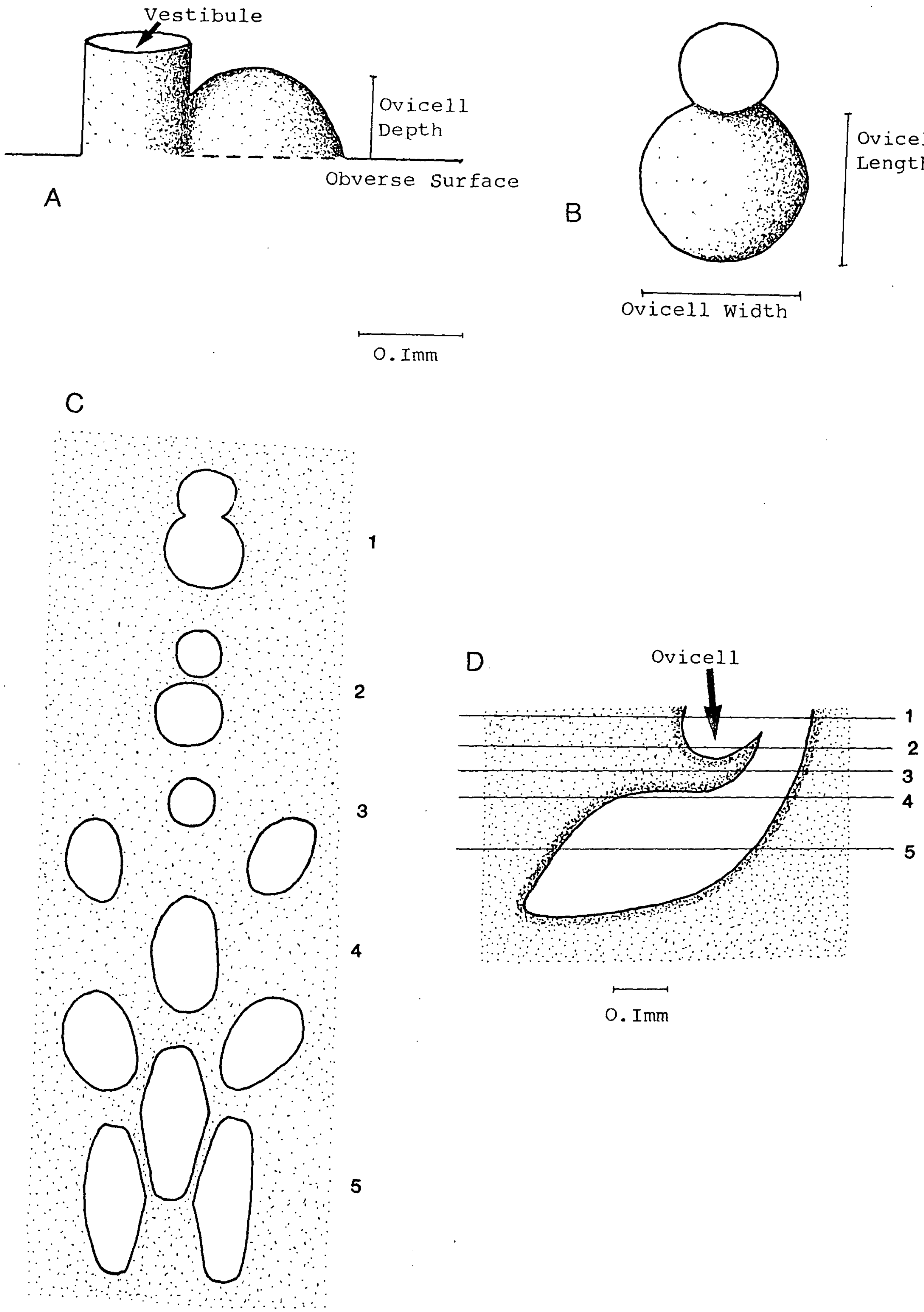
Figure I4. Ovicells.

A. Side view of ovicell and distal part of vestibule in cast preservation.

B. Plan view of 'A'.

C. Oblique tangential section of Synocladia virgulacea showing ovicell close to the obverse surface.The numbers I-5 correspond to the numbers on the longitudinal section and show which level of the zooecial chamber is represented in the tangential section.

D. Longitudinal section of Synocladia virgulacea showing ovicell and the levels in the section represented by the numbers I-5 in 'C'. It is not known with certainty if the ovicell is completely enclosed within the branch.



Vestibule
Ovicell Depth
Obverse Surface
A
B
Ovicell Width
O.Imm
C
1
2
3
4
5
D
Ovicell
1
2
3
4
5
O.Imm

Figure I5. Obverse surface of a fenestellid showing the characters measured in the present study.The bottom right corner of the diagram shows characters measured internally.

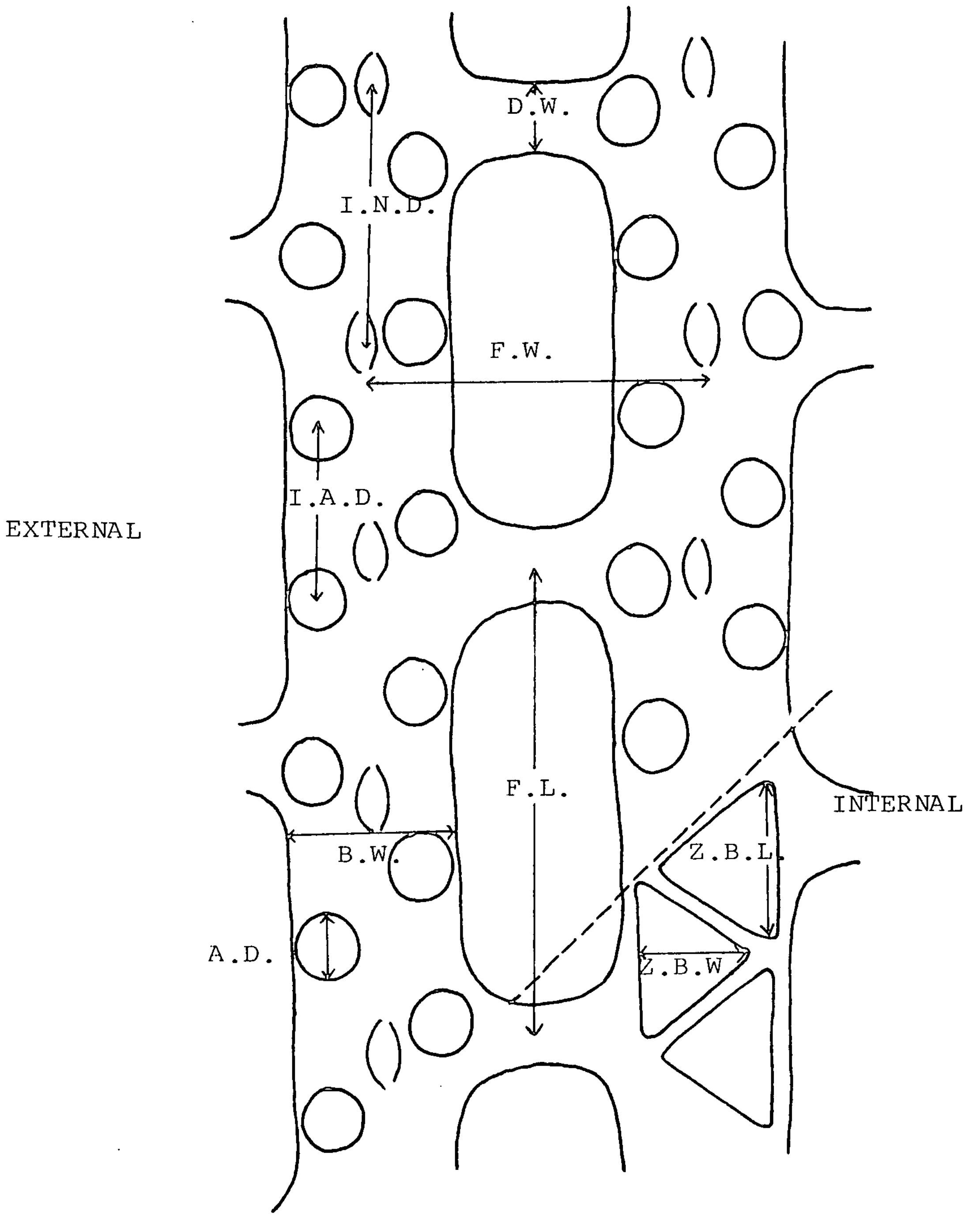

D.W.
I.N.D.
F.W.
I.A.D.
EXTERNAL
F.L.
INTERNAL
B.W.
Z.B.L.
A.D.
Z.B.W

Figure I6. Orientation of thin sections for the genus Fenestella;Longitudinal, Transverse and Tangential.(After Bancroft(I984)).

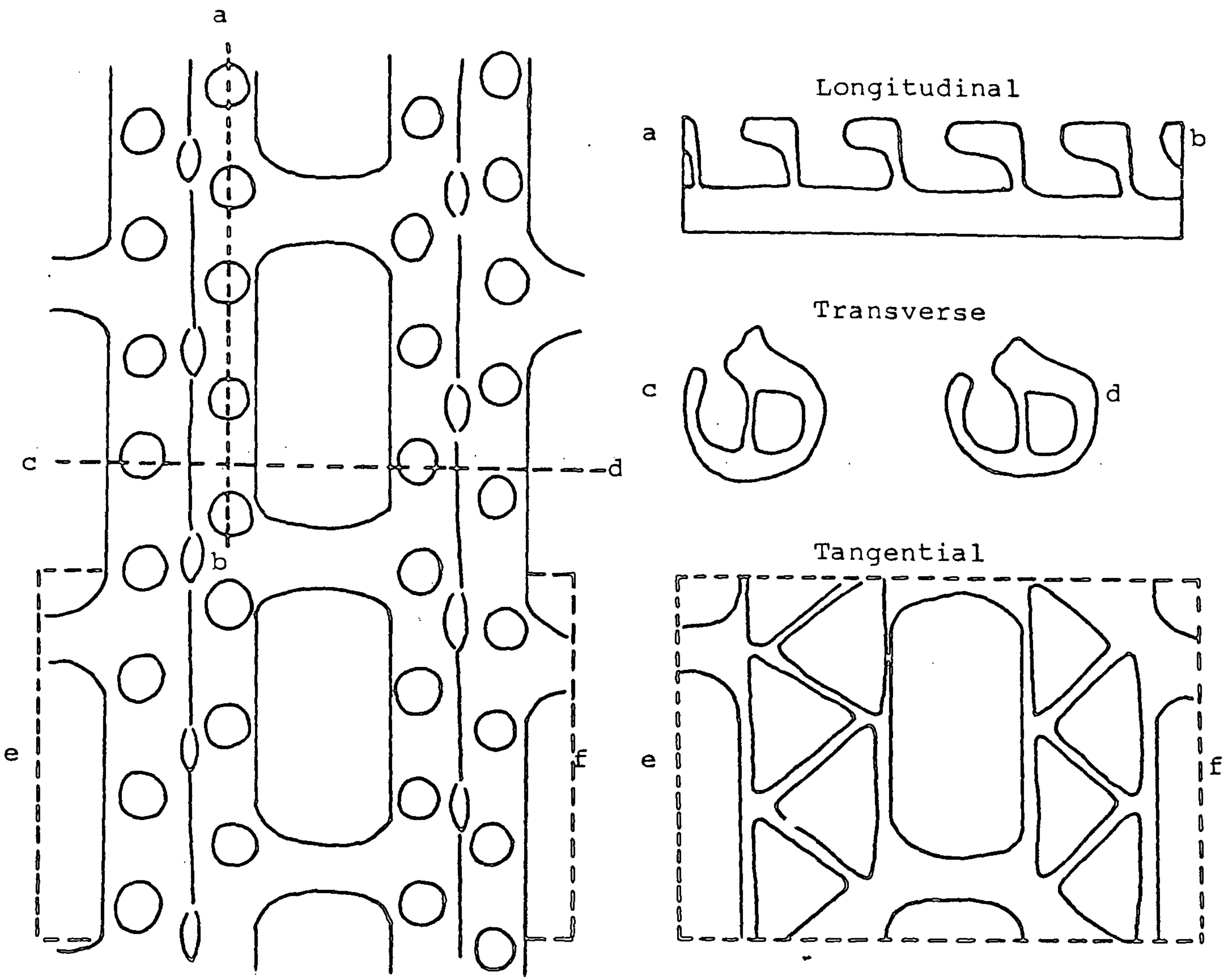

a
b
c
d
e
f
Longitudinal
a
b
Transverse
c
d
Tangential
e
f

Figure I7. _Fenestella retiformis_ Schlotheim

Obverse surface detail.Three nanate zooecia occur close to the bifurcation point.RH2.24.

Bar Scale=Imm

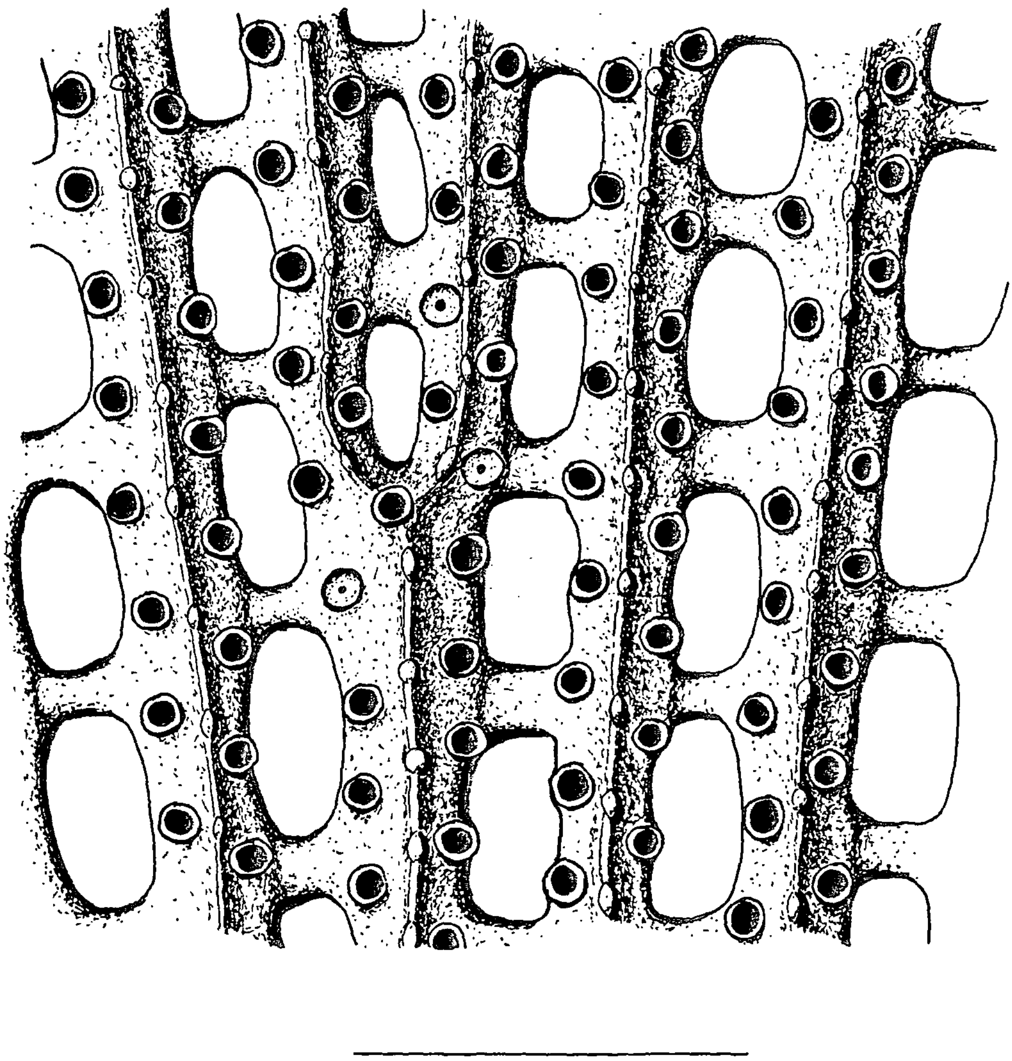


Figure I8. <u>Fenestella</u> <u>retiformis</u> Schlotheim

A.Zooecial chamber base shape.Bar scale-O.Imm.

B.Reverse surface detail.The second branch from the right shows longitudinal striae. Bar scale=Imm.RH2.26.

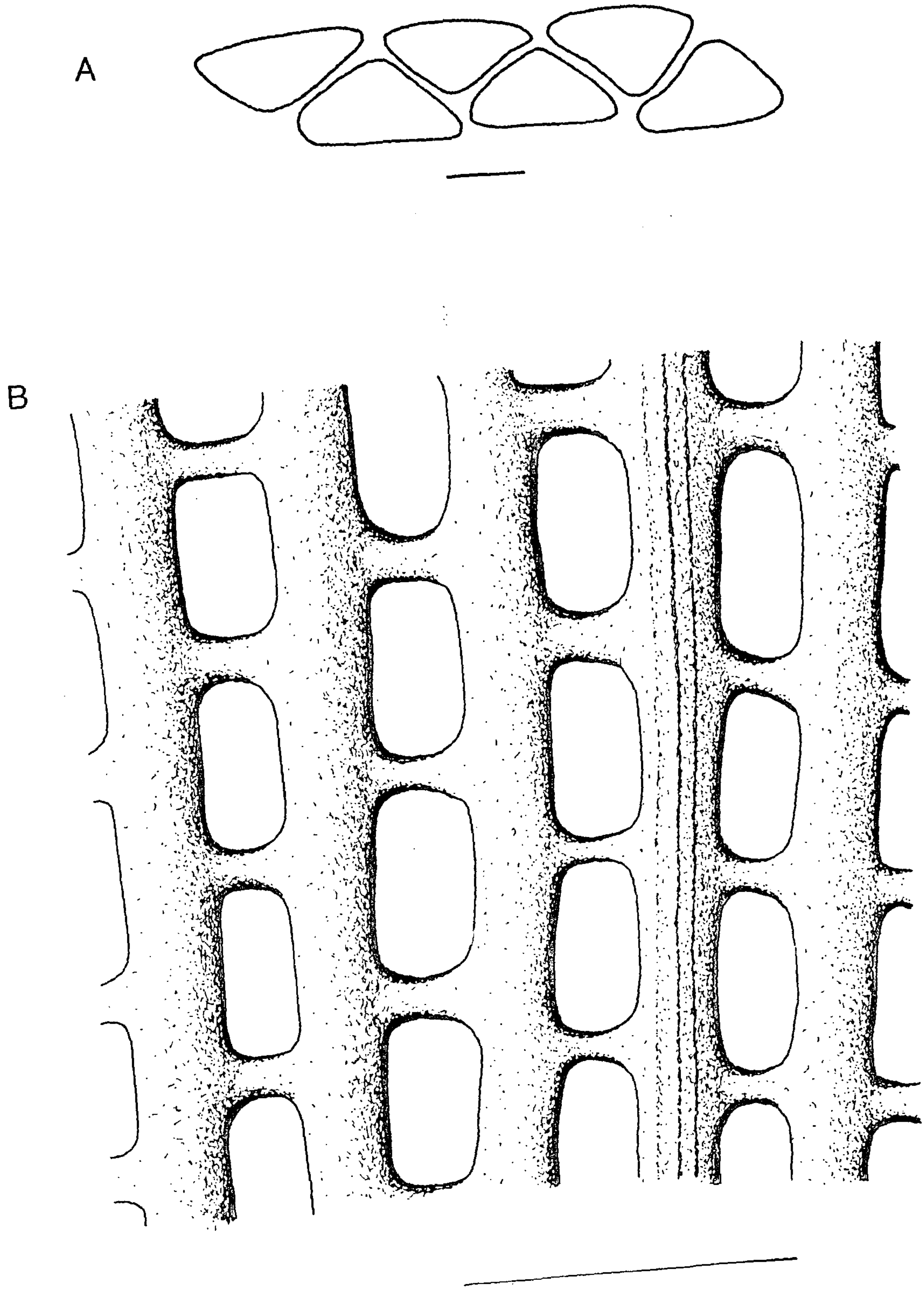

A
B

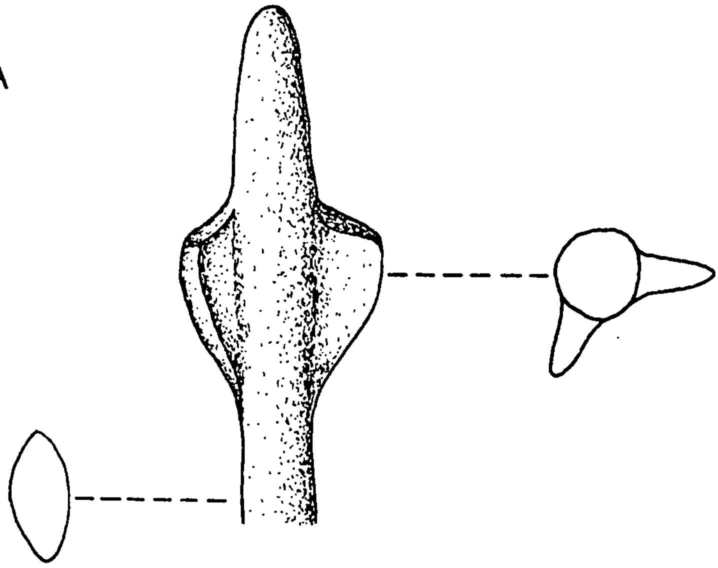
Figure I9. Nodes of *Fenestella retiformis*.

A. With transverse processes.

B. With a trifurcation.

The silhouette diagrams show the shape of the node in transverse section.

A



B

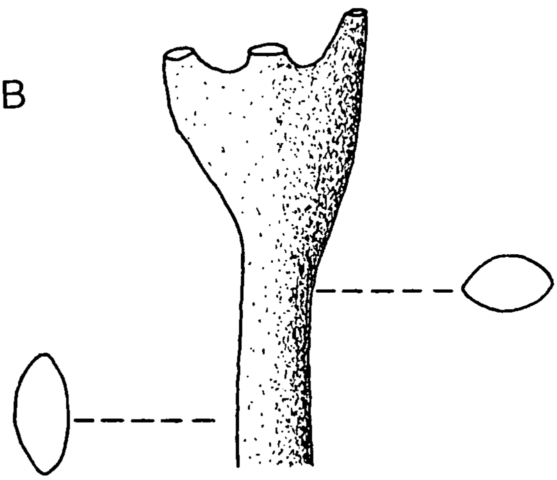
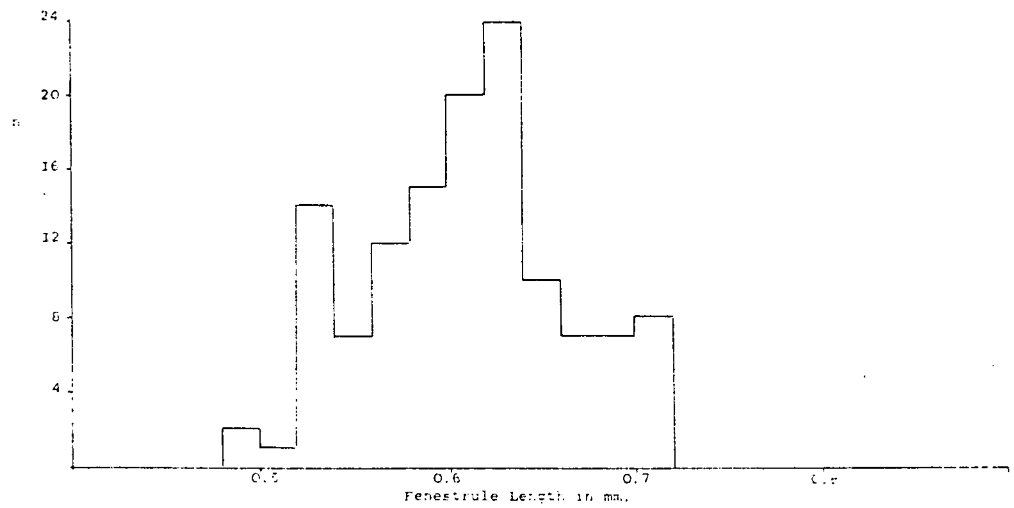


Figure 20. Histograms of Fenestrule Length and Fenestrule Width for *Fenestella retiformis*. Interval=0.02mm


n
24
20
16
12
8
4
0.5
0.6
0.7
0.8
Fenestrule Length in mm.

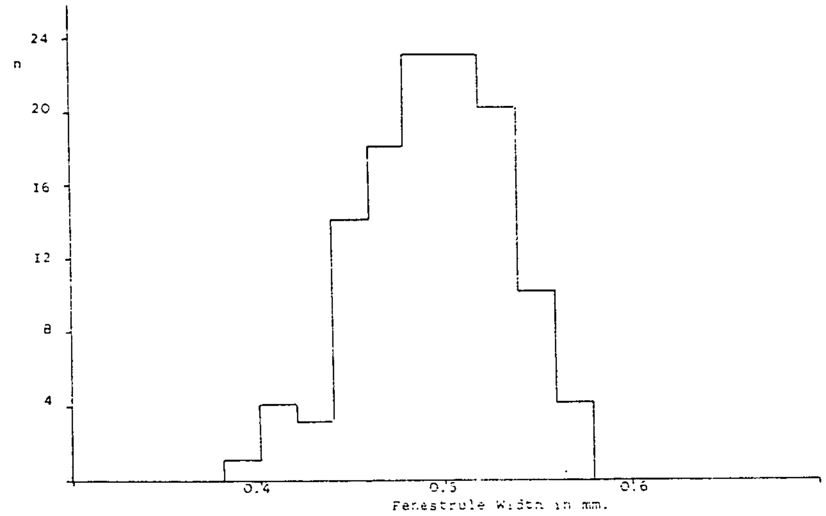

n
24
20
16
12
8
4
0.4
0.5
0.6
Fenestrule Width in mm.

Figure 2I. Histograms of Branch Width and Inter-apertural-distance for *Fenestella retiformis*. Interval-0.02mm.

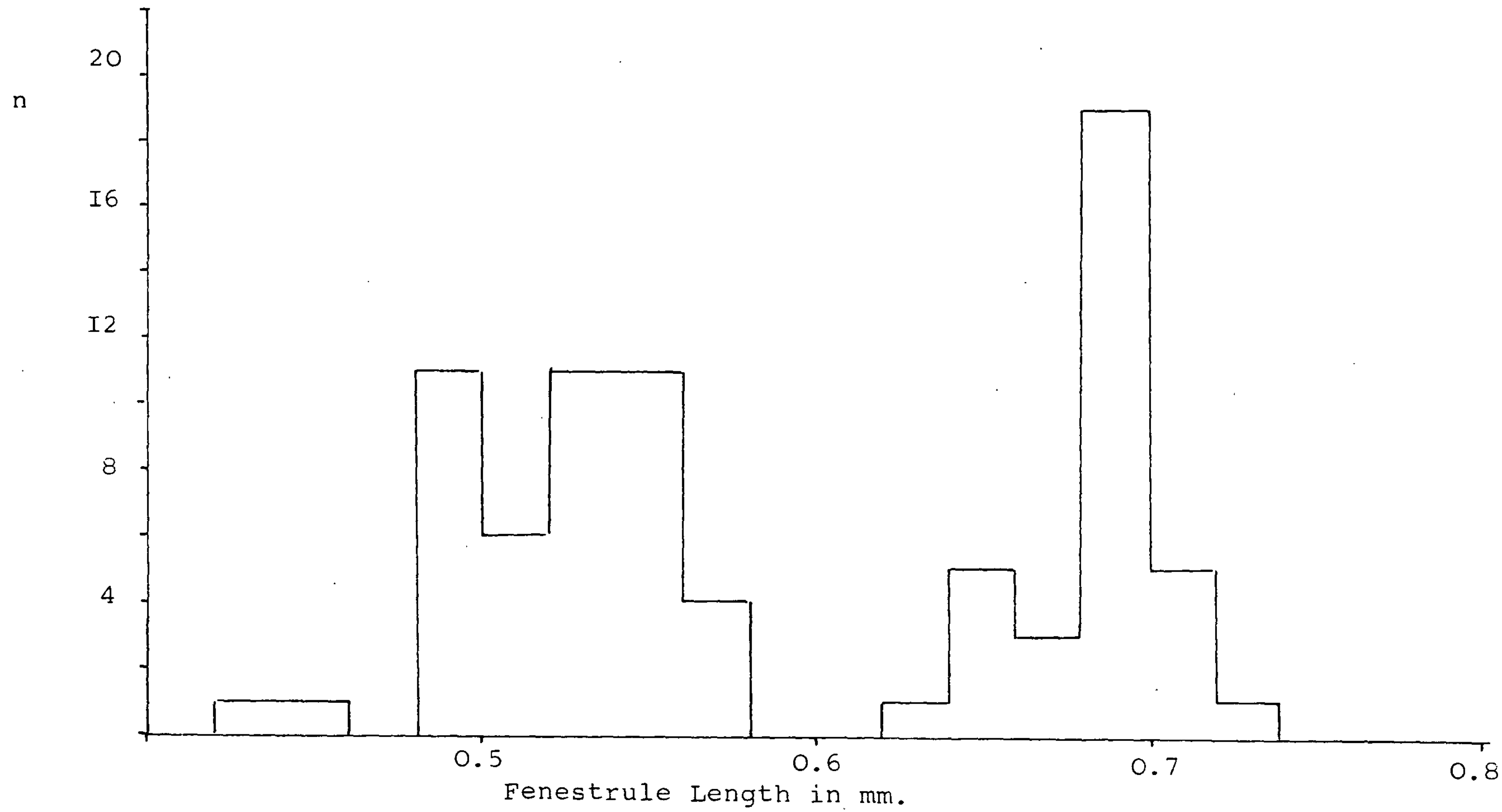
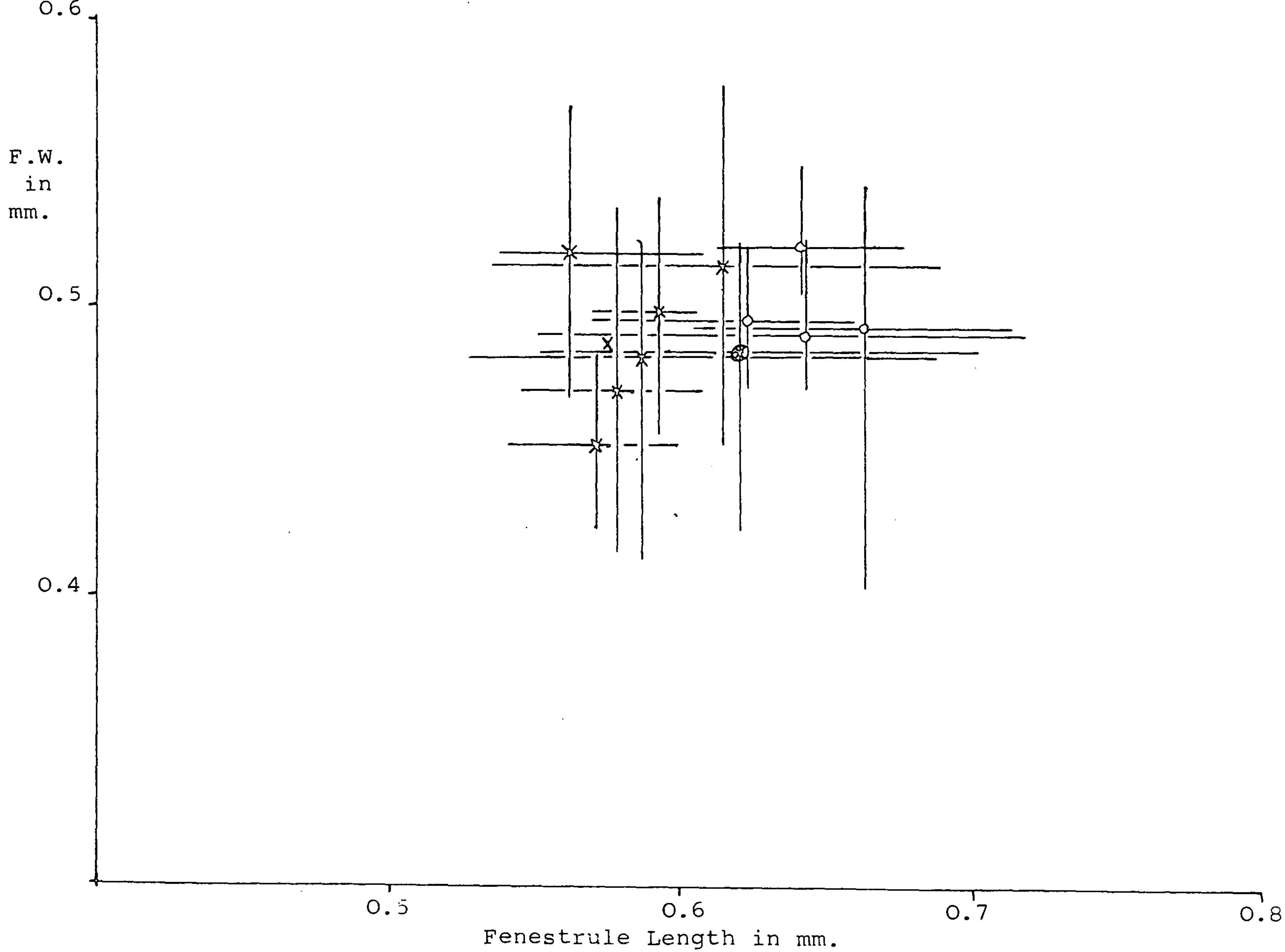
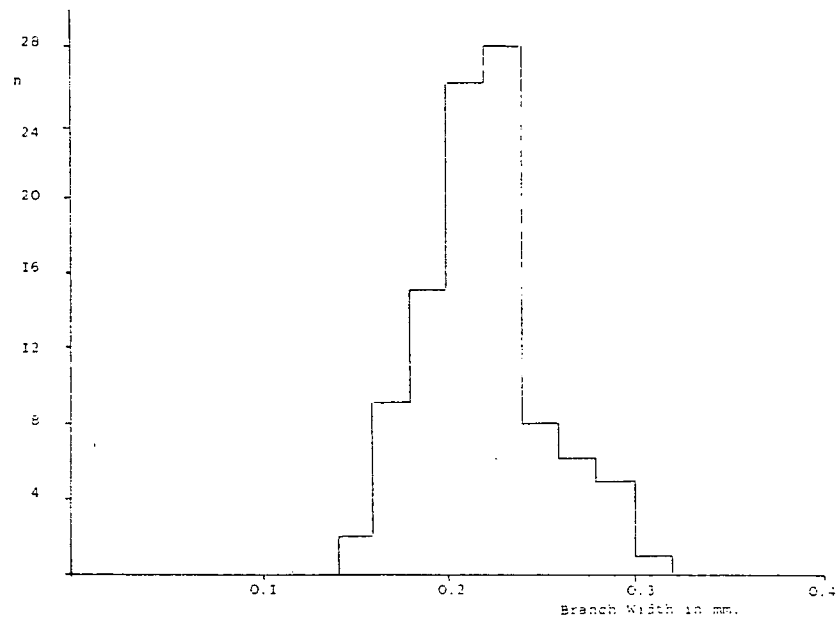

n
20
16
12
8
4
0.5
0.6
0.7
0.8
Fenestrule Length in mm.

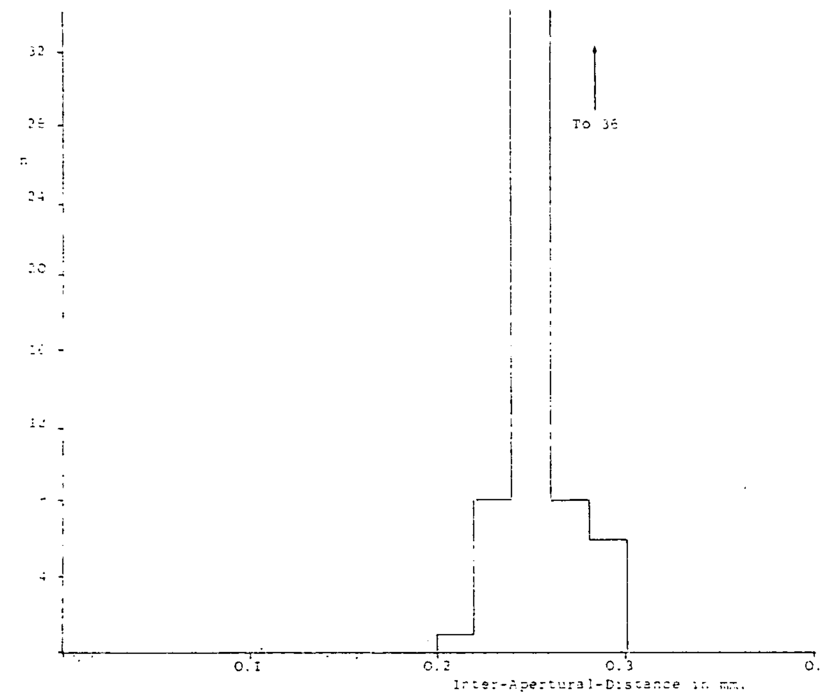
Figure 23. Graph of Fenestrule length v Fenestrule width for _Fenestella retiformis_. Crosses are locality averages close to the top of the reef;circles are averages for localities close to the base of the reef.Bars represent the within-locality range.



F.W.
in
mm.
0.6
0.5
0.4
0.5
0.6
0.7
0.8
Fenestrule Length in mm.



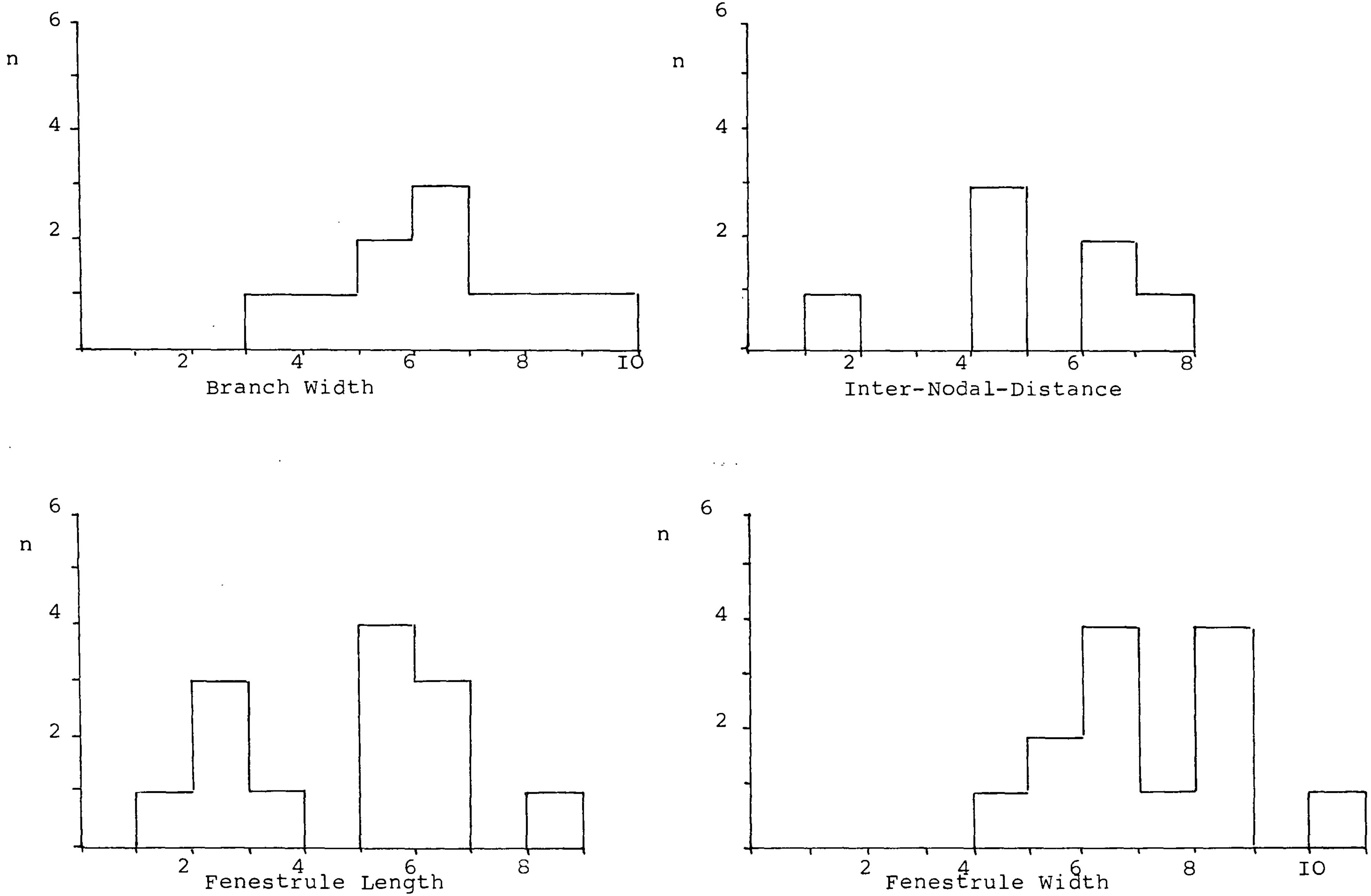
n
28
24
20
16
12
8
4
0.1
0.2
0.3
0.4
Branch Width in mm.



n
32
24
4
To 36
0.1
0.2
0.3
0.4
Inter-Apertural-Distance in mm.

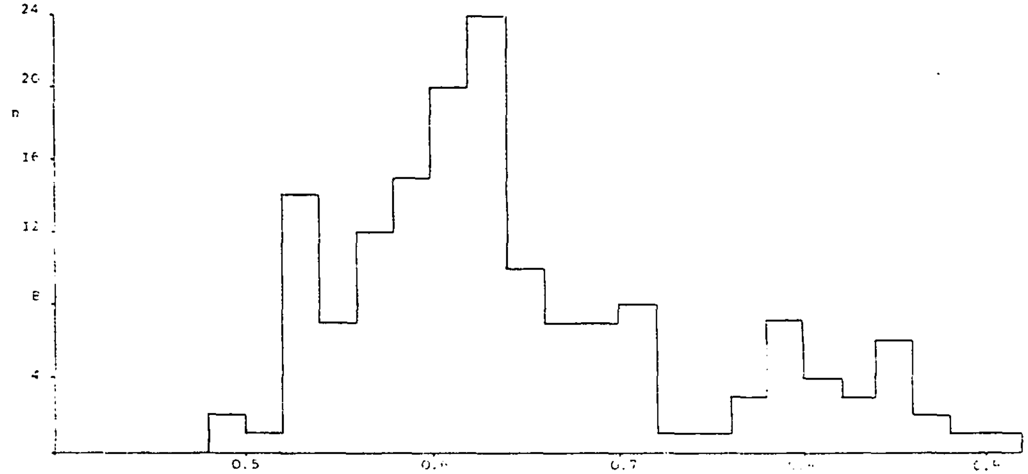
Figure 22. Histogram of Fenestrule length for a biased sample of *Fenestella retiformis*.

Figure 24. Intra-colony coefficients of variation for Branch width, Inter-nodal-distance, Fenestrule length and Fenestrule width in *Fenestella retiformis*.

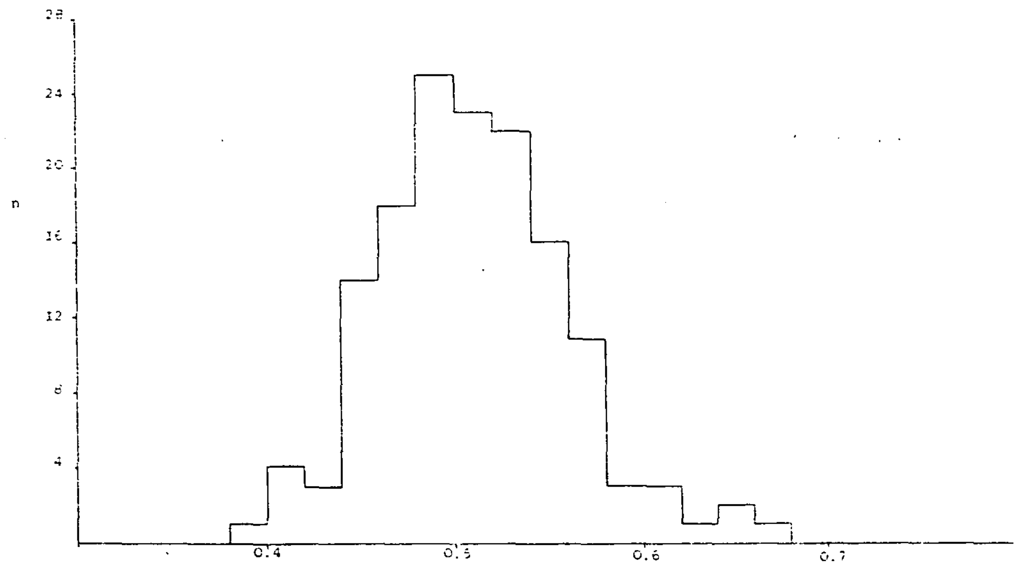


n
6
4
2
2
4
6
8
IO
Branch Width
n
6
4
2
2
4
6
8
Inter-Nodal-Distance
n
6
4
2
2
4
6
8
Fenestrule Length
n
6
4
2
2
4
6
8
IO
Fenestrule Width

Figure 25. Histograms of Fenestrule length and Fenestrule width for Fenestella retiformis and Fenestella geinitzi combined.



Fenestrule Length in mm.



Fenestrule Width in mm.

Figure 26. Bioimmuration in *Fenestella retiformis*.

A. A foreign organism becomes attached to the branch of *F.retiformis* out of the plane of the section.Epithelia are ruptured adjacent to the organism.

B. Epithelia begin to grow around the organism.

C. Epithelia fuse around the organism and deposition of weakly laminated skeleton takes place,extending out of the plane of the section.

D. Epithelia continue to withdraw from the foreign organism depositing a thick layer of laminated skeleton which partly occludes the fenestrule.

(Eustegal epithelium omitted from diagram)

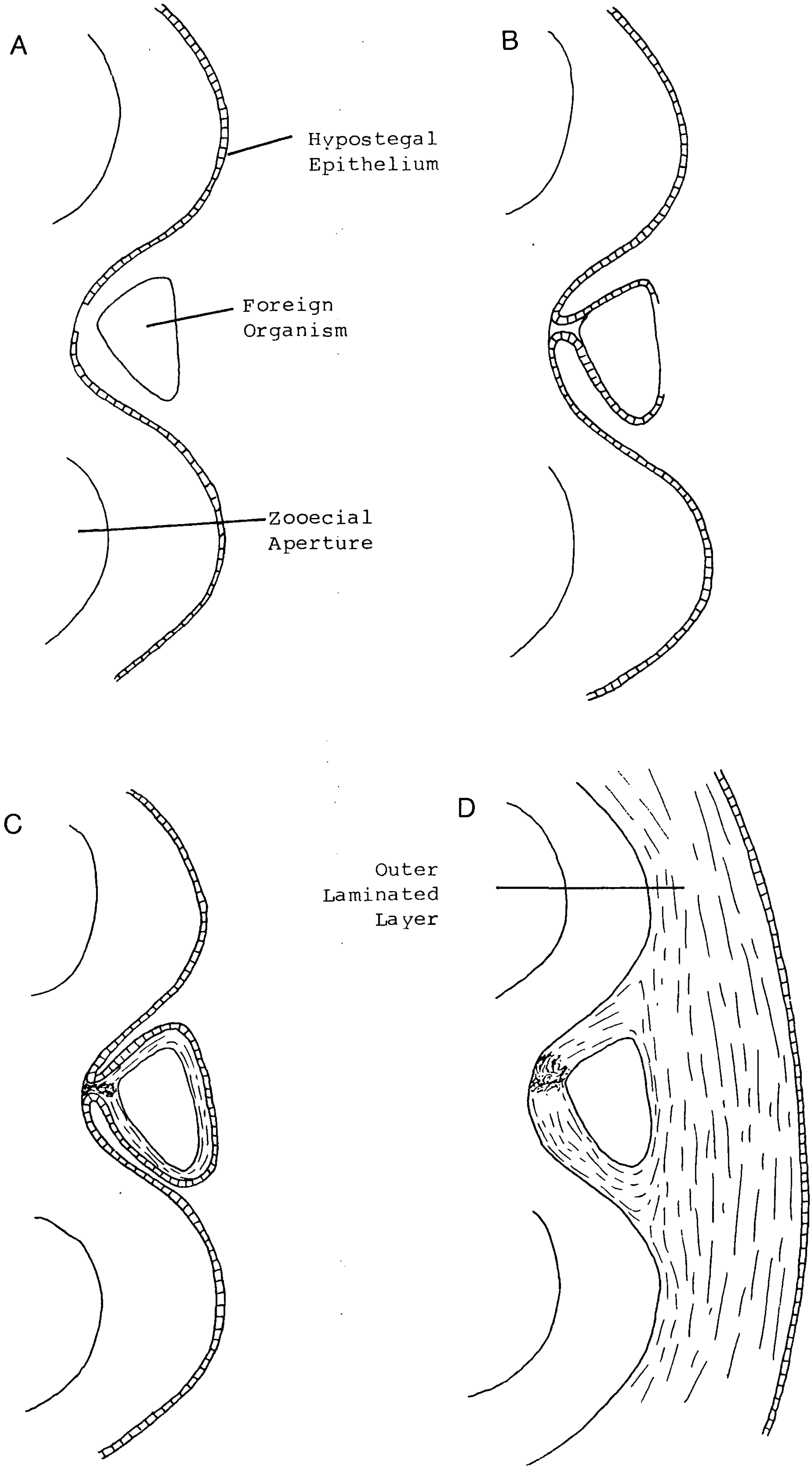

A
B
C
D
Hypostegal
Epithelium
Foreign
Organism
Zooecial
Aperture
Outer
Laminated
Layer

Figure 27. Fenestella geinitzi d'Orbigny
Obverse surface detail.RH4.27.
Bar scale=Imm

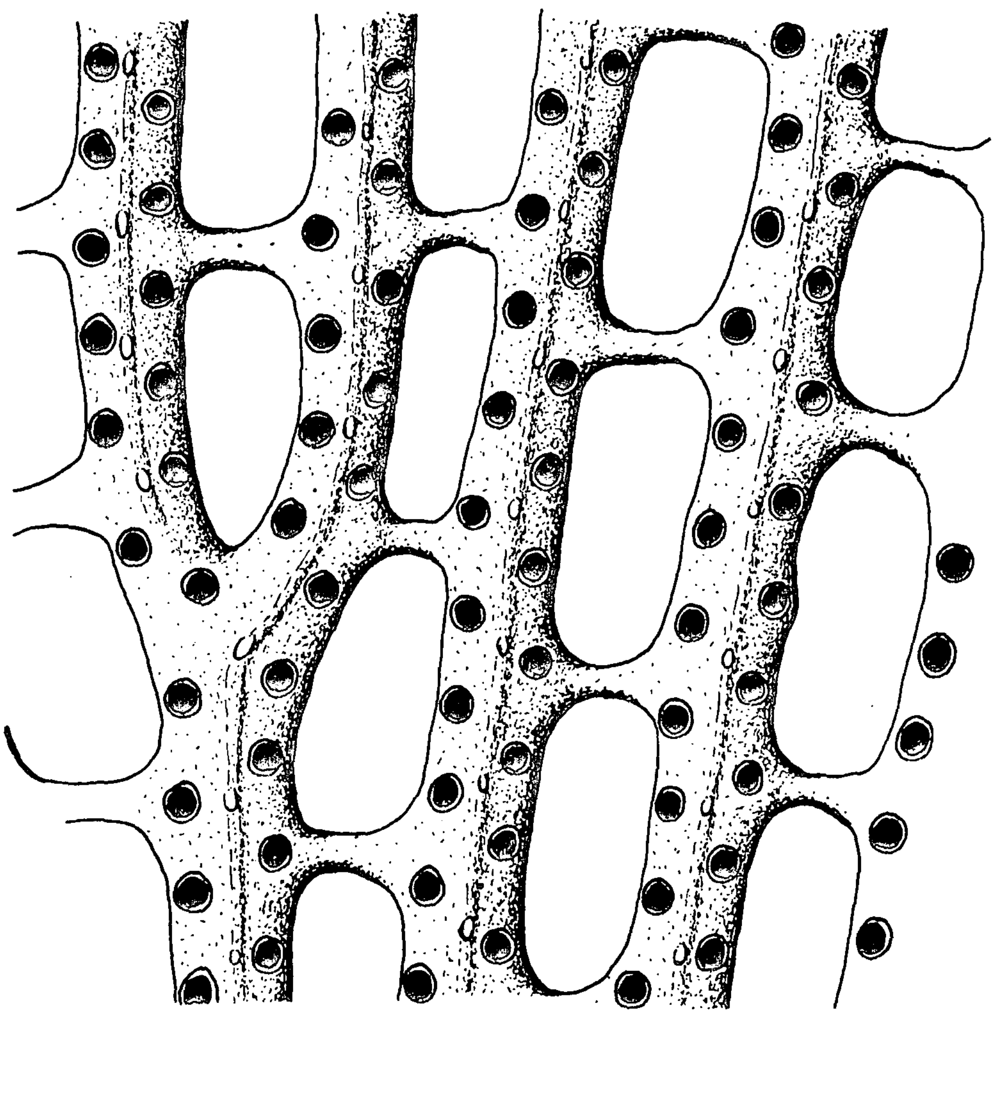


Figure 28. *Fenestella geinitzi* d'Orbigny
Reverse surface detail.HM7.6+3.
Bar scale-Imm

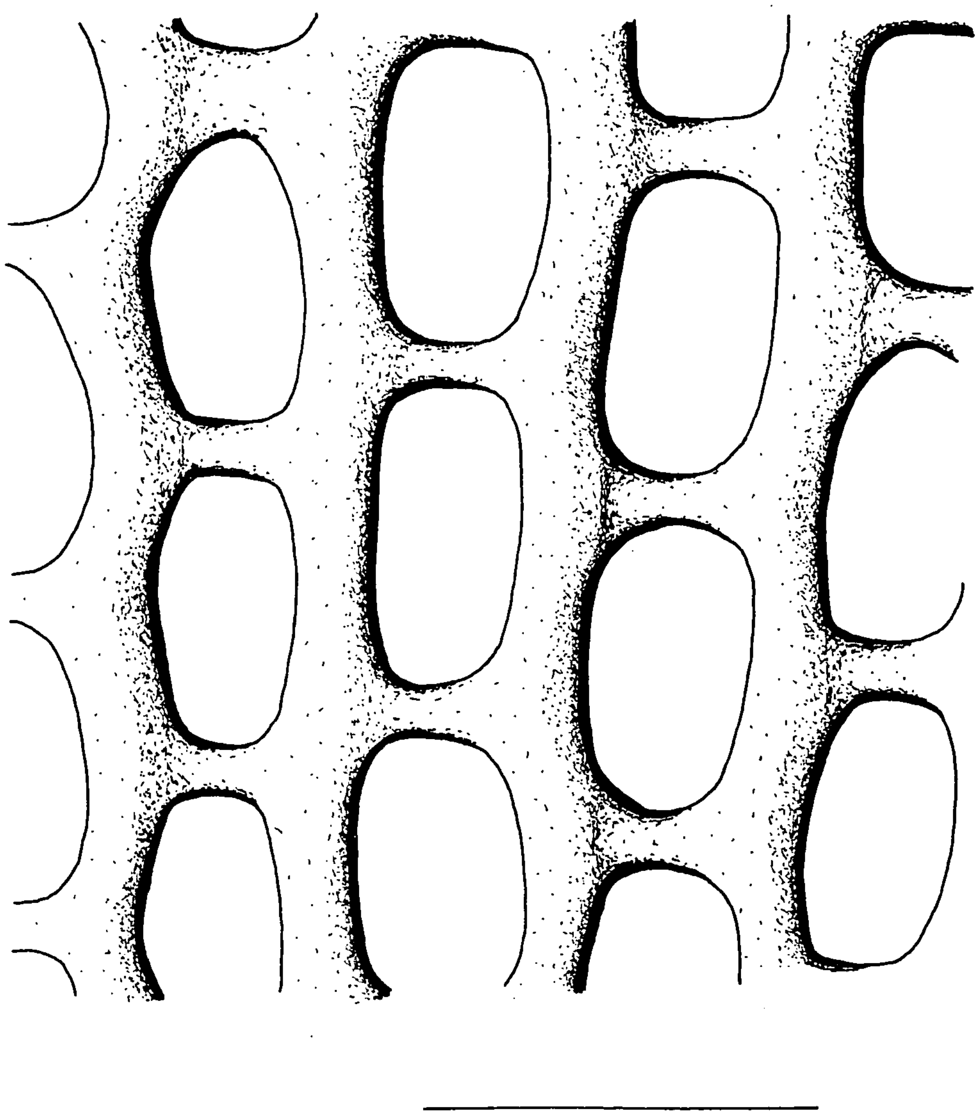


Figure 29. Histograms of Fenestrule length, Fenestrule width, Branch width and Inter-apertural-distance for Fenestella geinitzi. In mm.

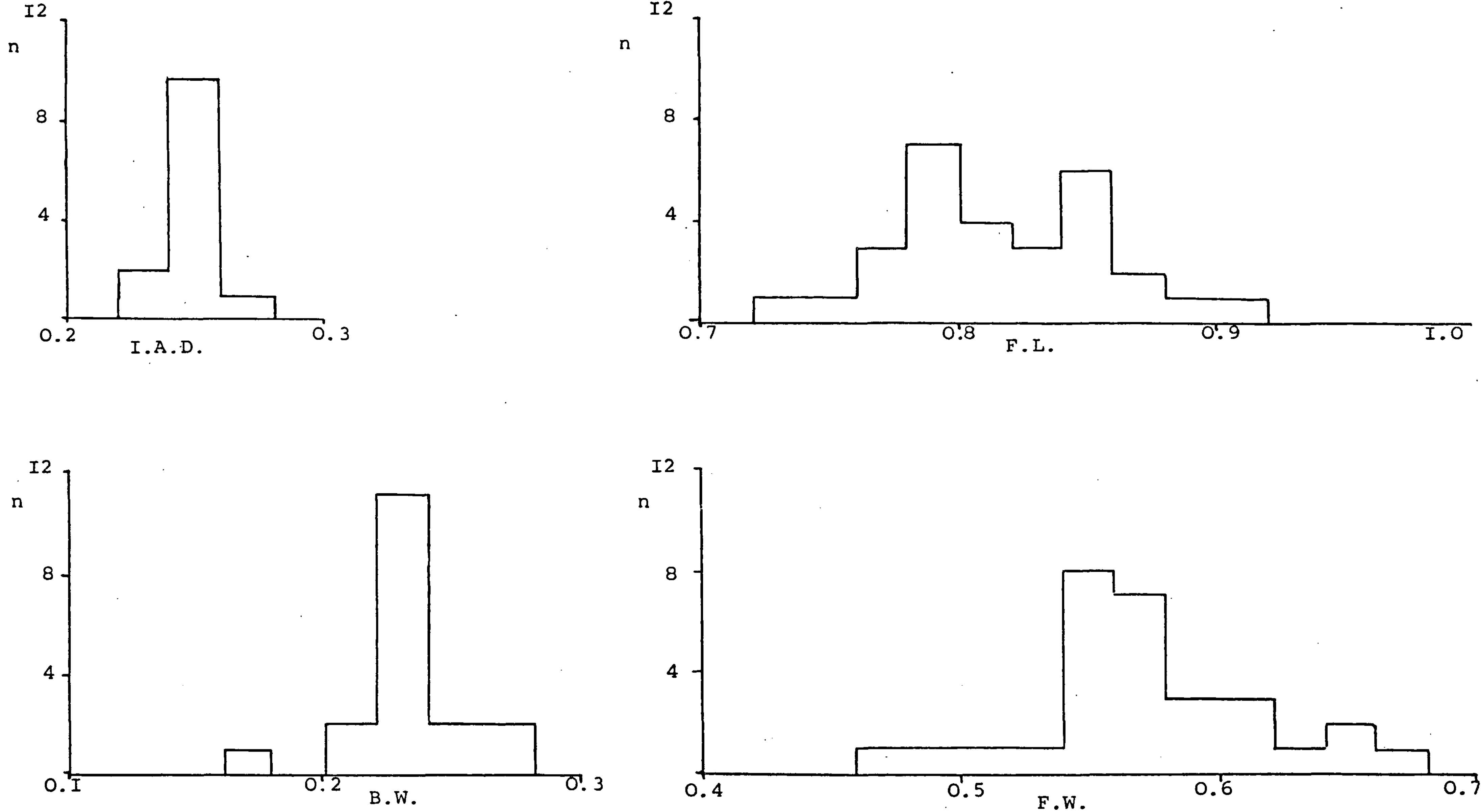
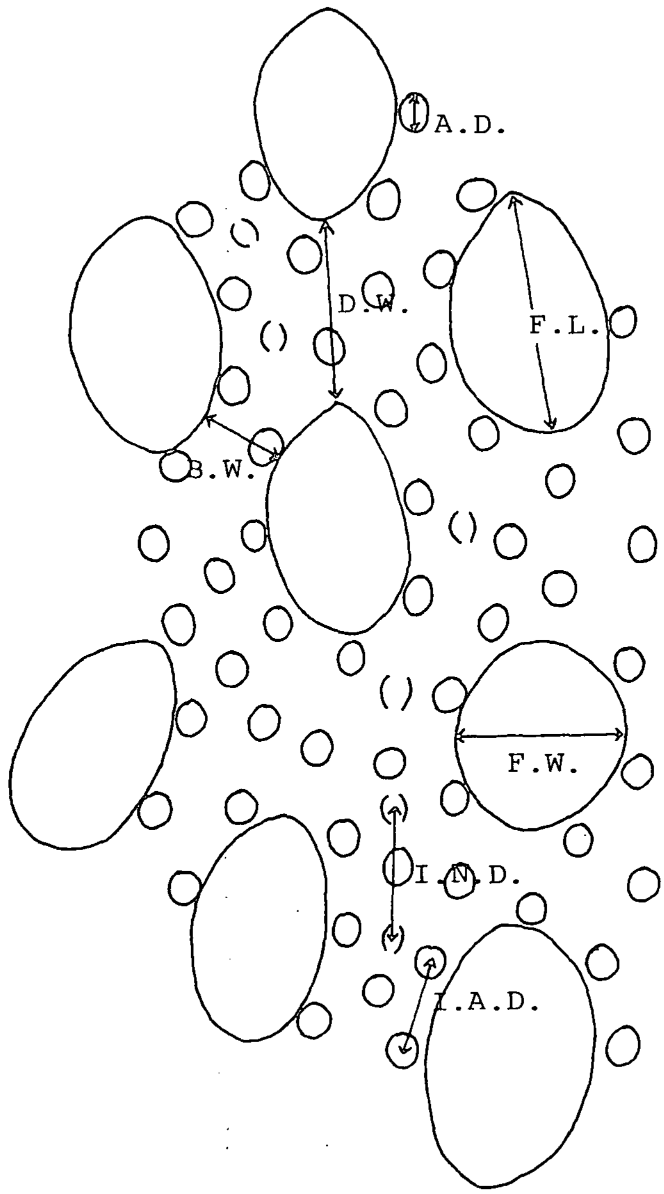

I2
n
8
4
0.2
I.A.D.
0.3
I2
n
8
4
0.7
0.8
F.L.
0.9
I.0
I2
n
8
4
0.I
0.2
B.W.
0.3
I2
n
8
4
0.4
0.5
F.W.
0.6
0.7

Figure 30. Diagram to show characters measured internally and externally on the genus *Kingopora*.See text,p.I3I for discussion.


A.D.
D.W.
F.L.
B.W.
F.W.
I.N.D.
I.A.D.

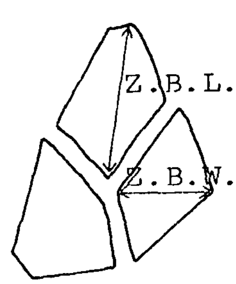

Z.B.L.
Z.B.W.

Figure 3I. *Kingopora ehrenbergi* Geinitz

Obverse surface detail.MP5.I2a.

Bar scale-Imm

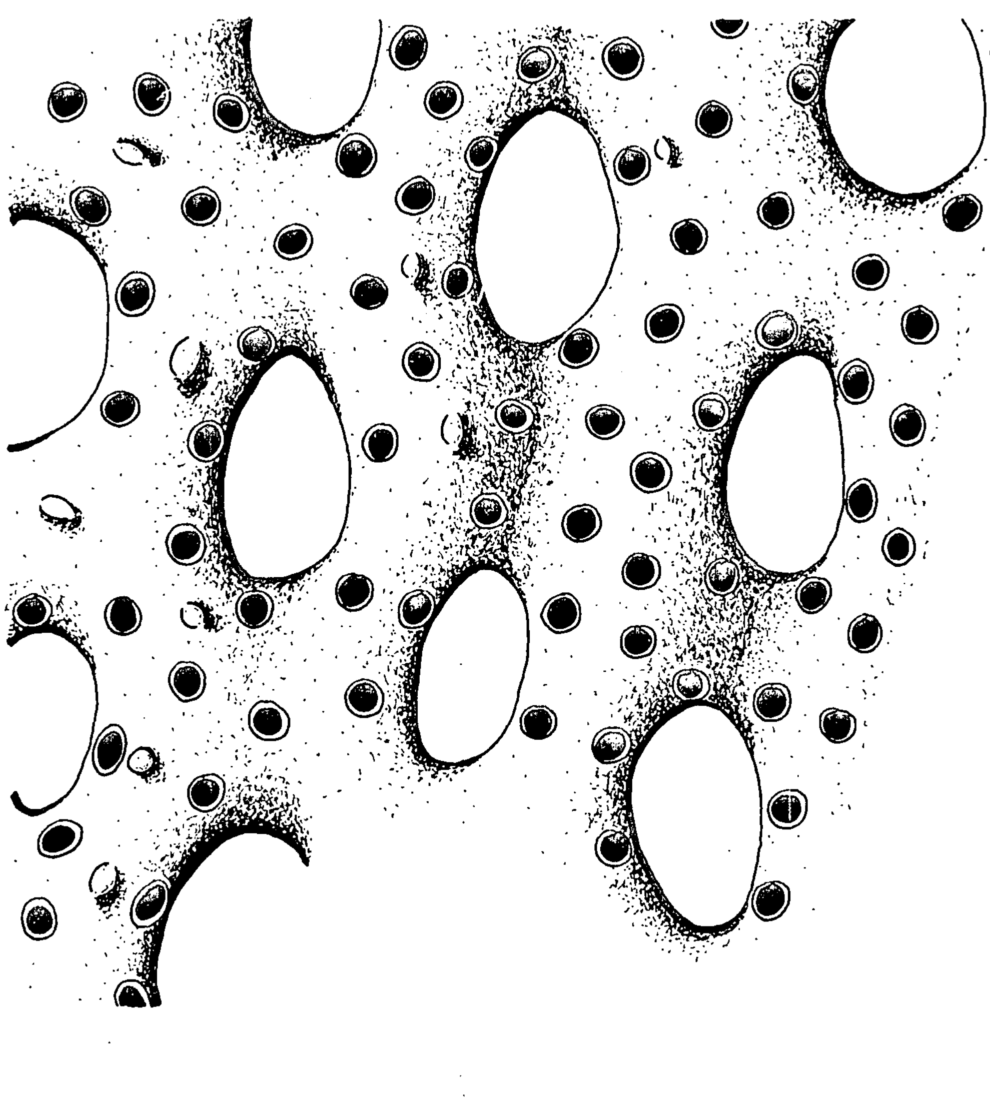
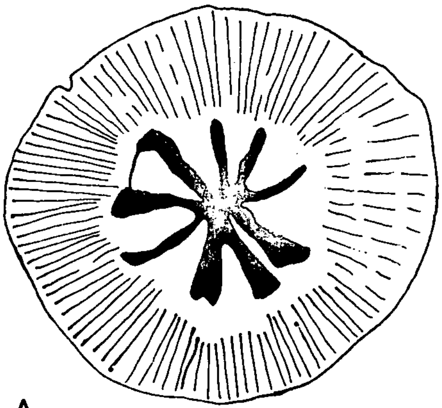


Figure 32. Kingopora ehrenbergi Geinitz

A. Korn's (1930) text-fig.6a.?Colony origin of Kingopora ehrenbergi.Bar scale-1mm

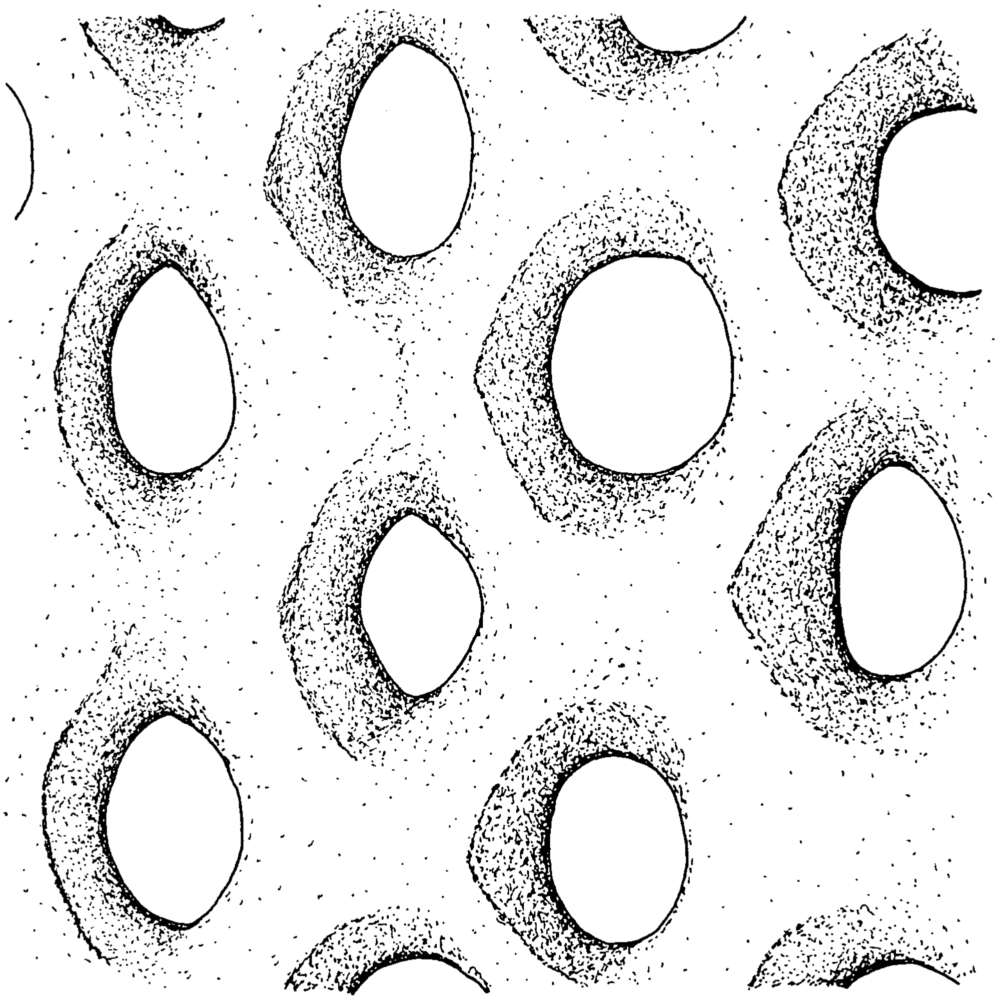
B. Korn's (op.cit.) text-fig.6b.?Colony origin of Kingopora ehrenbergi.Bar scale-1mm

C. Reverse surface detail.GLT4.Bar scale-1mm



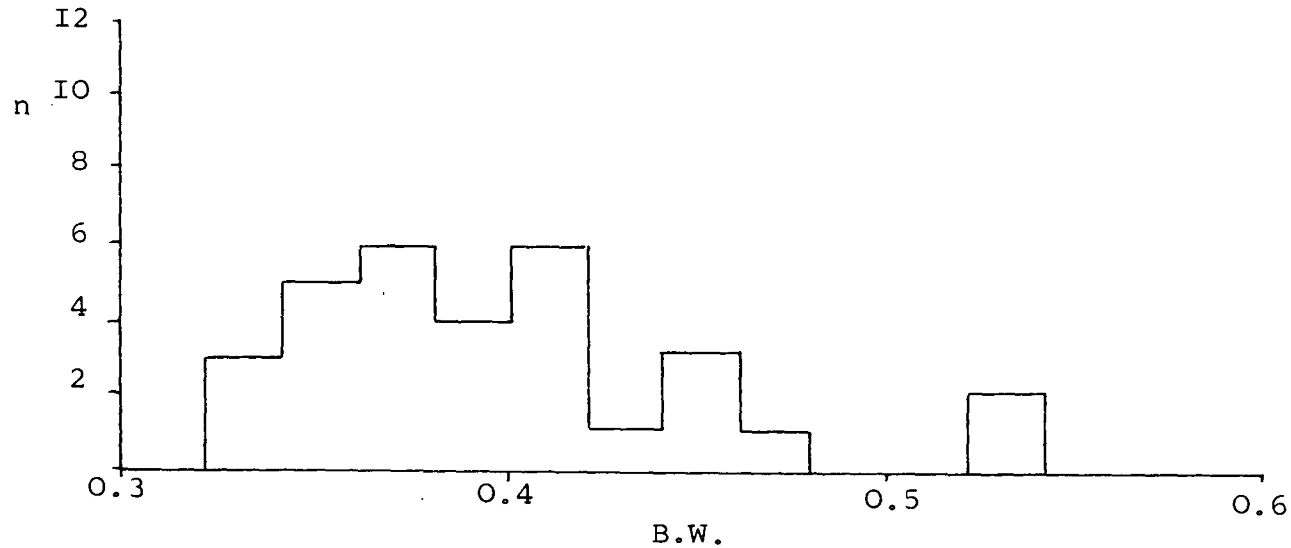
A

B



C

Figure 33. Histograms of Branch width and Dissepiment width (in mm) for *Kingopora ehrenbergi*.


n
I2
IO
8
6
4
2
0.3
0.4
0.5
0.6
B.W.

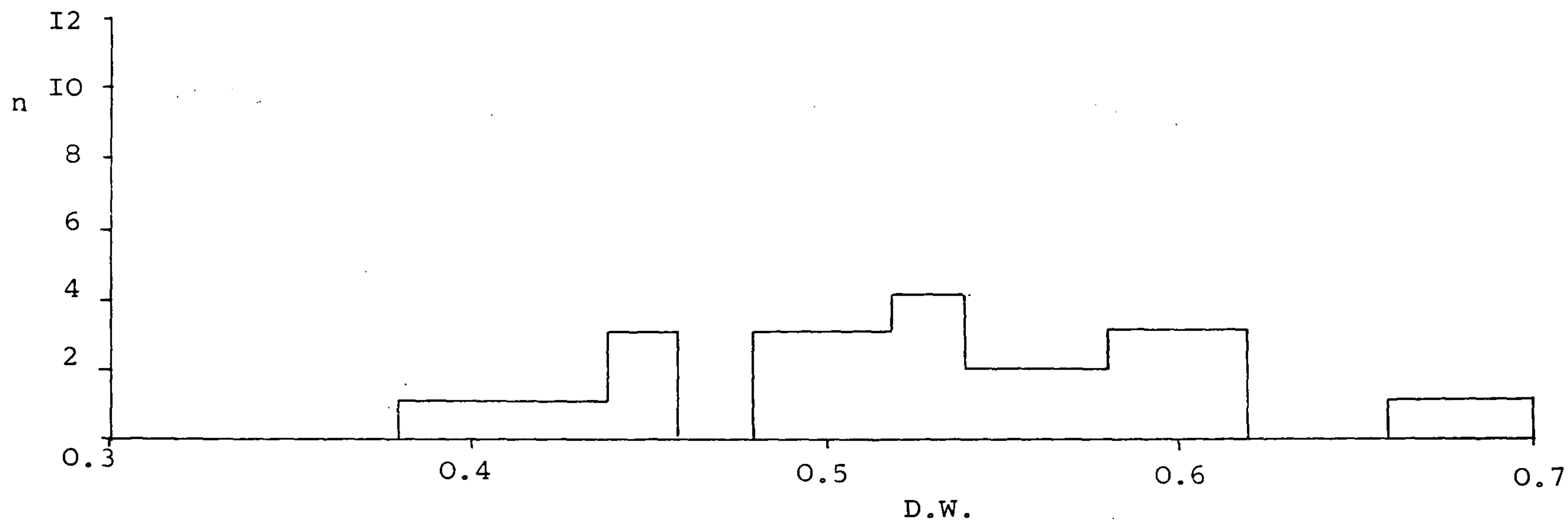
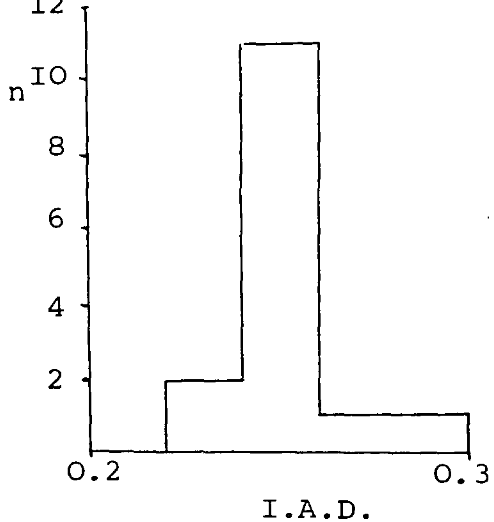
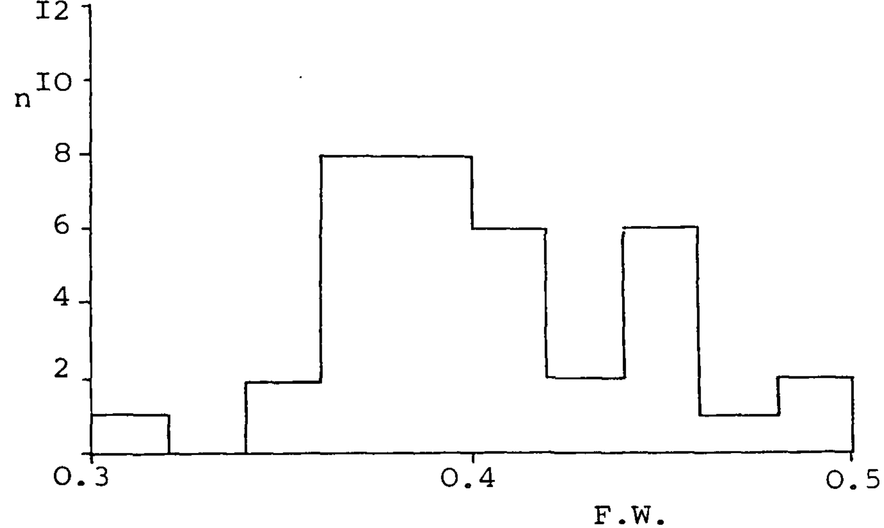

n
I2
IO
8
6
4
2
0.3
0.4
0.5
0.6
0.7
D.W.

Figure 34. Histograms of Inter-apertural-distance, Fenestrule width and Fenestrule length (in mm) for Kingopora ehrenbergi.


I2
n IO
8
6
4
2
0.2
0.3
I.A.D.


I2
n IO
8
6
4
2
0.3
0.4
0.5
F.W.

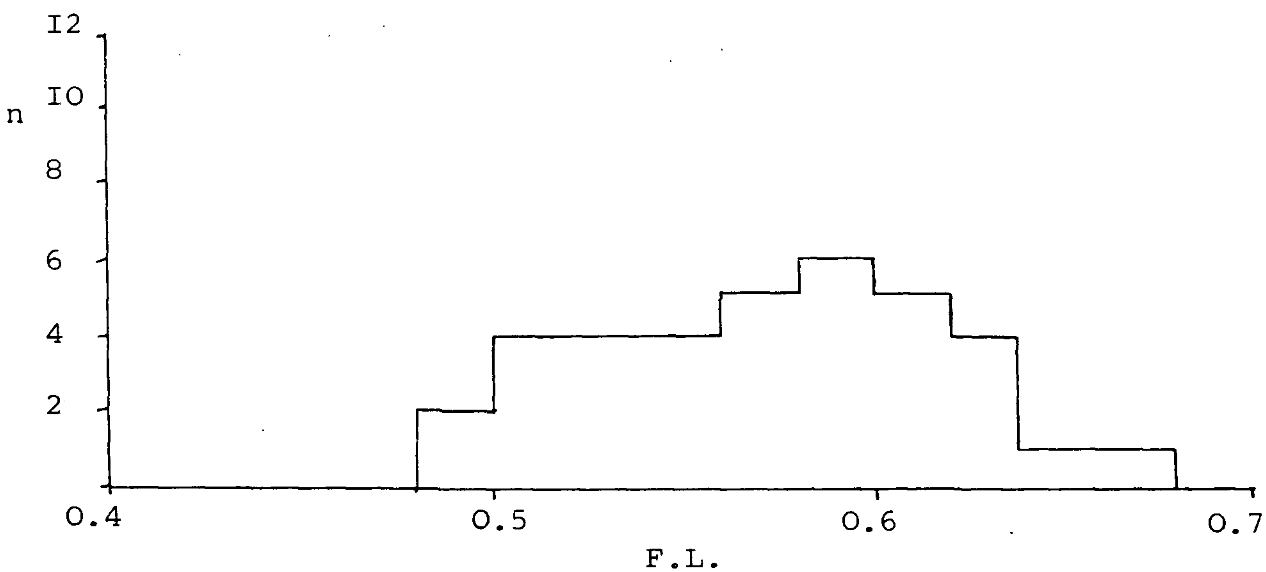
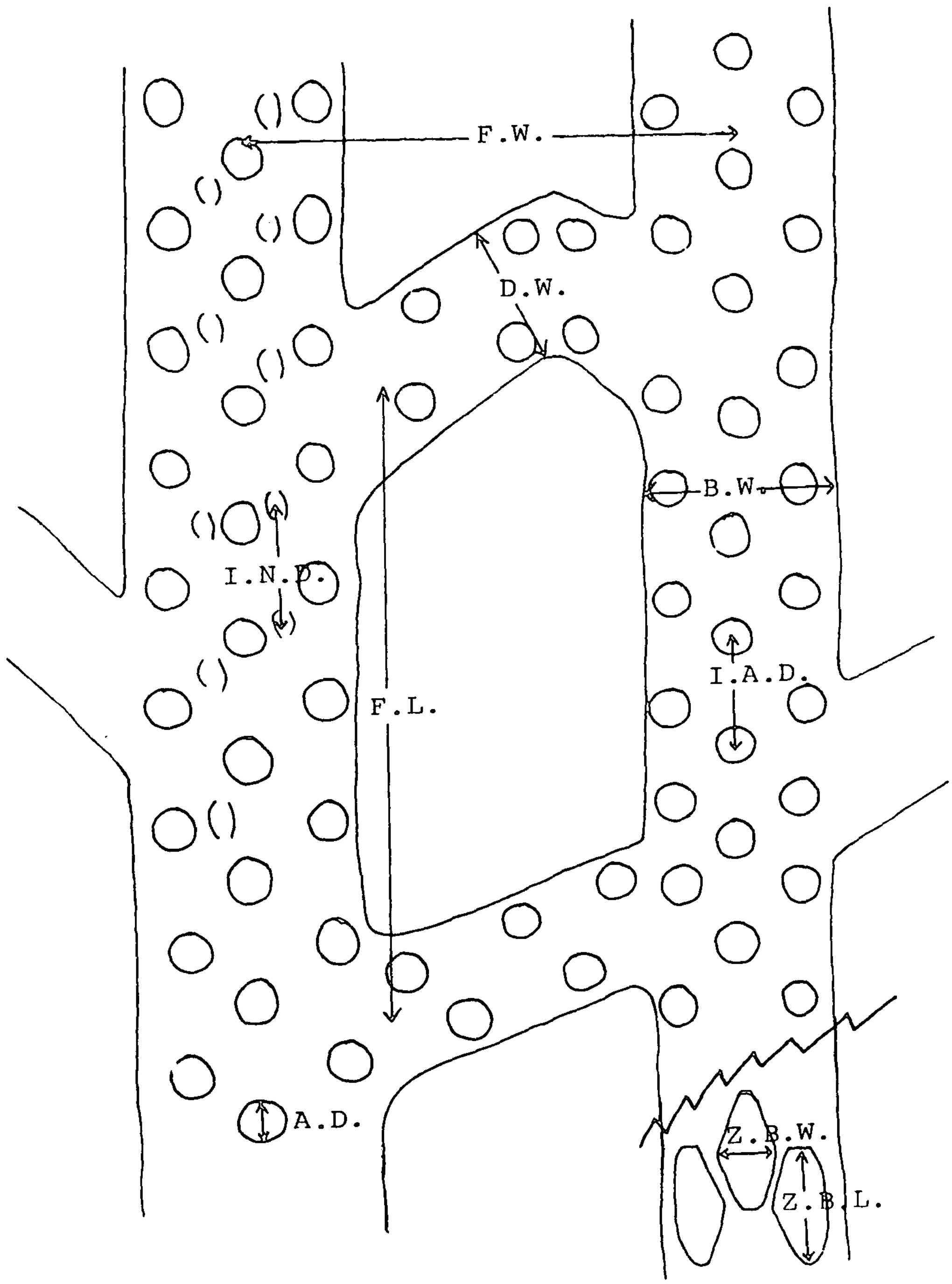

I2
n IO
8
6
4
2
0.4
0.5
0.6
0.7
F.L.

Figure 35. Diagram to show the characters measured internally and externally on the genus *Synocladia*.



F.W.
D.W.
B.W.
I.N.D.
F.L.
I.A.D.
A.D.
Z.B.W.
Z.B.L.

Figure 36. *Synocladia virgulacea* Sedgwick

Obverse surface detail.Composite drawing showing the variable appearance of the obverse surface which may result from poor preservation.
Bar scale-Imm

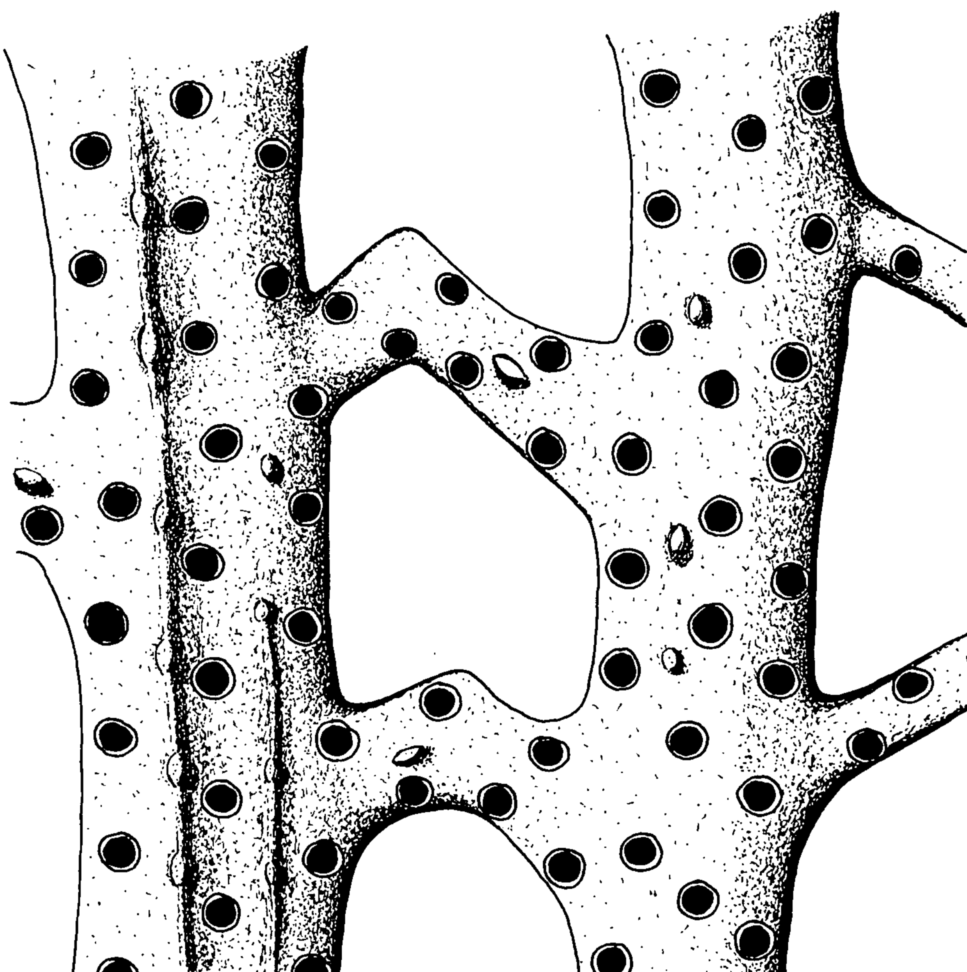


Figure 37. _Synocladia_ _virgulacea_ Sedgwick

Reverse surface detail.HM5.5.
Bar scale-5mm

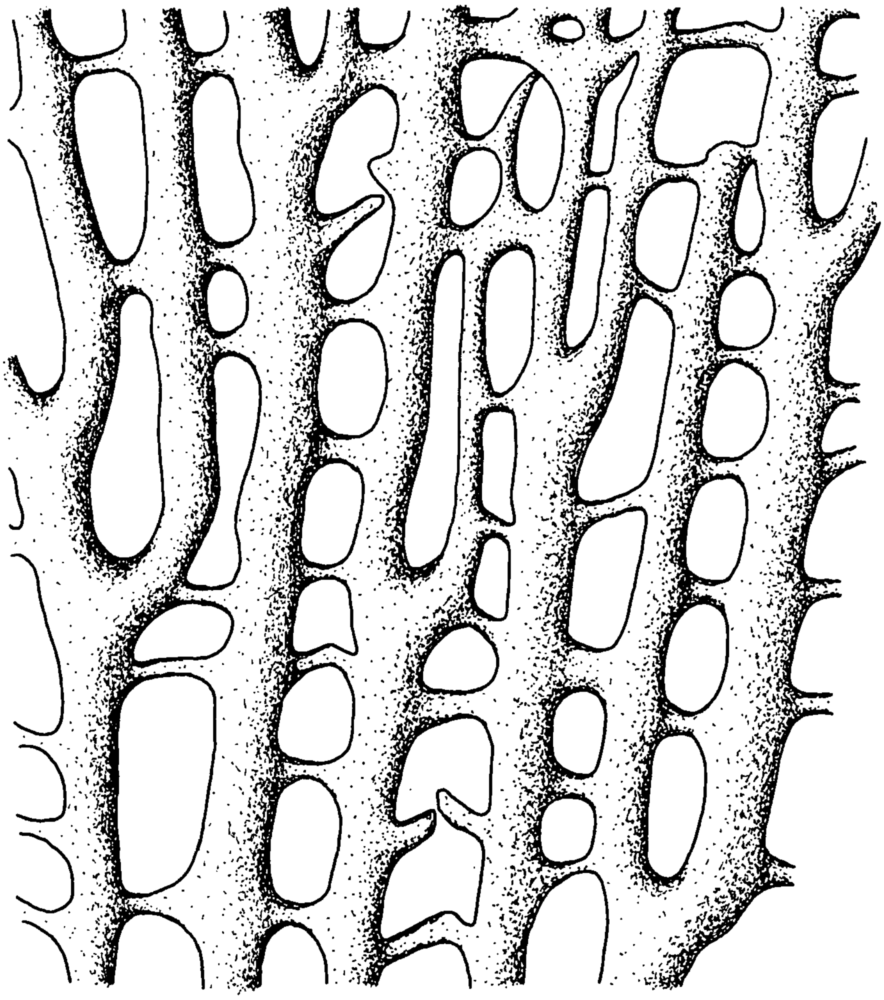
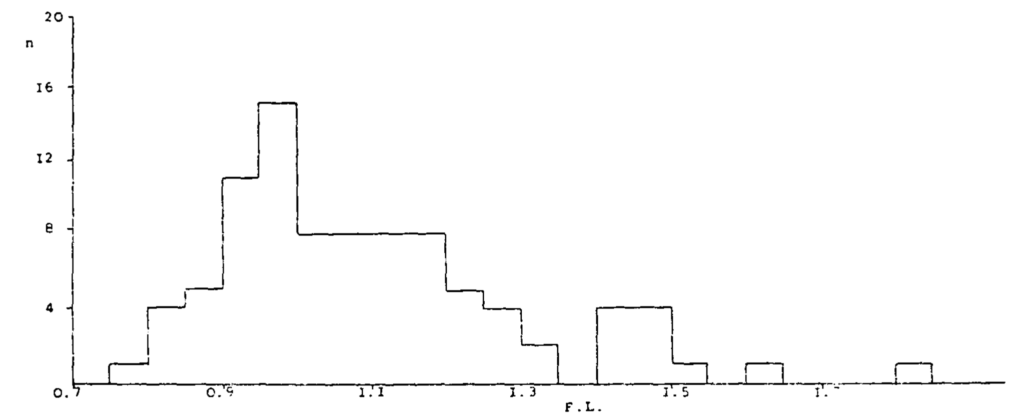


Figure 38. Histograms of Fenestrule length and Fenestrule width for Synocladia virgulacea. (in mm)


20
n
16
12
8
4
0.7
0.9
1.1
1.3
1.5
F.L.

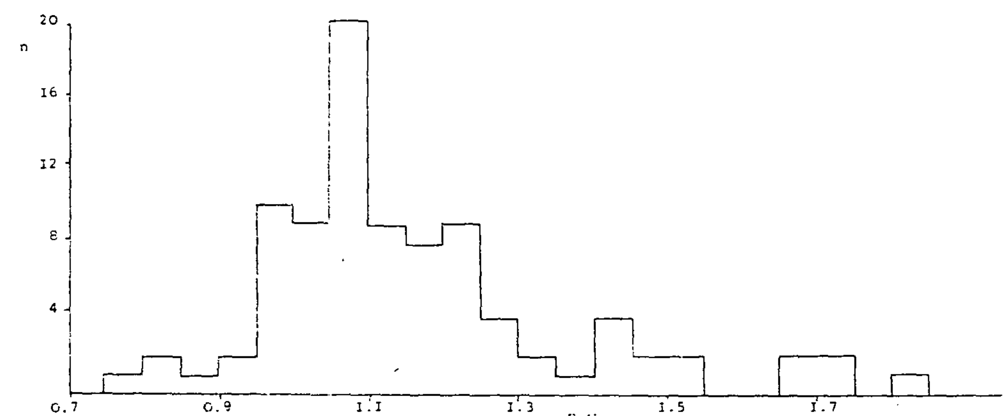
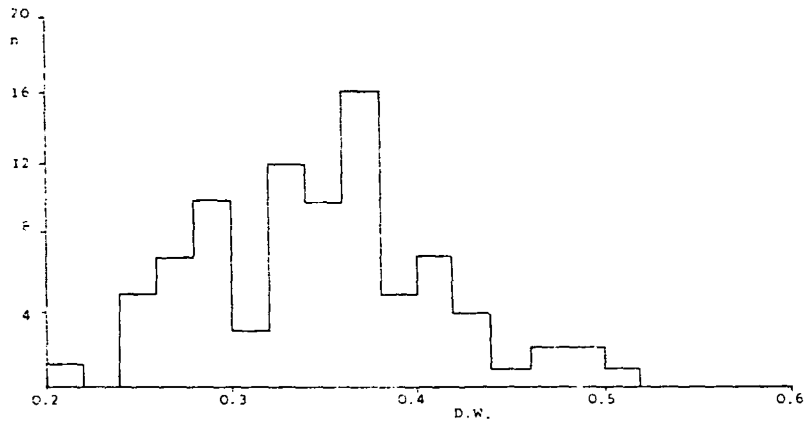
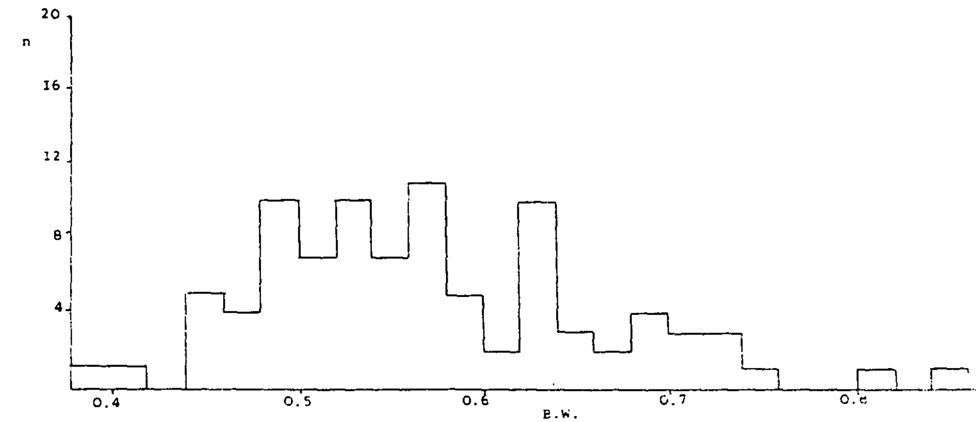

20
n
16
12
8
4
0.7
0.9
1.1
1.3
1.5
1.7
F.W.

Figure 39. Histograms of Dissepiment width, Branch width and Inter-apertural-distance for *Synocladia virgulacea*. (in mm)


n
D.W.


n
B.W.

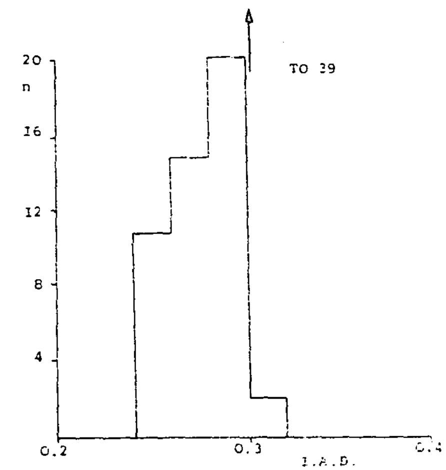
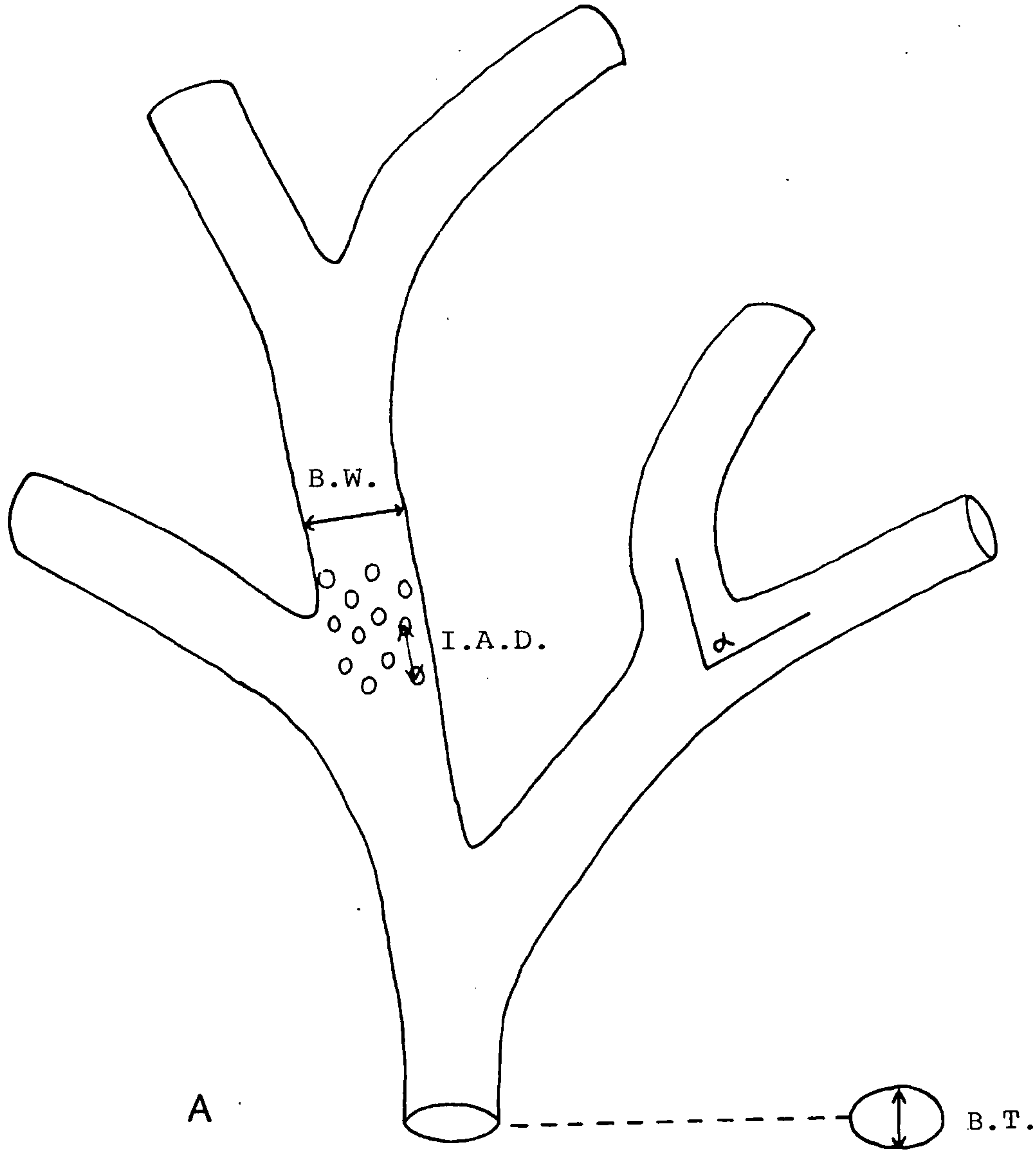
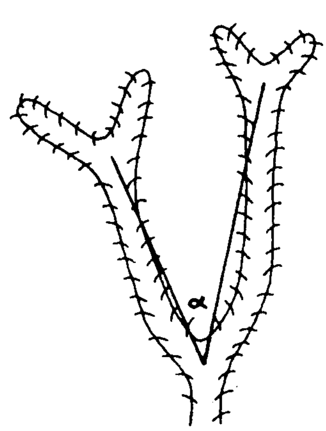

n
TO 39

Figure 40. A. Diagram to show characters measured on the genus *Thamniscus* (and *Ryhopora*). See text, p. I7I for discussion.

B. Diagram to show the procedure for measurement of bifurcation angle, according to Harmelin (I973), based on studies of *Idmonea atlantica*.



A



B

Figure 4I. _Thamniscus_ _dubius_ Schlotheim

Obverse surface detail.Composite drawing.
Bar scale-Imm

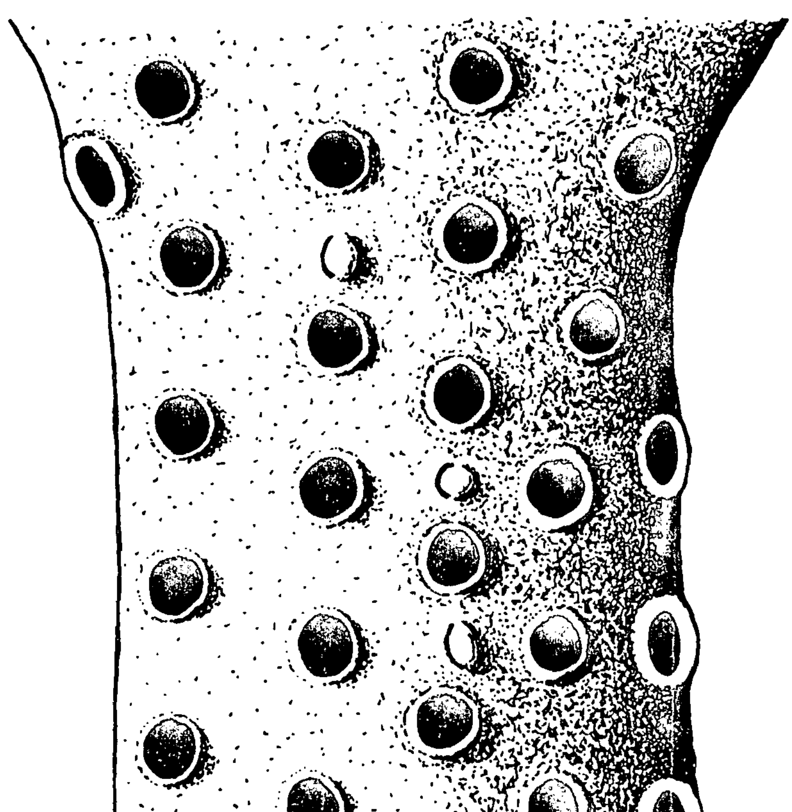


Figure 42. A. Stylized diagram of colony origin of _Thamniscus dubius_ (apertures not shown). This is hypothetical; the origin may instead consist of a single erect branch as in _T. erectus_ Elias (1957).

B. _Thamniscus dubius_ Schlotheim Reverse surface detail. Composite drawing. Bar scale-1mm

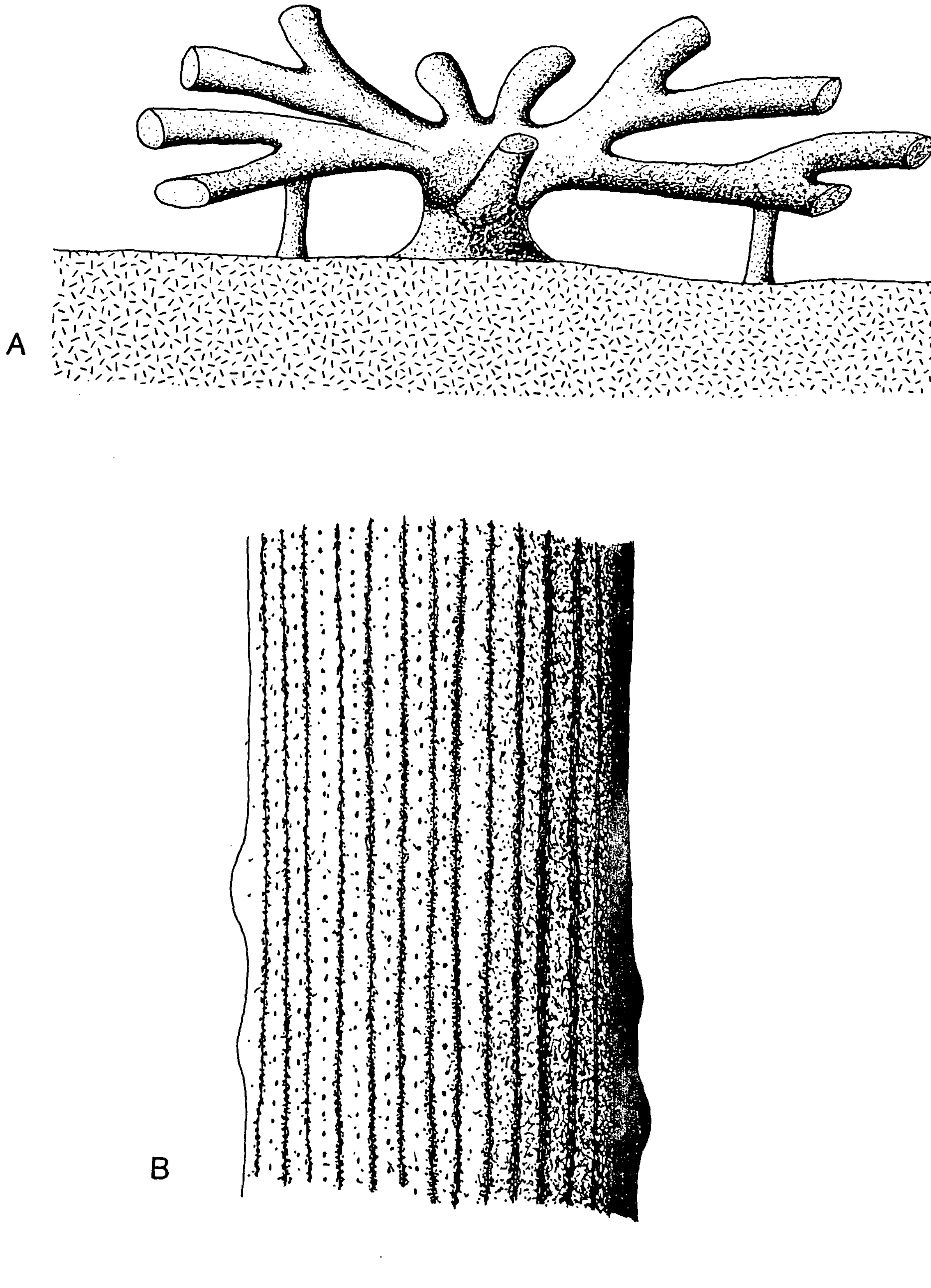
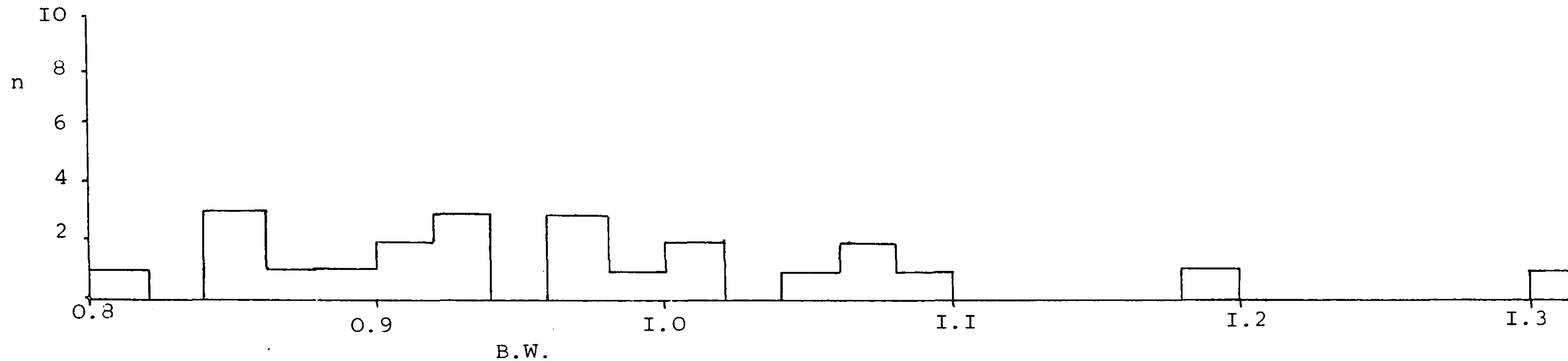
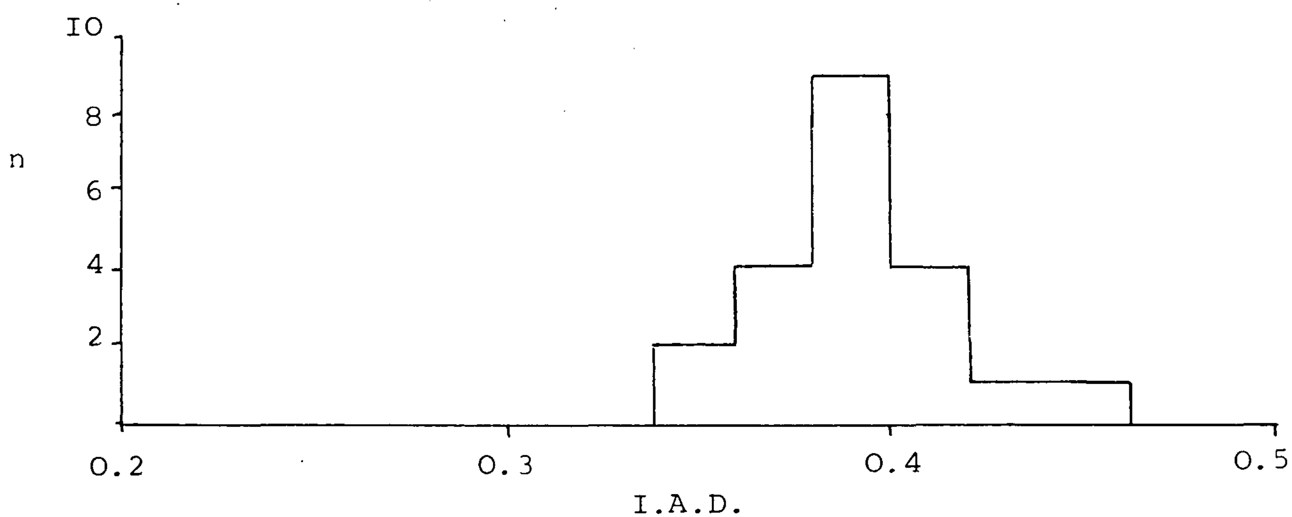

A
B

Figure 43. Histograms of Branch width and Inter-apertural-distance for *Thamniscus dubius* (in mm).



IO
8
n
6
4
2
O.8
O.9
I.O
I.I
I.2
I.3
B.W.



IO
8
n
6
4
2
O.2
O.3
O.4
O.5
I.A.D.

Figure 44. *Thamniscus geometricus* Korn

Obverse surface detail.MP5.59.
Bar scale-Imm

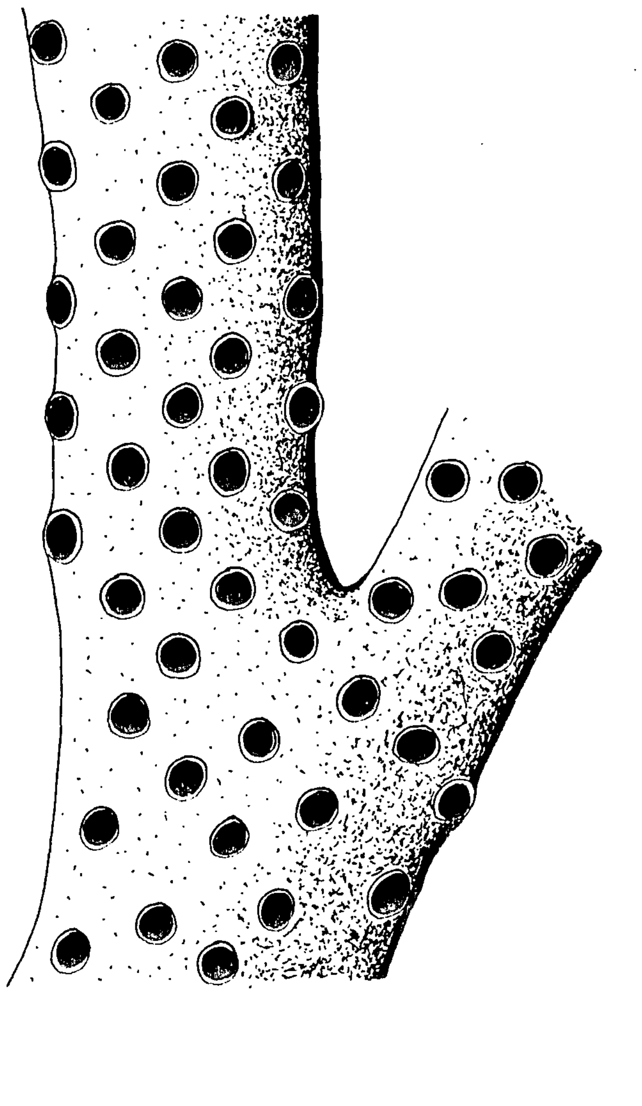


Figure 45. Thamniscus geometricus Korn

Reverse surface detail.Based on HAW 63 and RH2.73a.Bar scale=Imm

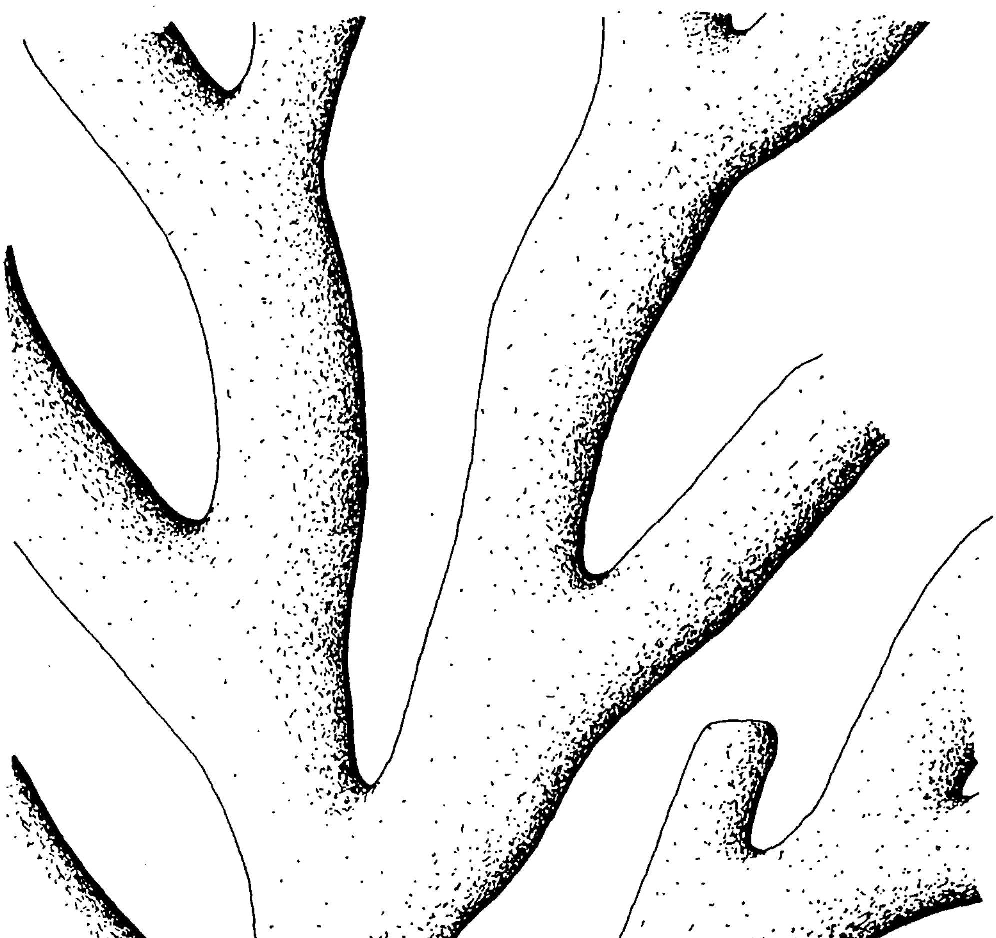
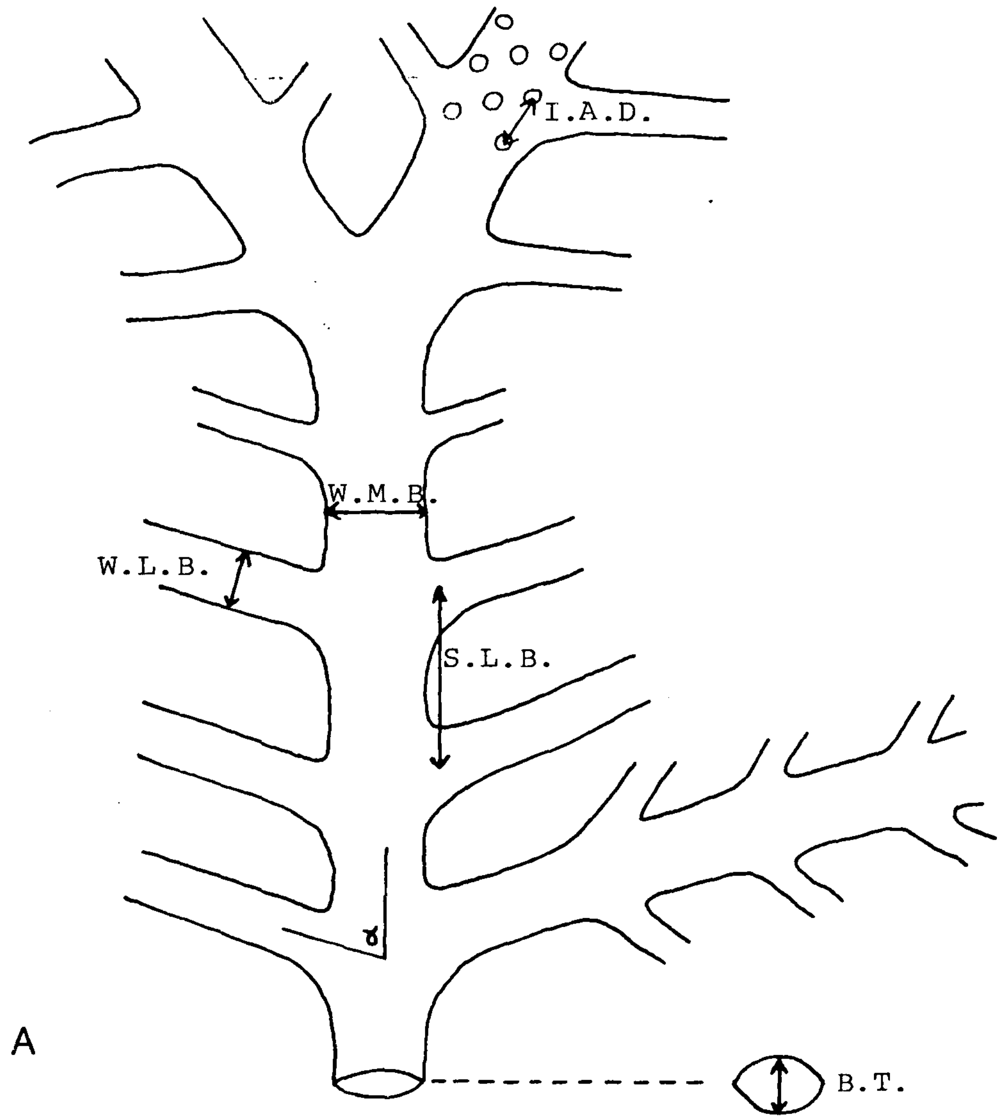


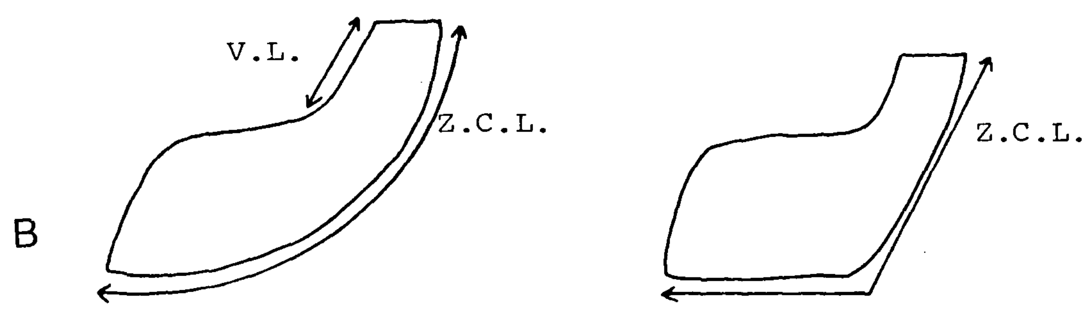
Figure 46. Characters measured on the genus *Acanthocladia* (and *Penniretepora*).

A. External.

B. Measurement of zooecial chambers.



I.A.D.
W.M.B.
W.L.B.
S.L.B.
γ
A
B.T.



V.L.
Z.C.L.
B
Z.C.L.

Figure 47. Acanthocladia anceps Schlotheim

Obverse surface detail.HAW I5.
Bar scale-Imm

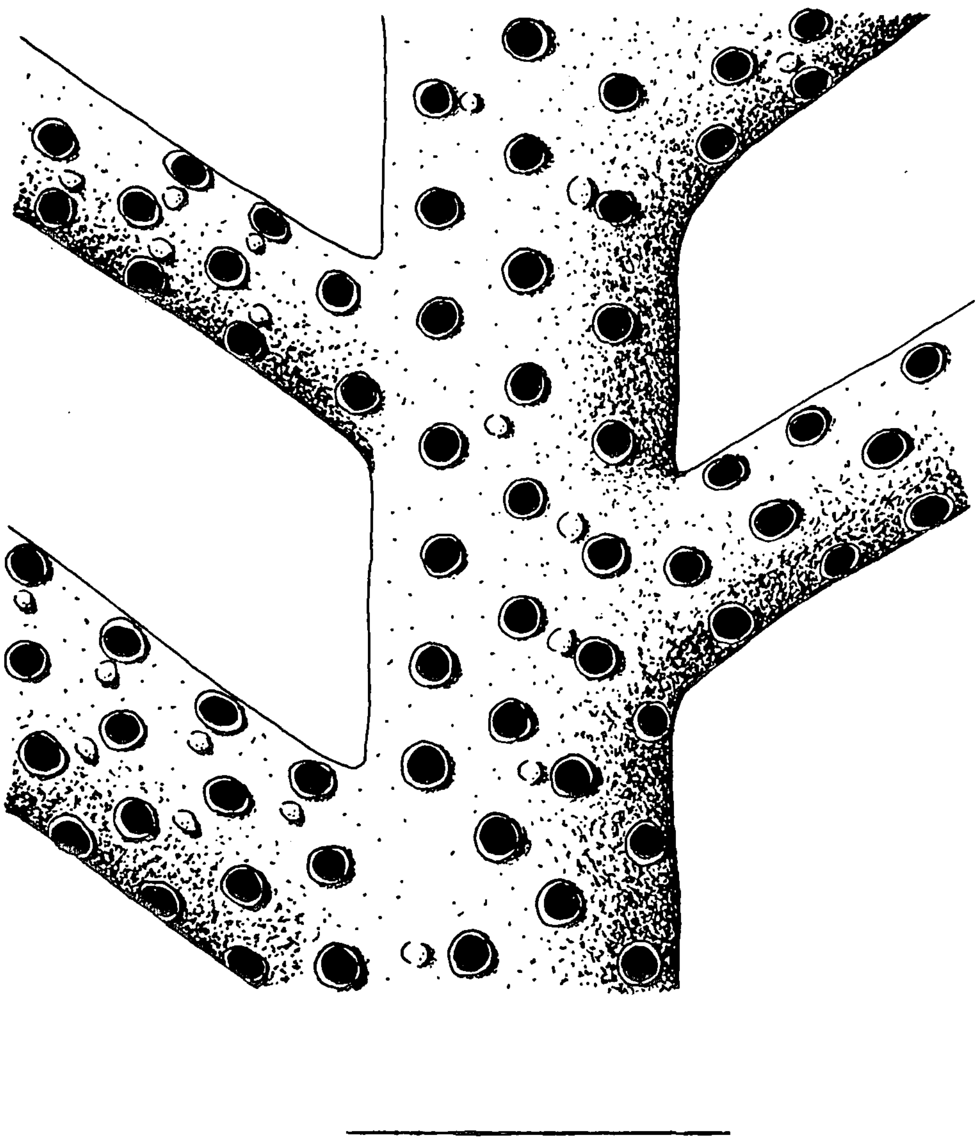


Figure 48. Acanthocladia anceps Schlotheim

Reverse surface detail.RH4.45.
Bar scale=Imm

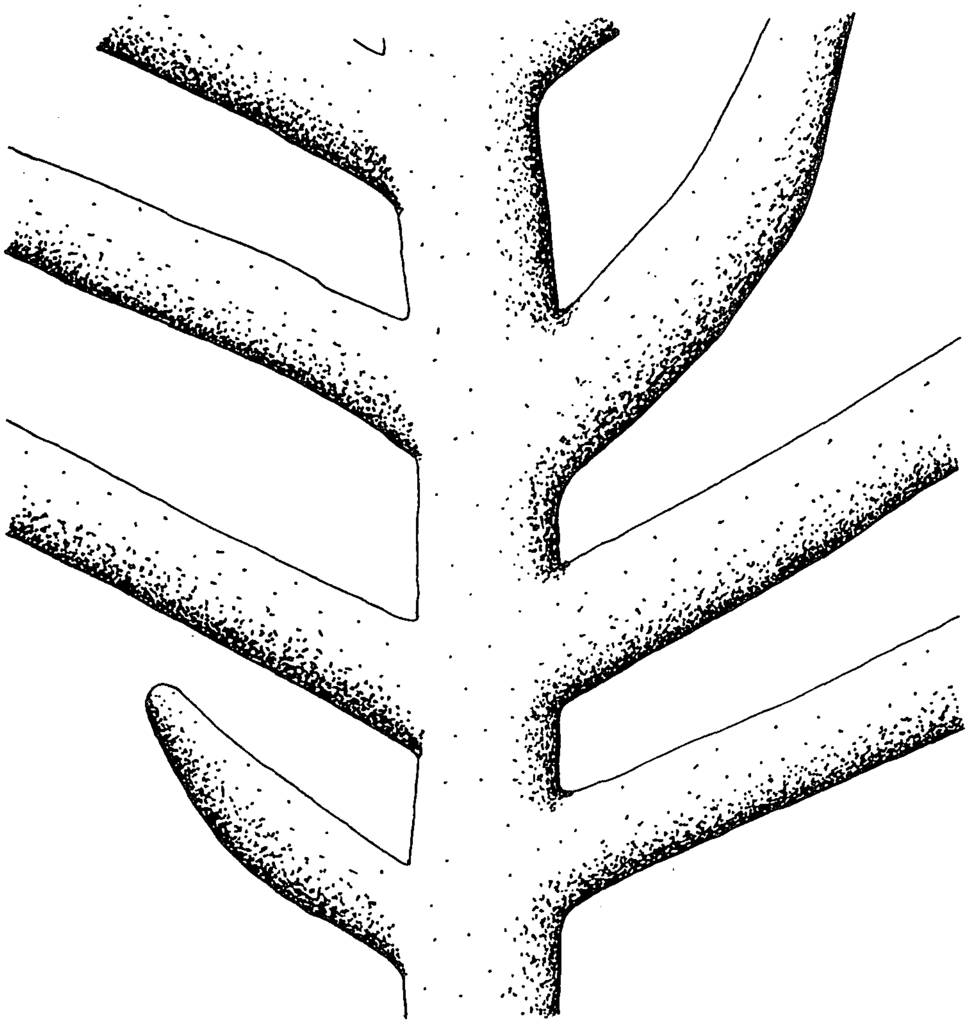


Figure 49. Colony origin of ?Acanthocladia anceps or ?A.laxa viewed from the underside. Specimen MP4.I.Bar scale-Imm

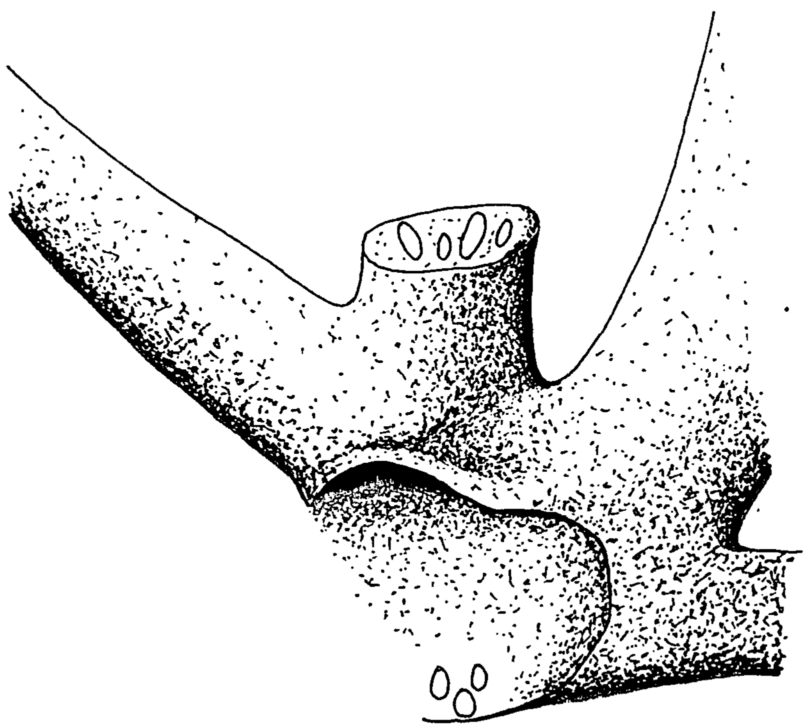
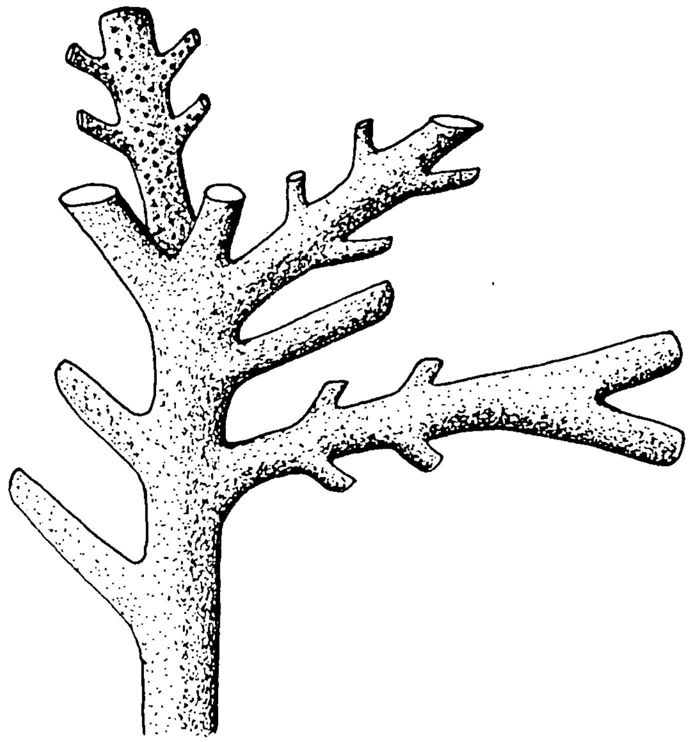


Figure 50. Colony form of _Acanthocladia anceps_.

A. Colony origin consisting of a single erect branch.

B. Colony origin consisting of a circle of radiating branches which expand in a sub-horizontal plane close to the substratum. Apertures not shown.



A

B

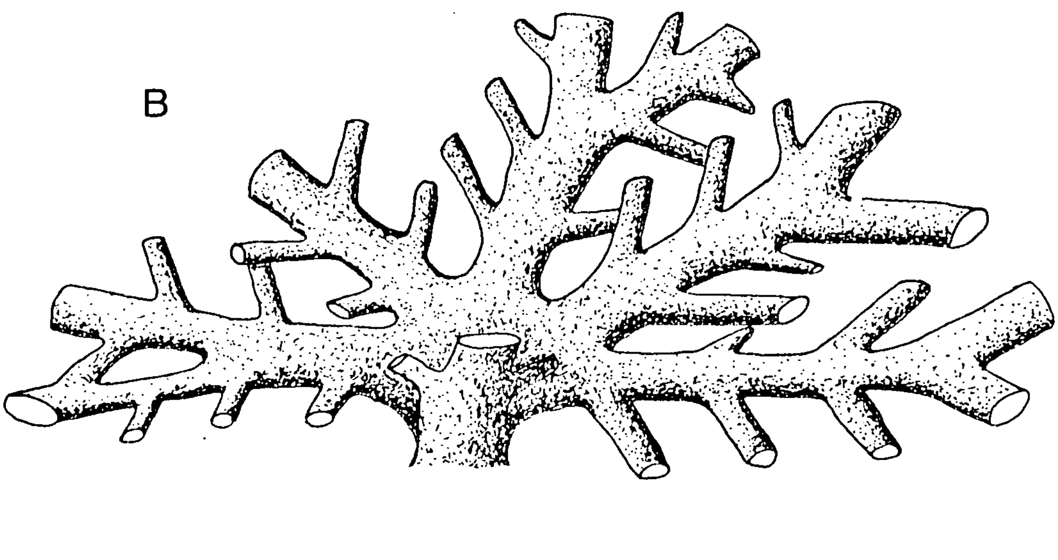
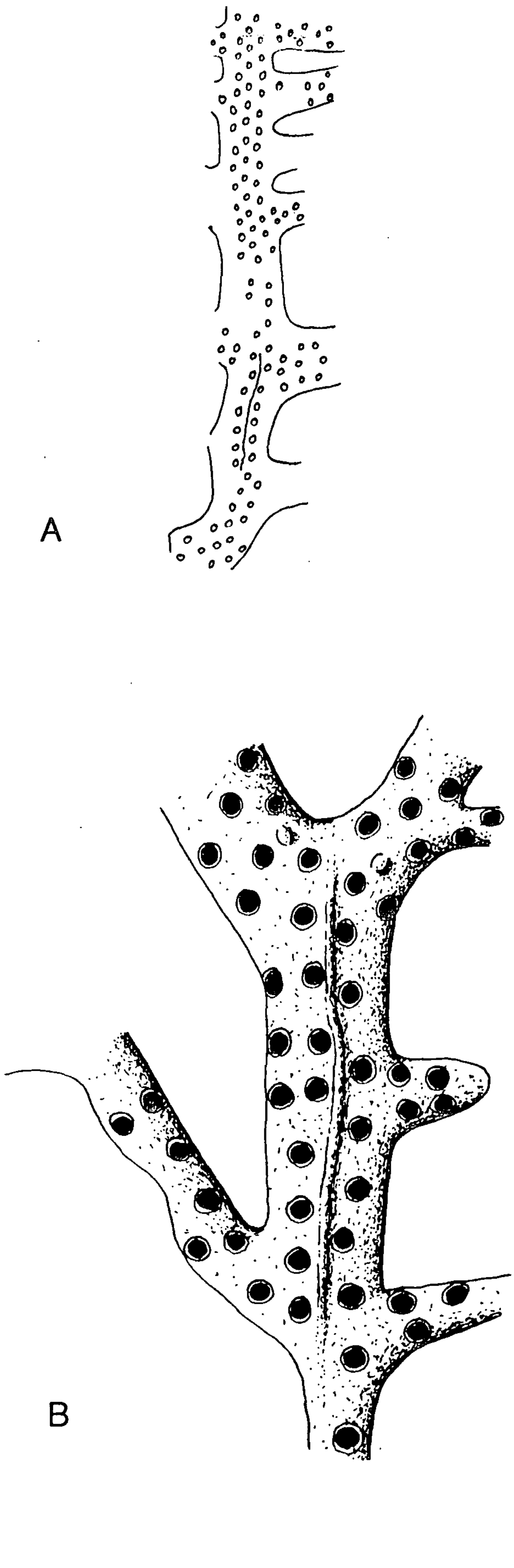


Figure 5I. A. Drawing of _Acanthocladia anceps A_ (from Dreyer(I96I,pl.IX fig.3)).

B. _Acanthocladia anceps_ showing two rows of apertures on part of the main branch obverse surface. HAW 26a.Bar scale-Imm



A

B

Figure 52. *Acanthocladia anceps*.
Silhouette drawing of specimen HAW 7 to show margin of colony which expands by bifurcation.
Bar scale=IOmm

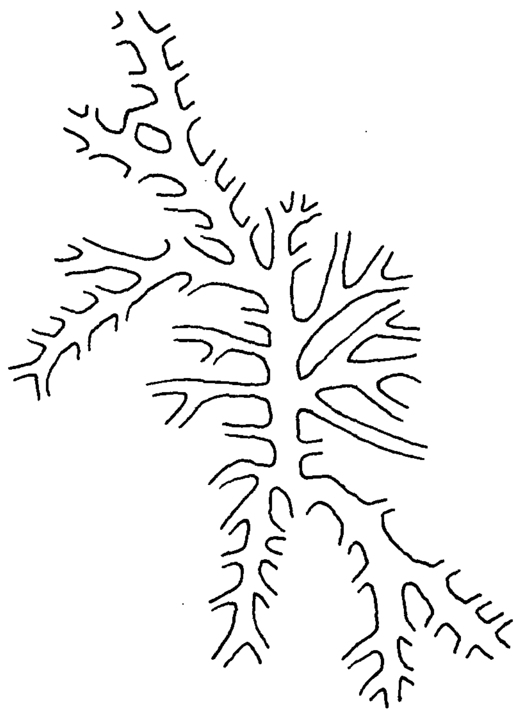
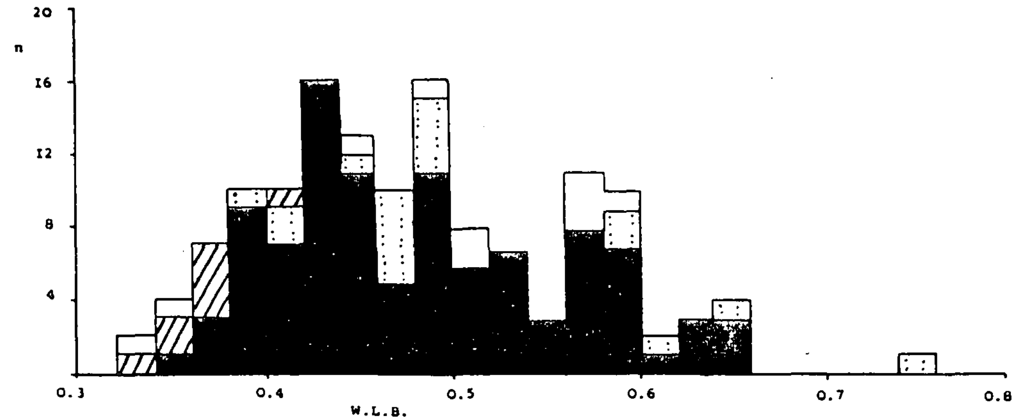


Figure 53. Histograms of measured parameters for _Acanthocladia anceps_, _A.minor_. _A.magna_, _A.laxa_ and _A.diffusus_ combined. Solid ornament=_A.anceps_, diagonal lines =_A.minor_, cross=_A.magna_, dots=_A.laxa_ and _A.diffusus_=clear.

A. Width of lateral branches (in mm).

B. Spacing of lateral branches (in mm).

A



B

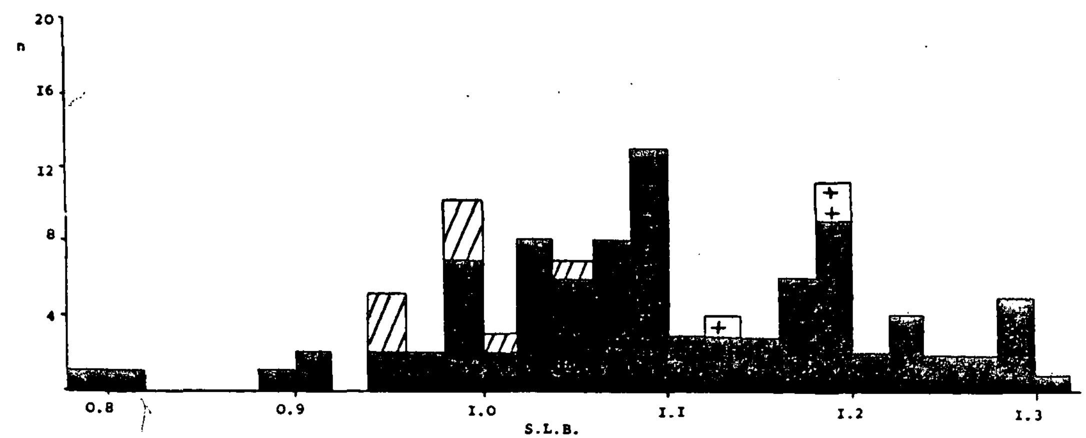
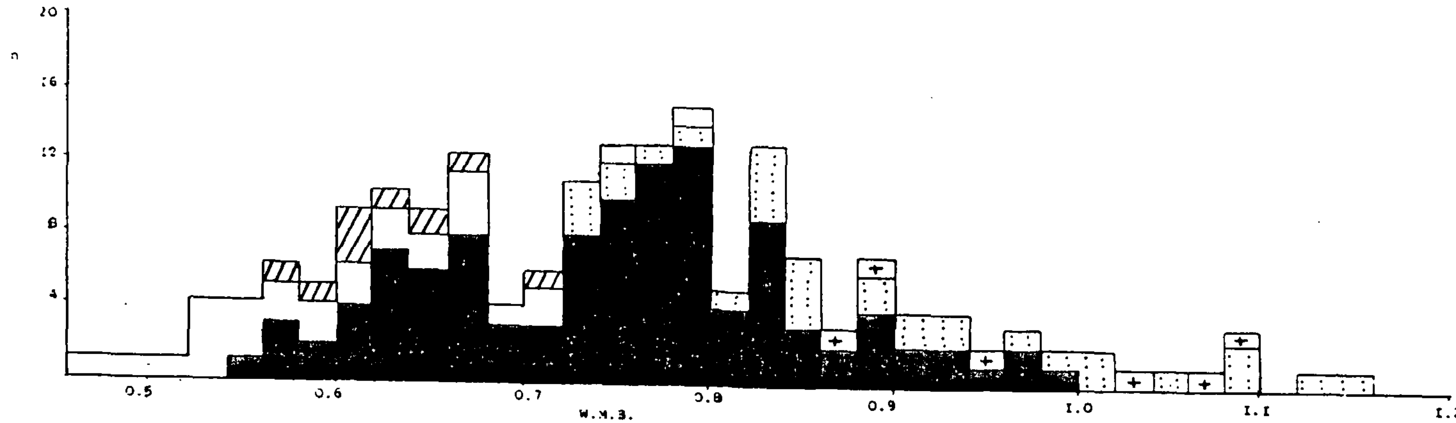


Figure 54. Histograms of measured parameters for *Acanthocladia anceps*, *A. minor*, *A. magna*, *A. laxa*, *A. diffusus*.
Ornament as in Figure 53.

A. Width of main branch(in mm).

B. Branch thickness(in mm).

A



B

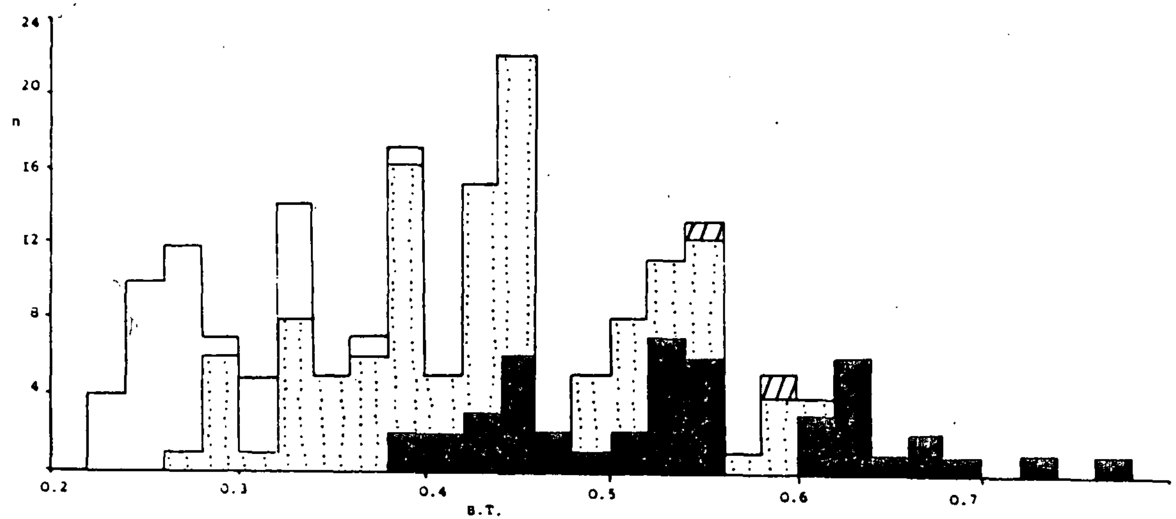


Figure 55. Acanthocladia minor Korn

Obverse surface detail.RH2.55.
Bar scale-Imm

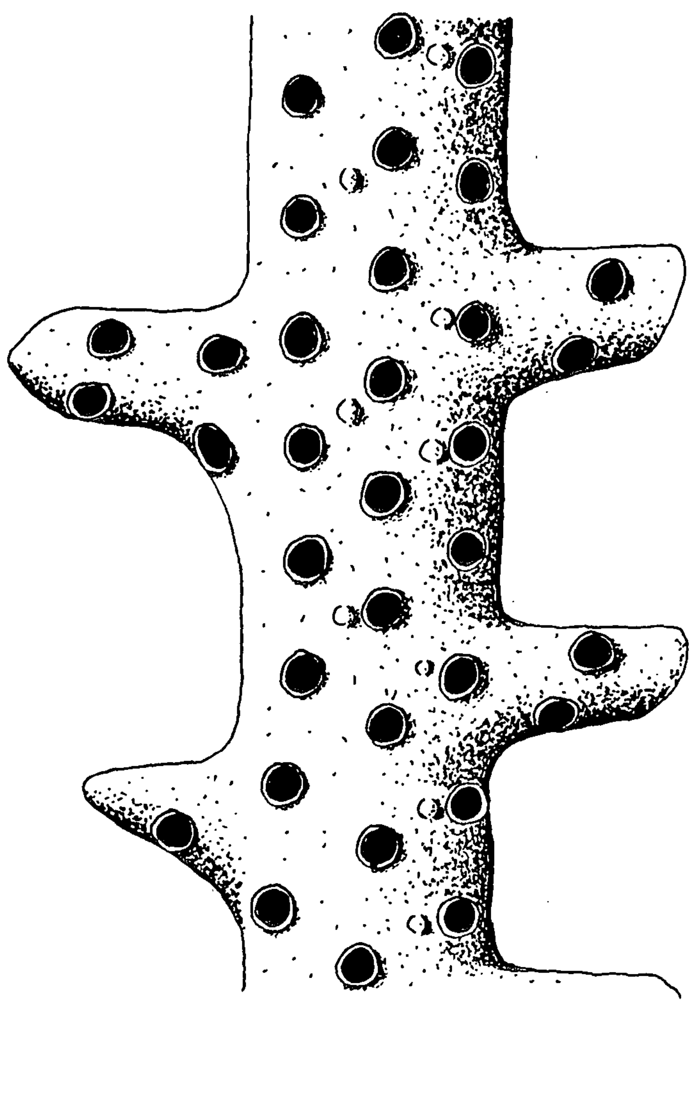


Figure 56. Acanthocladia minor Korn

Reverse surface detail.RHI:I5.
Bar scale-Imm

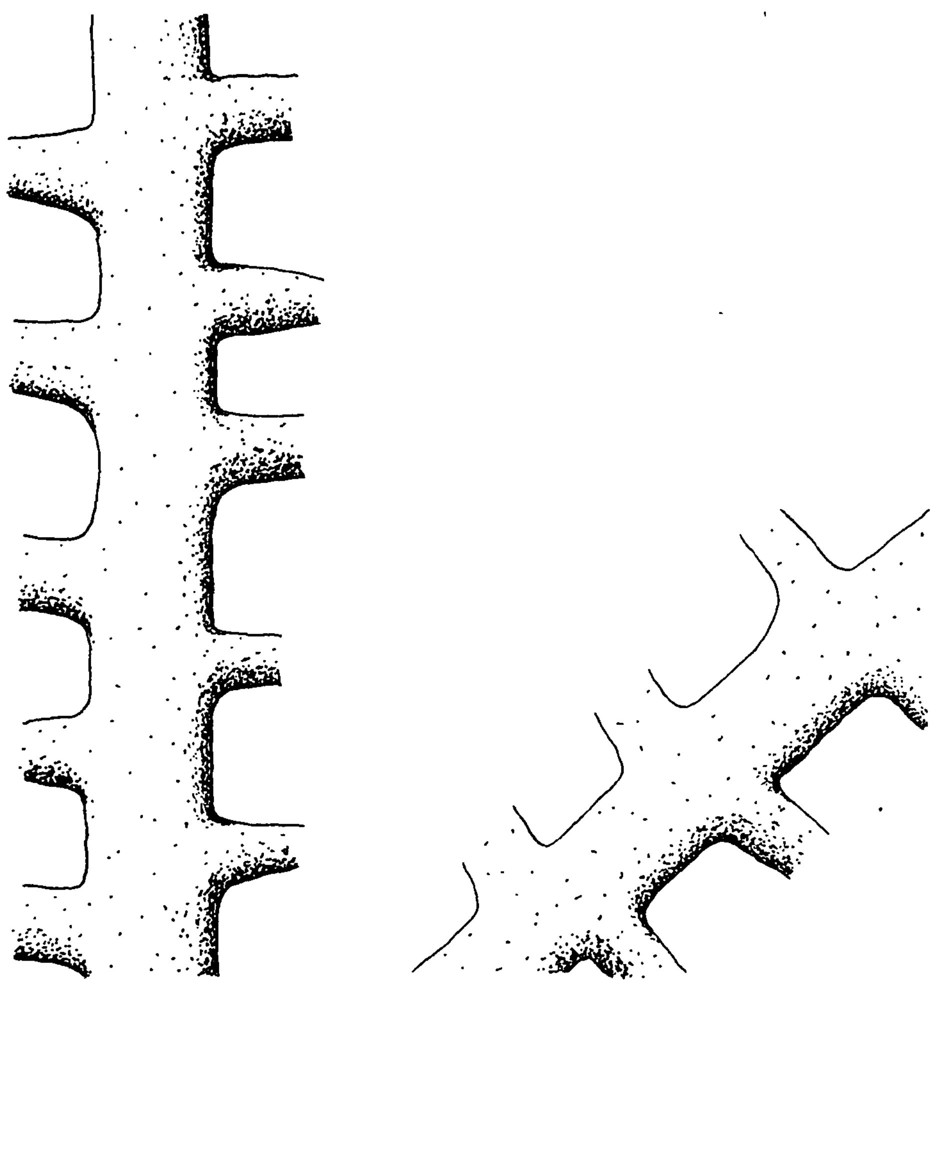


Figure 57. Graph of Width of main branch -v- Width of lateral branch for *Acanthocladia anceps* and *A.minor* combined.
Filled circles=*A.anceps*,unfilled circles =Schlotheim's specimens of *A.anceps*, crosses=*A.minor*.
In mm.

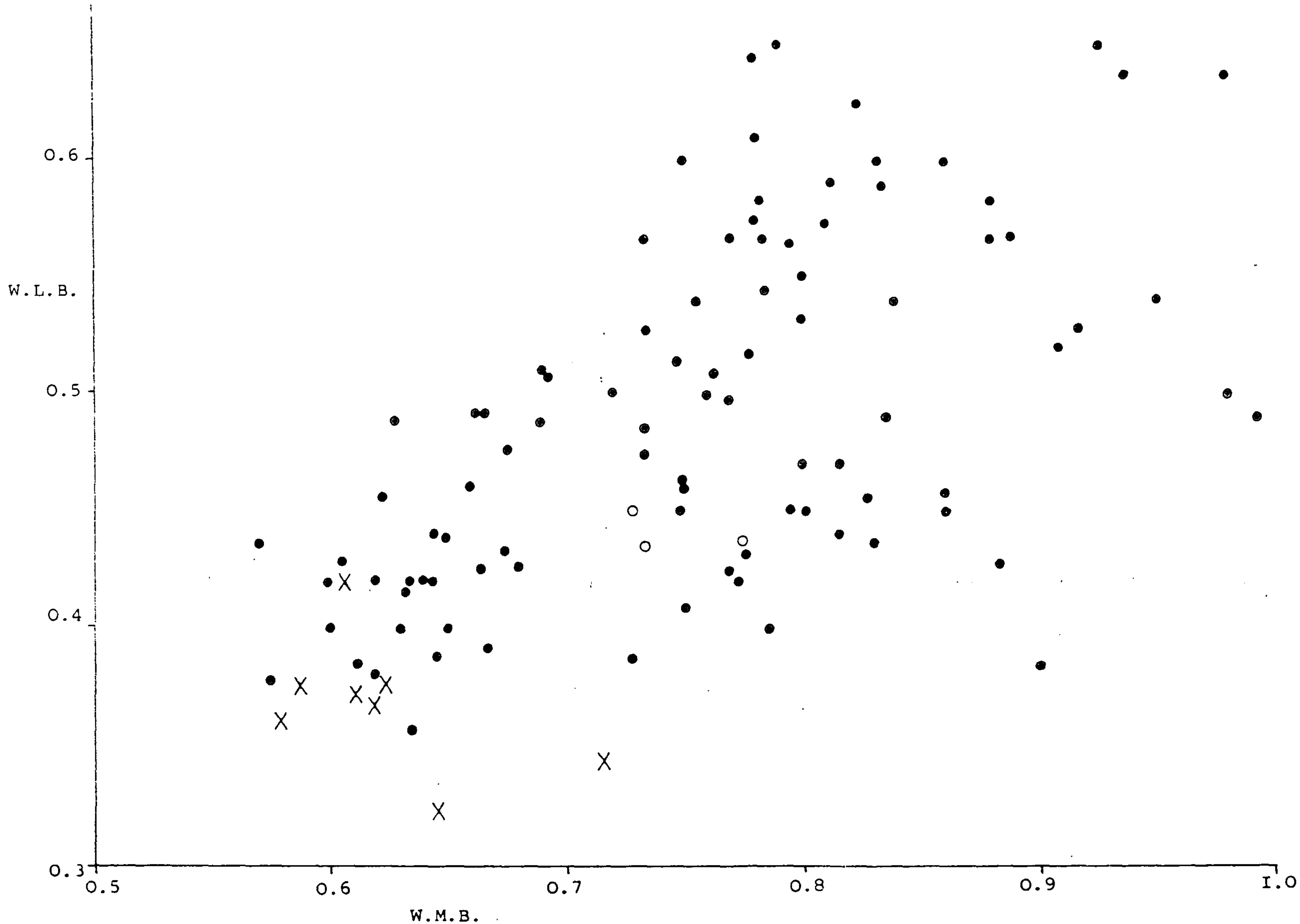

W.L.B.
0.6
0.5
0.4
0.3
0.5
0.6
0.7
0.8
0.9
1.0
W.M.B.

Figure 58. Acanthocladia magna sp.nov.

Obverse surface detail.Composite drawing, RH2.43 and RH2.70a.The proximal part of the main branch shows five nanate zooecia.
Bar scale=Imm

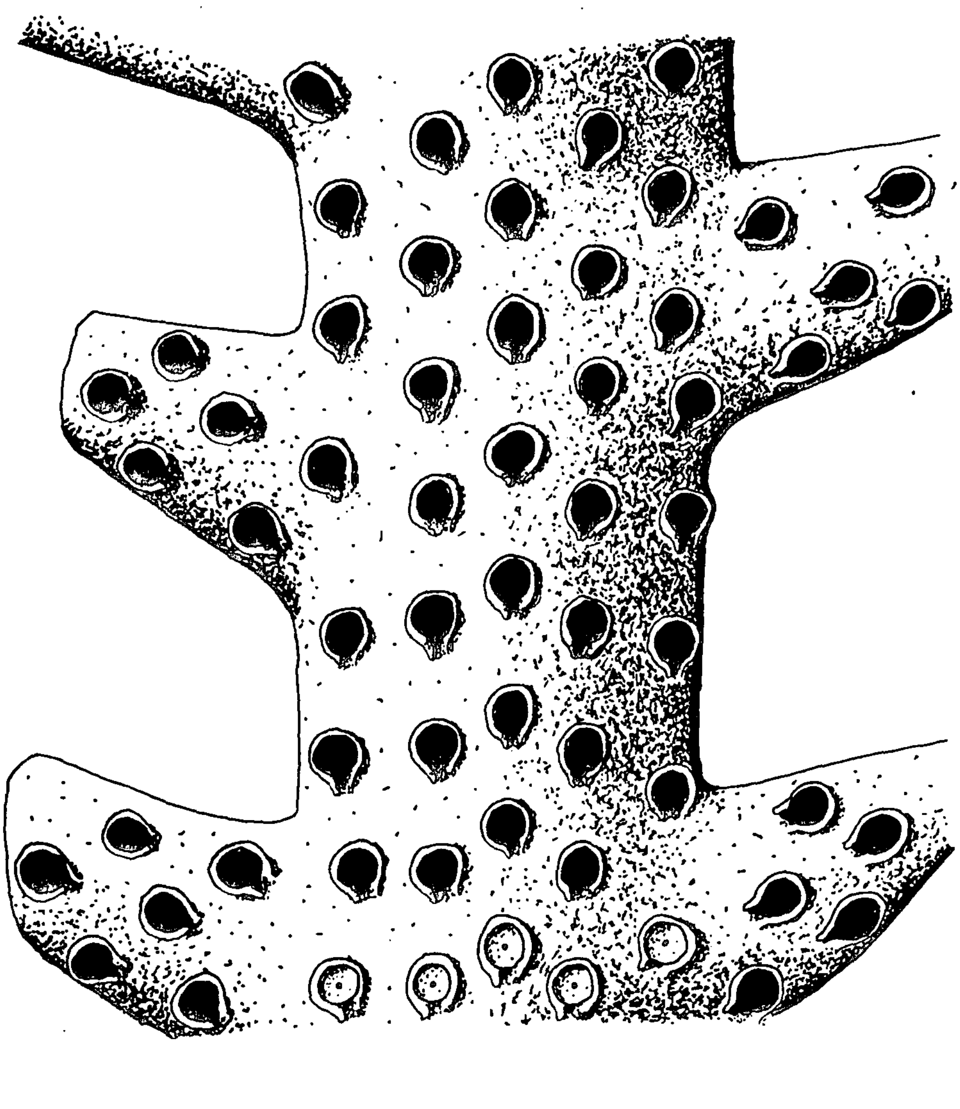


Figure 59. Acanthocladia laxa Korn

Reverse surface detail.MP5.38a.
Bar scale=Imm

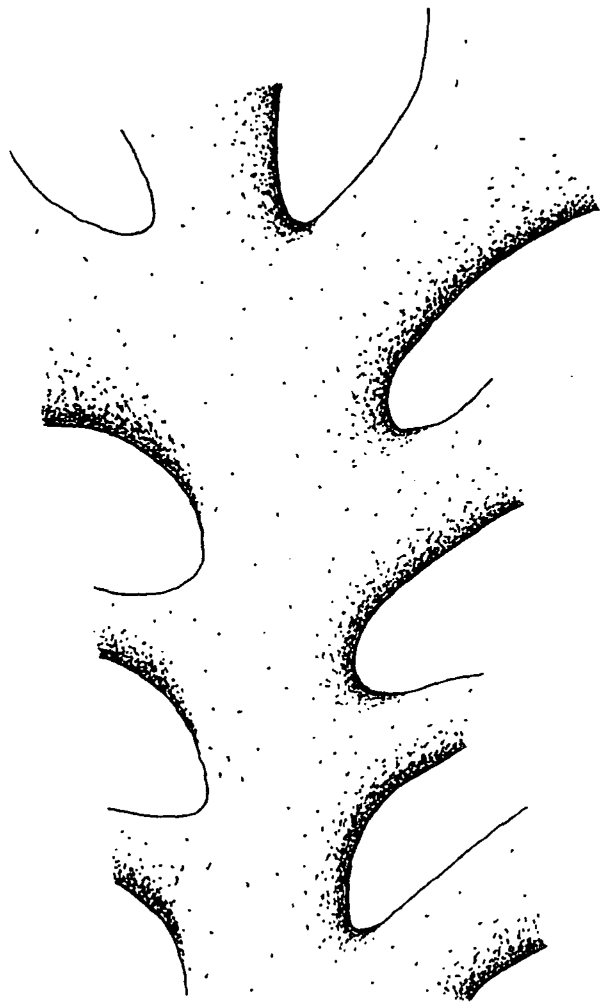


Figure 6O. Zoaria of _Acanthocladia_ species-outline drawings.Comparison of zoarial regularity, see text ,p.228 .

a. _A.anceps_.HAW 7.(Magnification approx.I.4X all other diagrams).
b. _A.magna_.RH2.43.
c. _A.minor_.RH2.55.
d. _A.minor_.RHI.I5.
e. _A.minor_.RHI.I5.
f. _A.anceps_.RH4.44.
g. _A.anceps_.RH2.5O.
h. _A.anceps_.RH2.5I.
j. _A.anceps_.RH4.45.
k. _A.anceps_.HAWI.
l. _A.anceps_.HAW IO.
m. _A.anceps_.RH4.34.
n. _A.anceps_.HAW I.
p. _A.anceps_.HAW I3b.
q. _A.anceps_.HAW 3a.
r. _A.anceps_.HAW I3b.
s. _A.anceps_.RH2.68.

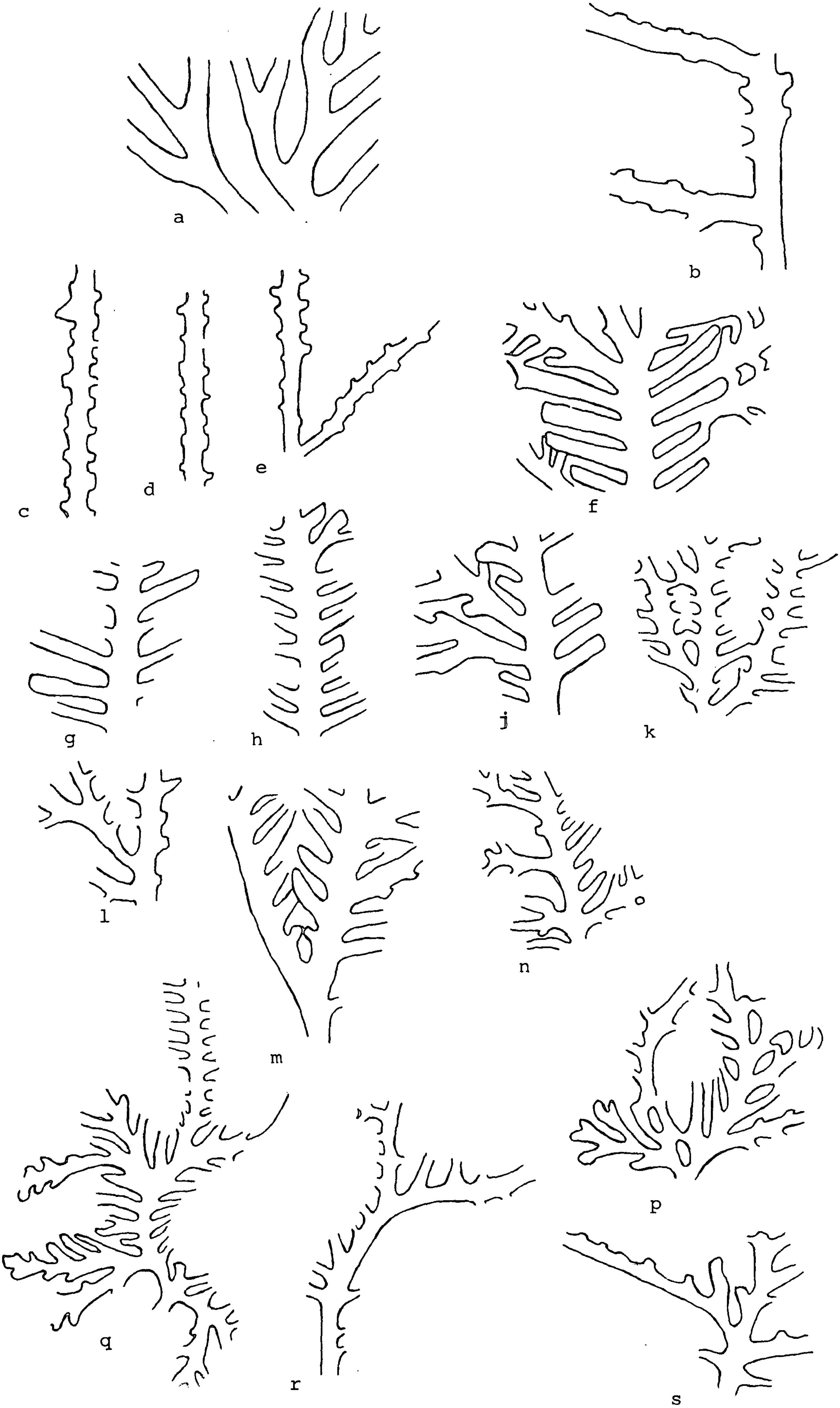

a
b
c
d
e
f
g
h
j
k
l
m
n
p
q
r
s

Figure 6I. Zoaria of Acanthocladia species-outline drawings. Comparison of zoarial regularity, see text, p. 228 .

a. A.anceps.RH2.45.
b. A.anceps.RH2.48a.
c. A.laxa.HDN 7.
d. A.laxa.GLQ 36.
e. A.laxa.RHI.I3.
f. A.laxa.RHI.I2.
g. A.laxa.RHI.I.
h. A.laxa.HM7.I3.
j. ?A.laxa.RHI.2
k. ?A.diffusus.RHI.4I.
l. A.diffusus.RHI.37.
m. ?A.diffusus.RHI.46.
n. ?A.diffusus.RH4.4I.
p. A.diffusus.RHI.48.
q. A.diffusus.BH I2.
r. A.diffusus.HYR I8.
s. A.diffusus.HYR I6.

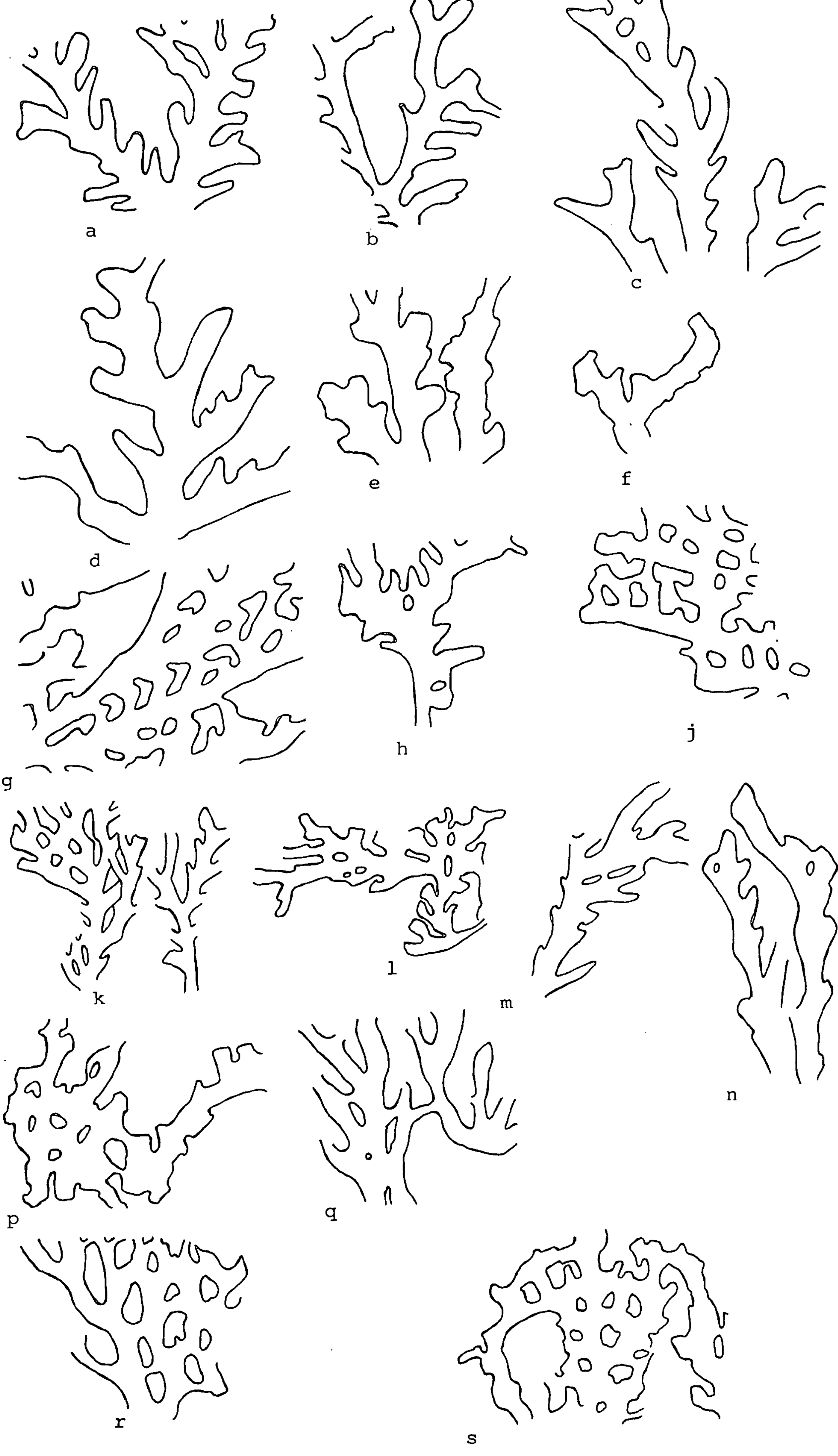

a
b
c
d
e
f
g
h
j
k
l
m
n
p
q
r
s

Figure 62. Acanthocladia diffusus Korn

Obverse surface detail.HTQ 4.
Bar scale=Imm

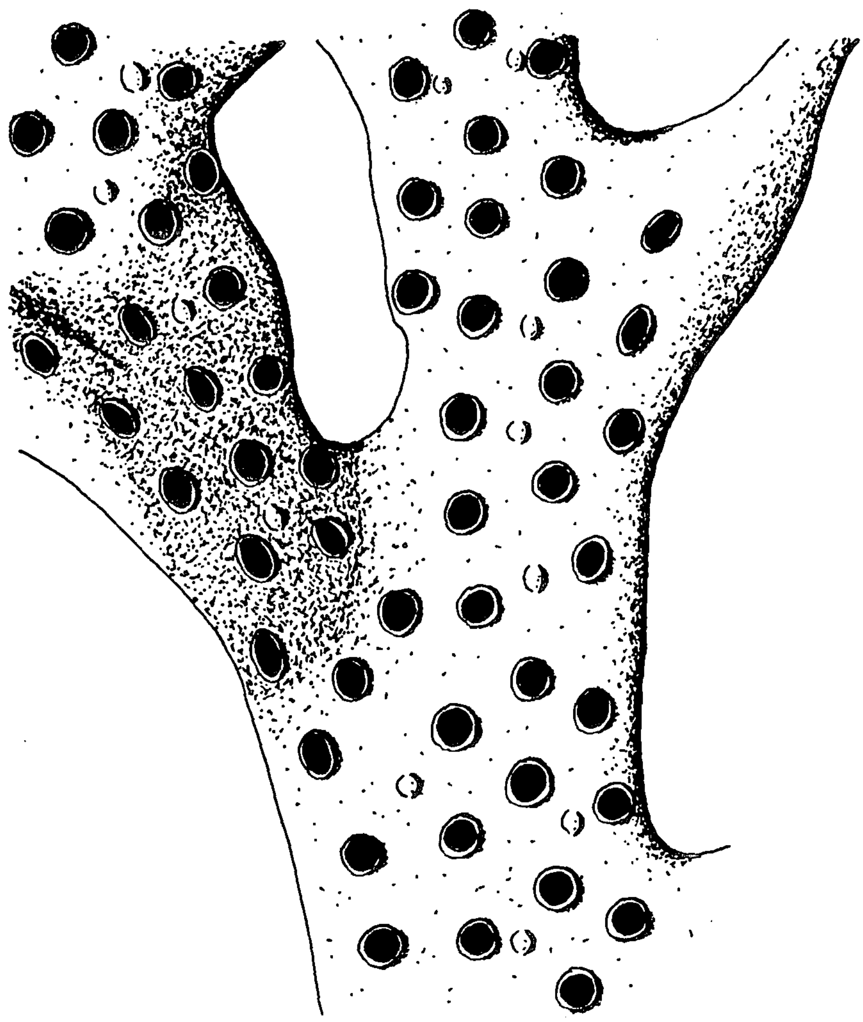


Figure 63. Acanthocladia diffusus Korn

Reverse surface detail.BH I2.
Bar scale=Imm

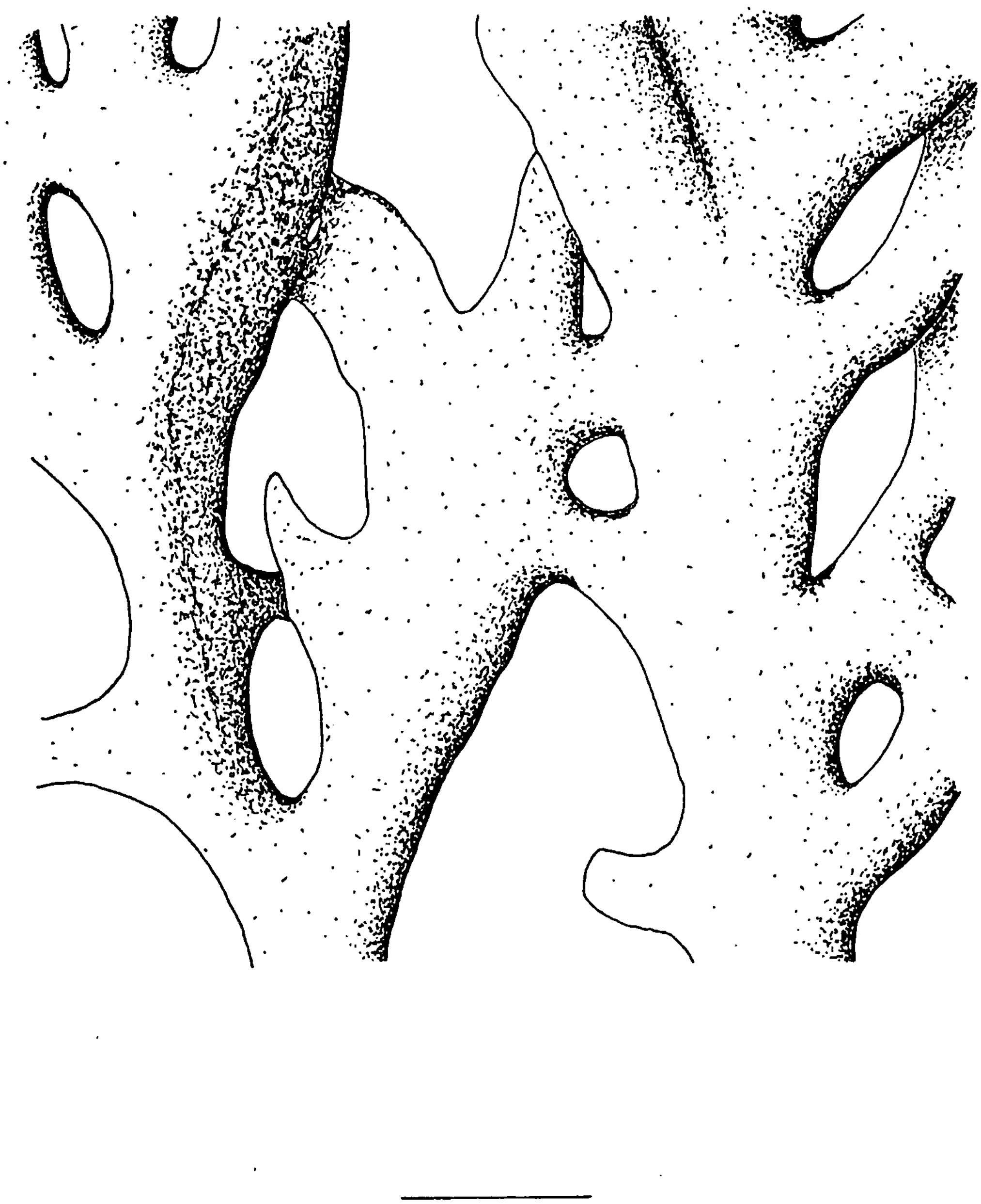


Figure 64. Correlation of zoarial morphology with habitat for "*Idmonea*"*atlantica* (from Harmelin(I973)).Colonies growing in obscure recesses are less robust and less regularly branched than those in a more open environment.

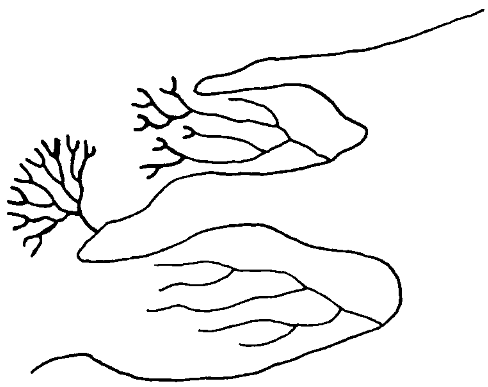


Figure 65. Kalvariella typica Morozova

Obverse surface detail. BH IOb.
Bar scale=Imm

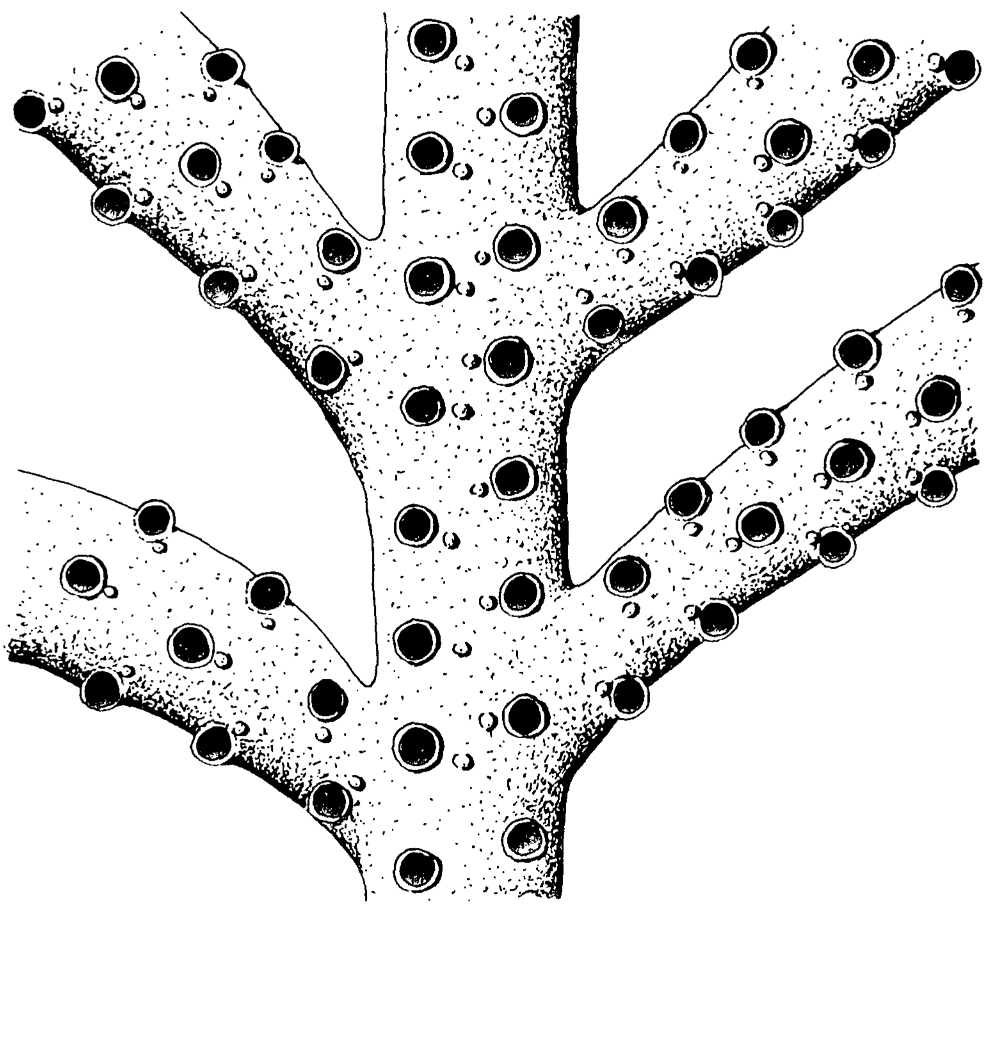


Figure 66. Penniretepora waltheri Korn

Reverse surface detail.HYR28.
Bar scale=Imm

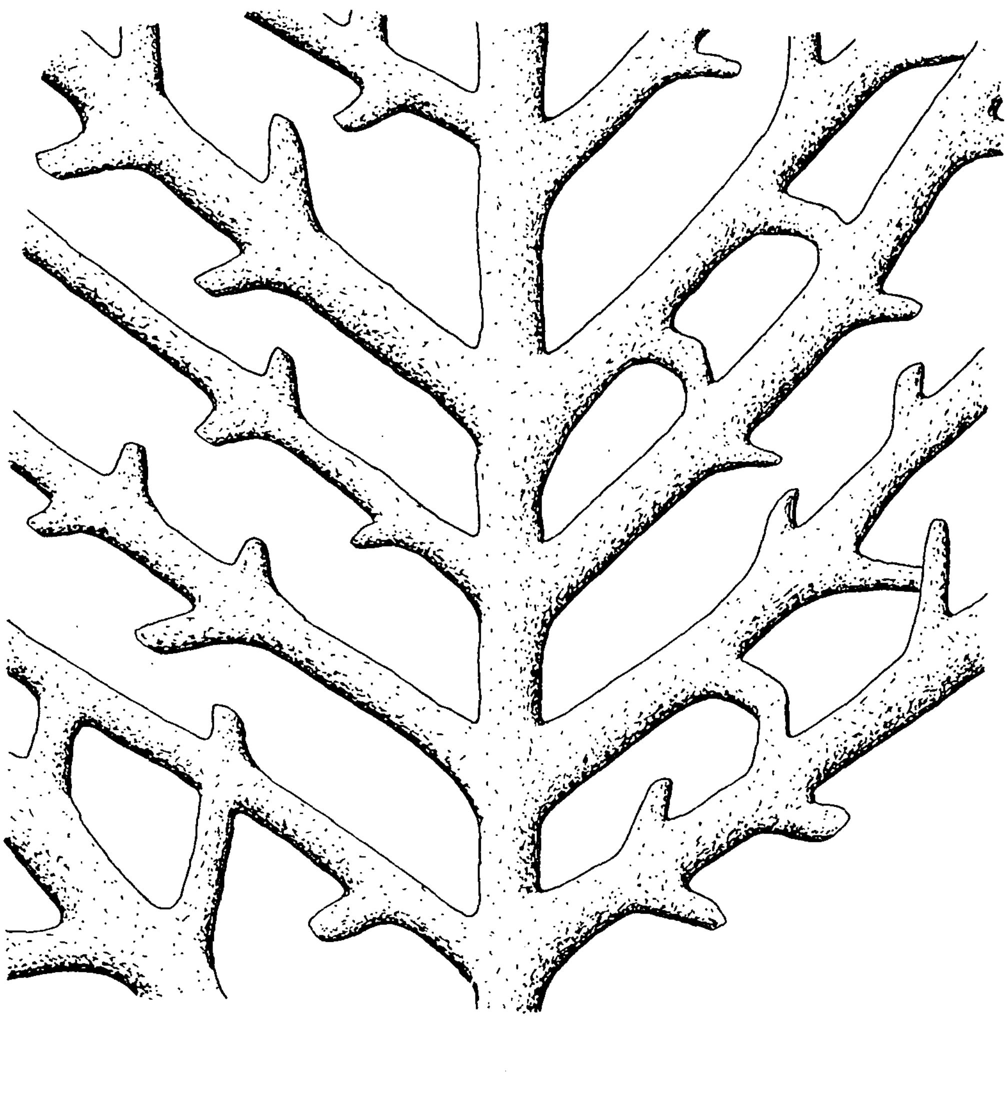


Figure 67. _Penniretepora_ _waltheri_ _nodata_ subsp.nov.

Obverse surface detail.Composite drawing,
RH2.28 and RH2.Ib.
Bar scale=Imm

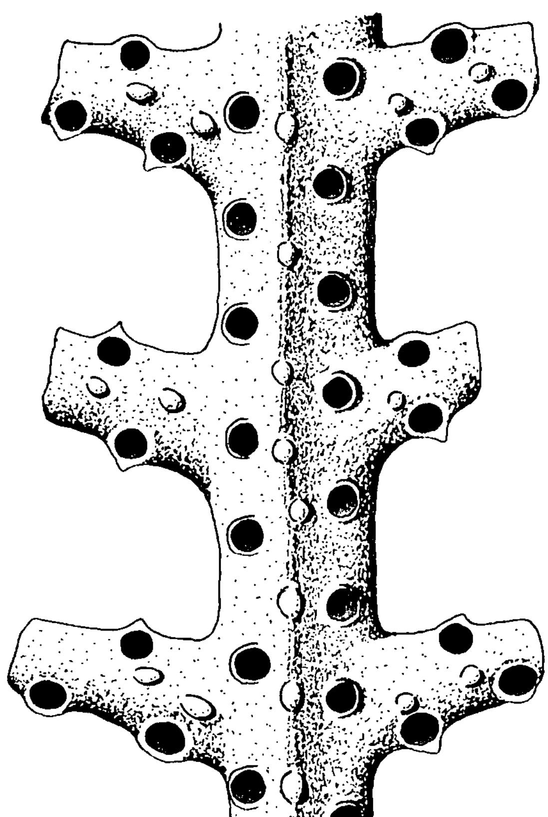


Figure 68. *Penniretepora waltheri nodata* subsp.nov.

Reverse surface detail.RH2.42.
Bar scale=Imm

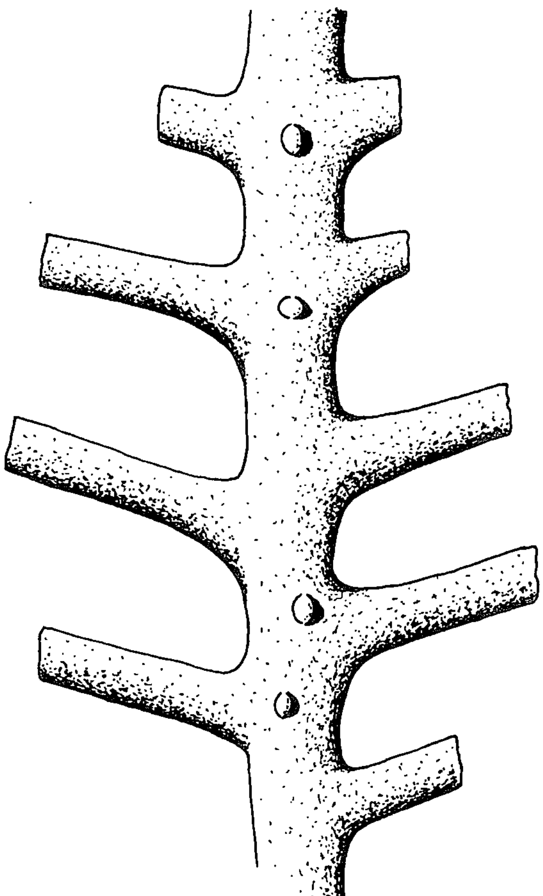


Figure 69. Ryhopora delicata gen.nov.,sp.nov.

Obverse surface detail.RH2.30b.
Bar scale=Imm

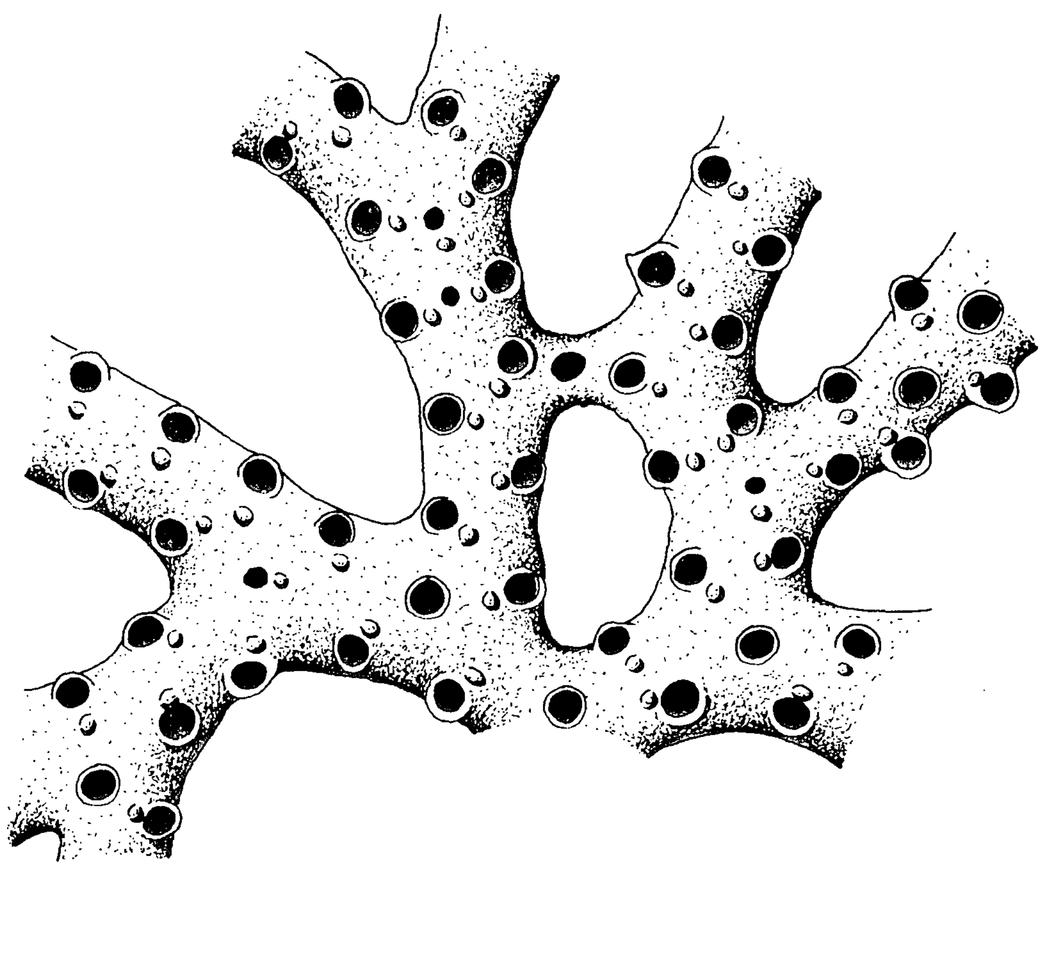


Figure 70. A and B.Inter-zooecial wall laminae in the Trepostomata.

A. Tangential section showing the inter-zooecial wall with an apparent granular core surrounded by laminated skeleton.

B. Longitudinal section-dashed line= level of diagram A.The appearance of a granular core flanked by laminated skeleton in A is a result of the angle of intersection of the plane with the wall laminae,being steeper at the edge of the inter-zooecial wall but sub-parallel to the plane in the centre.

C and D.Growth of wall laminae in the Trepostomata.(From Boardman and Cheetham(I969).

C. Laminae oblique orally,grown one at a time,parallel to depositing epithelium.

D. Laminae oblique aborally,growth by simultaneous edgewise extension of several laminae which are not parallel to the depositing epithelium.

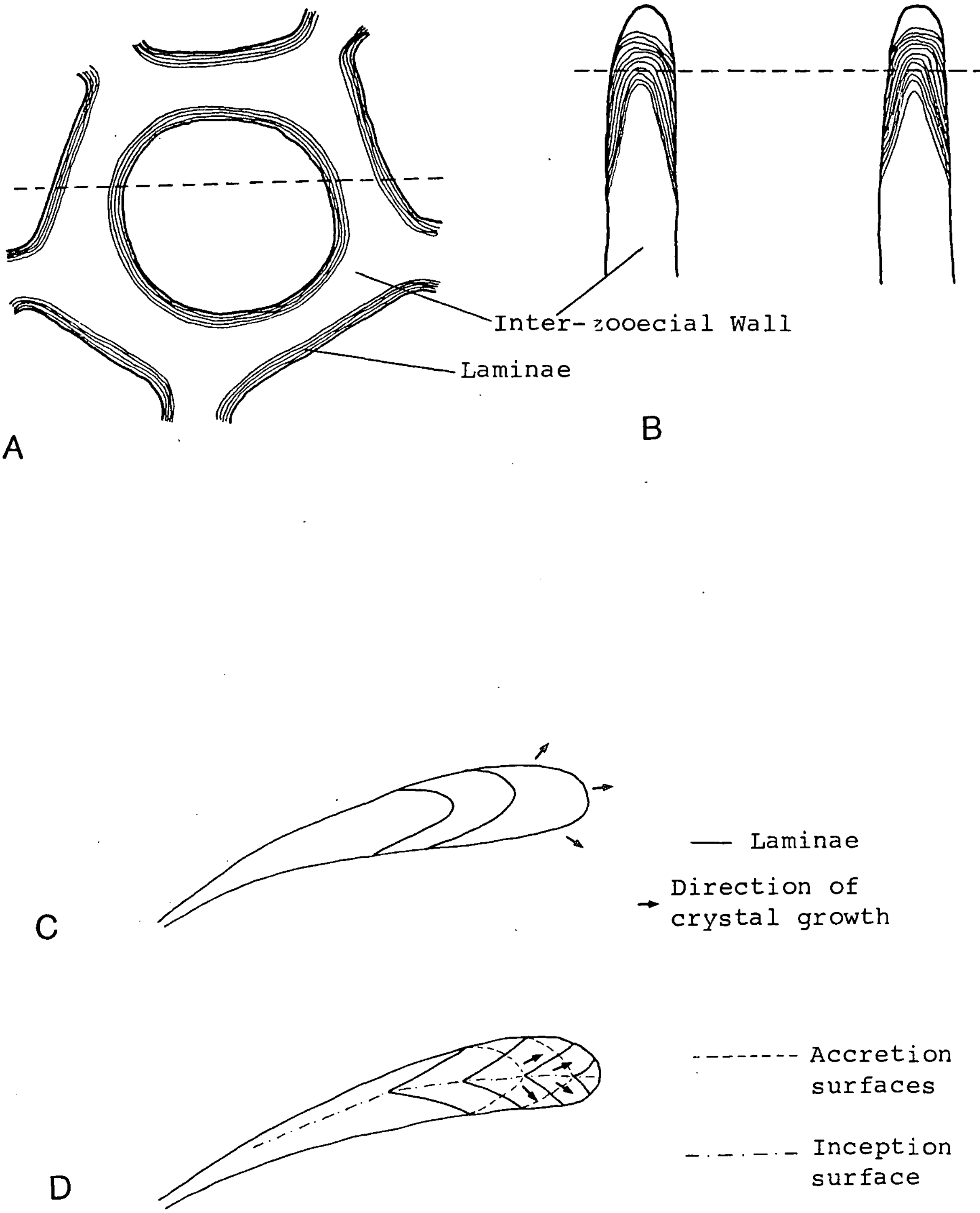
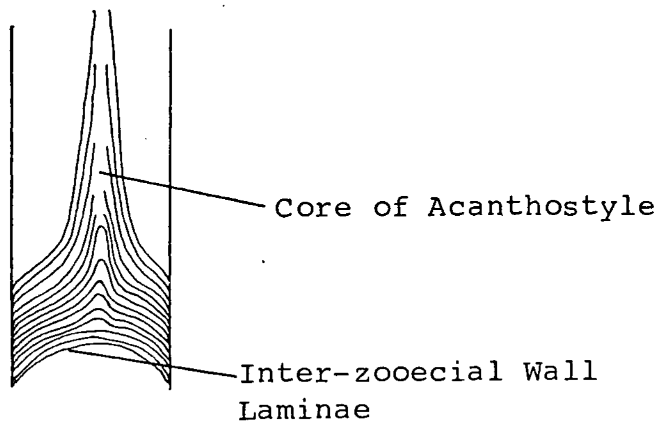
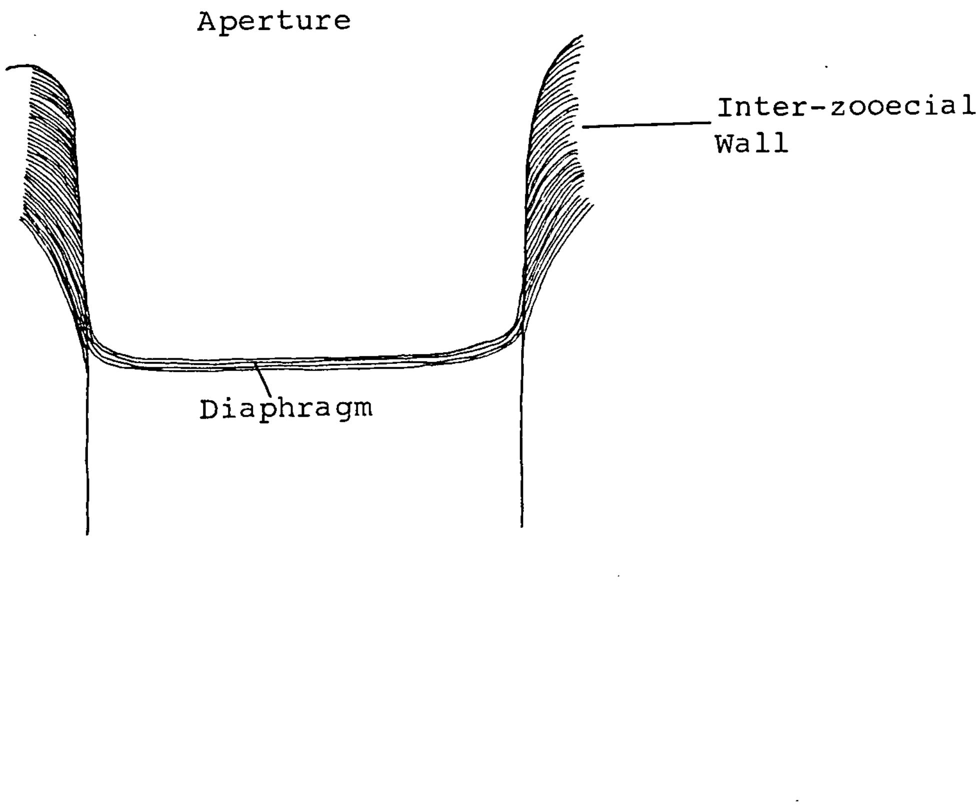

Inter-zooecial Wall
Laminae
A
B
C
Laminae
Direction of crystal growth
D
Accretion surfaces
Inception surface

Figure 7I. A. Longitudinal section to show oral flexure of inter-zooecial wall laminae to produce an acanthostyle which consists of a granular core with sub-parallel wall laminae. (Partly after Tavener-Smith(I969b)).

B. Longitudinal section through the distal part of an autozooecium. Laminae of the diaphragm are continuous orally with those lining the zooecial chamber and with those of the inter-zooecial wall.

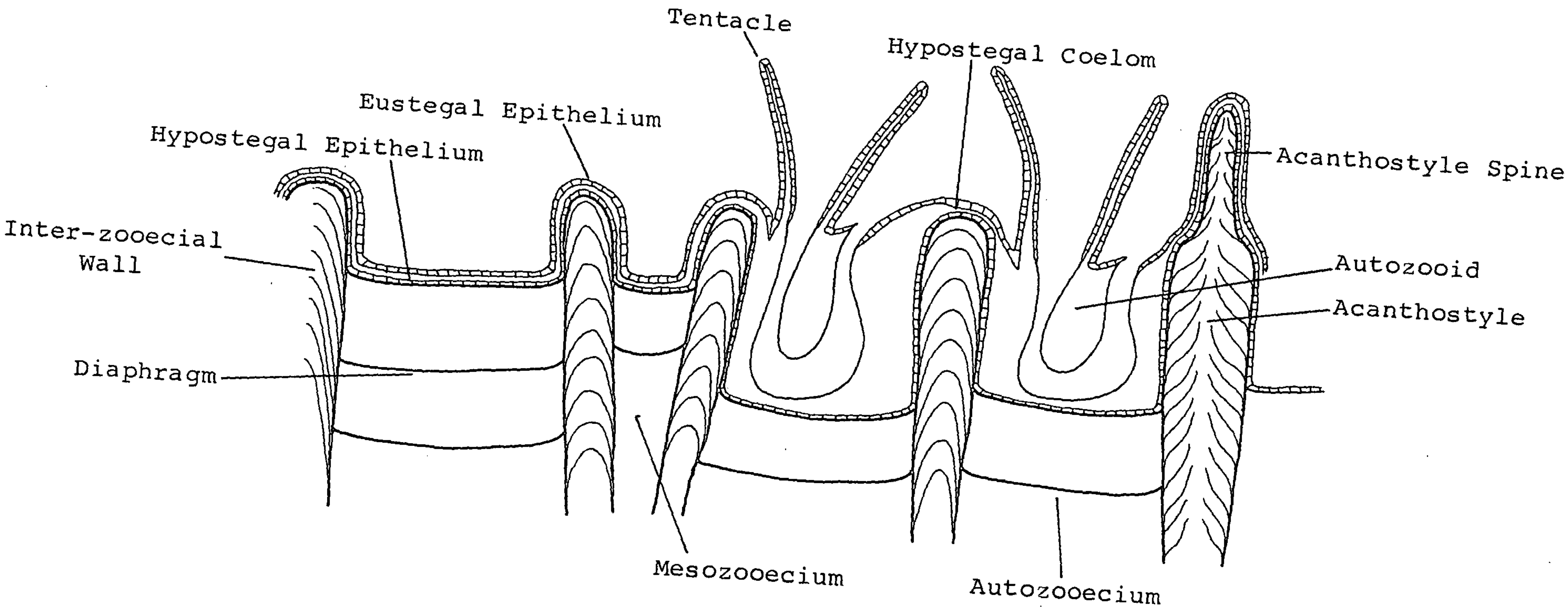

Core of Acanthostyle
Inter-zooecial Wall
Laminae

A


Aperture
Inter-zooecial
Wall
Diaphragm

B

Figure 72. Diagrammatic reconstruction of the relationship between hard and soft parts in the Trepostomata. (Partly after Tavener-Smith(I969b)).



Tentacle
Hypostegal Coelom
Eustegal Epithelium
Hypostegal Epithelium
Acanthostyle Spine
Inter-zooecial
Wall
Autozooid
Acanthostyle
Diaphragm
Mesozooecium
Autozooecium

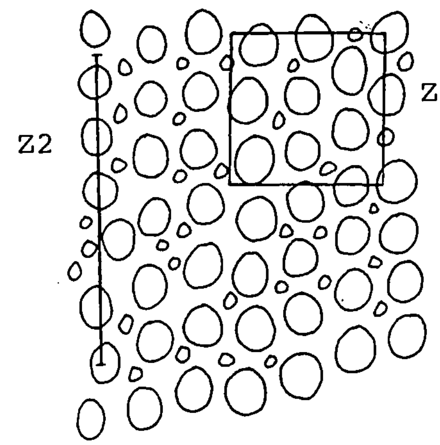
Figure 73. Characters measured on bryzoans of the Order Trepostomata in the present study.

A. Counts of Zooecial apertures, made on the external surface.

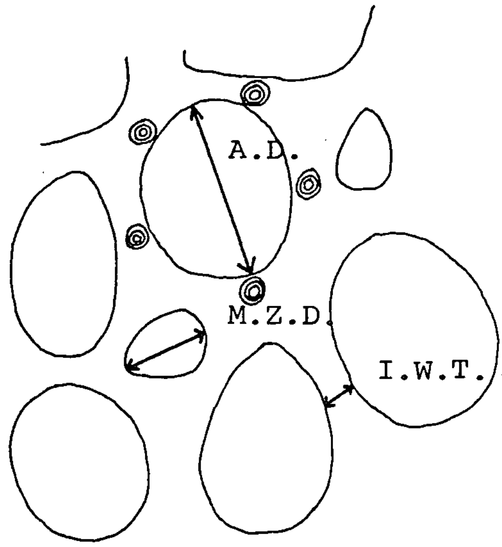
B. Measurements made on the external surface.

C. Measurements made in longitudinal section.

See text, p. 287 for discussion.



A



B

C

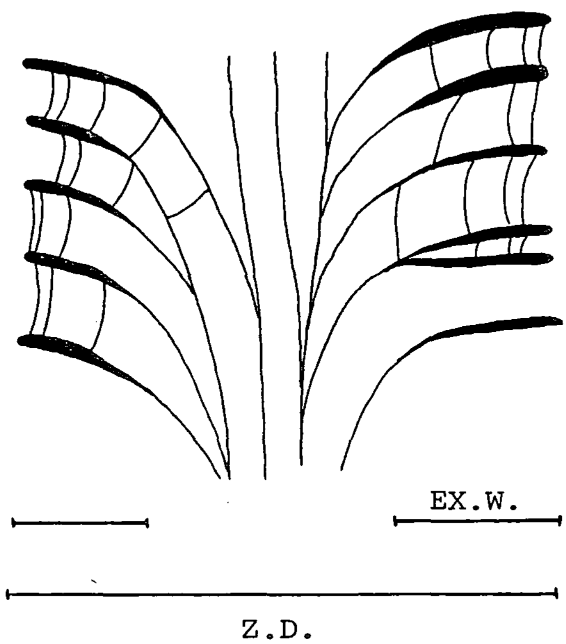


Figure 74. Diagrams to explain the morphology of the secondary overgrowth seen in thin section GLQIOI (represented diagrammatically by fig.B).

A. The colony of <u>Dyscritella columnaris</u> is attached to a substrate.

C. Partial degeneration of the colony takes place,then an overgrowth is initiated by regeneration at the distal margin of the colony.Sediment is deposited(or cement is precipitated)around the base of the colony.The overgrowth extends proximally and eventually grows out over the layer of sediment.Thus the basal layer of the overgrowth is not in contact with the exozone below.The plane of section in 'C' corresponds with the transverse section,'B'.

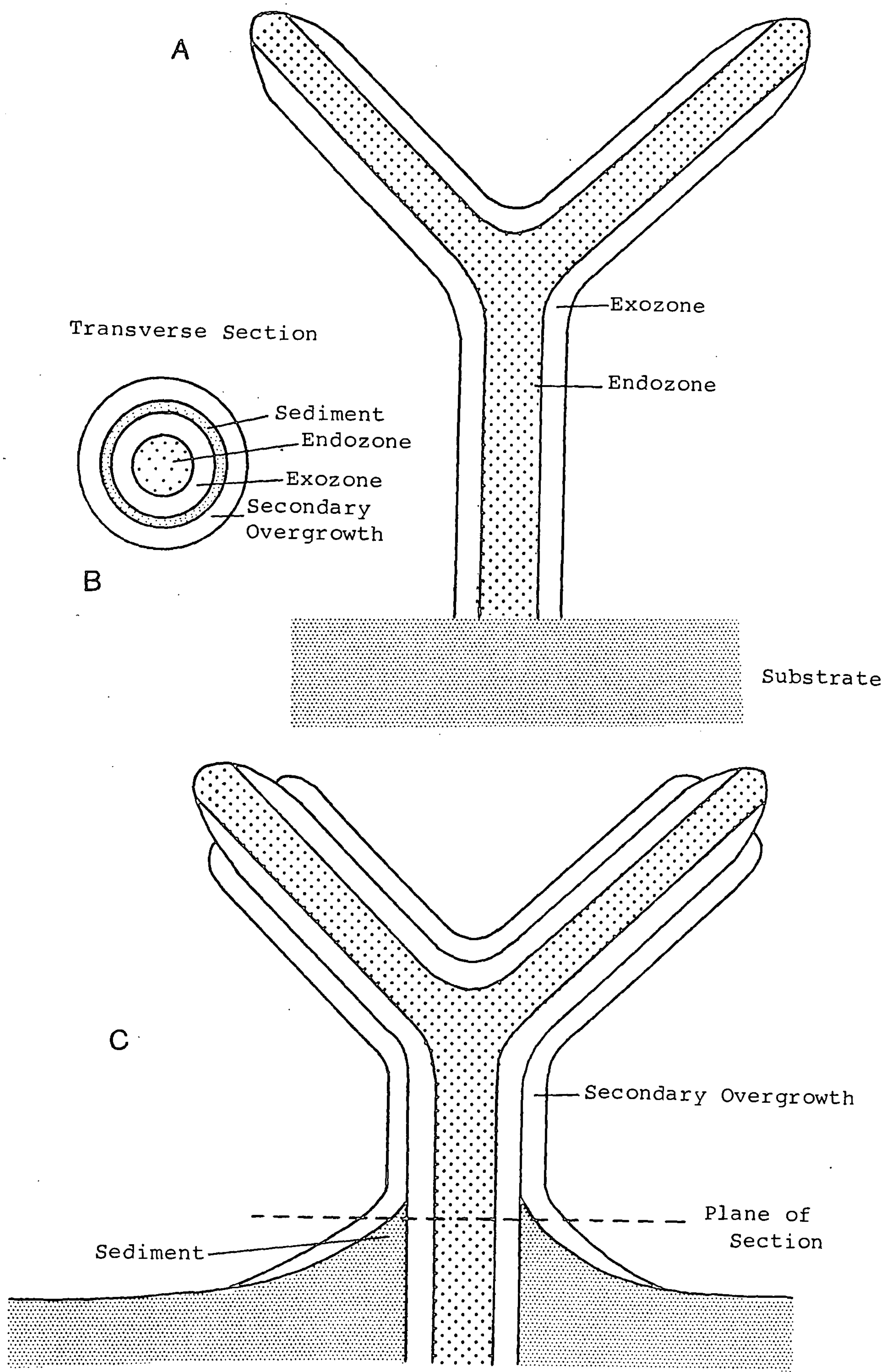
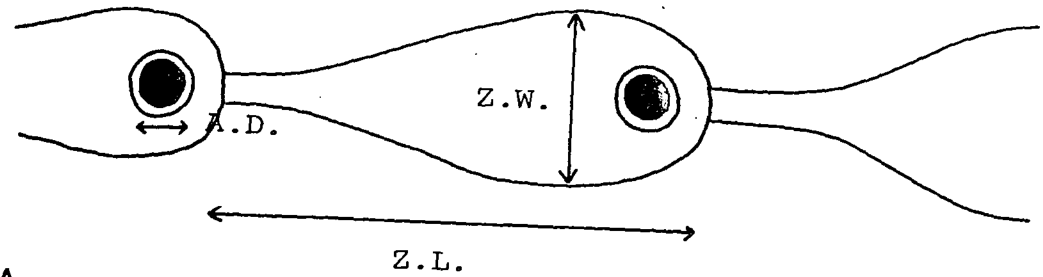
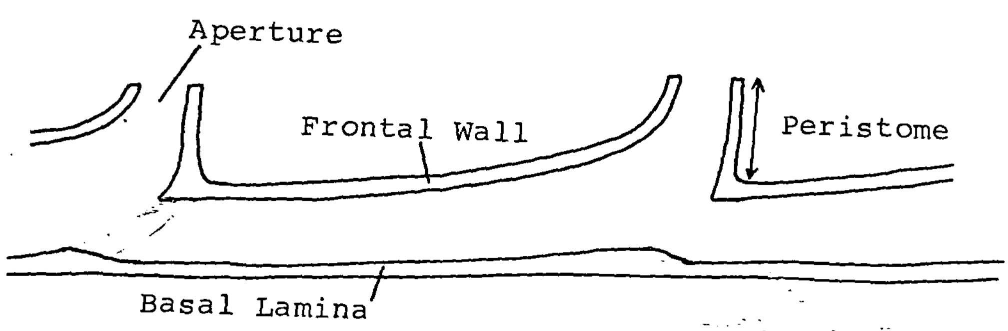

A
Exozone
Endozone
Transverse Section
Sediment
Endozone
Exozone
Secondary
Overgrowth
B
Substrate
C
Secondary Overgrowth
Plane of
Section
Sediment

Figure 75. A. Diagram to show measurements made on the genus Corynotrypa. See text, p. 3II for discussion.

B. Longitudinal section through zooecia of an encrusting cyclostome such as Corynotrypa.
"A" and "B" after Taylor(I977).



A



B

Figure 76. Corynotrypa voigtiana King

Zooecia encrusting a specimen of the brachiopod Horridonia.RH3.I.
Bar scale=Imm

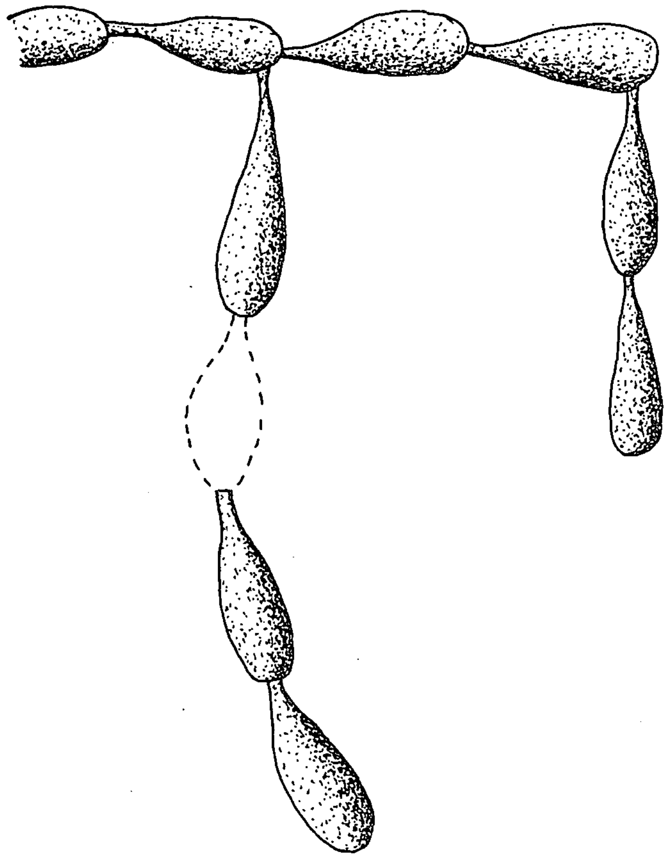


Figure 77. Corynotrypa voigtiana King

Zooecia encrusting the reverse surface of Fenestella retiformis.RH2.26.
Bar scale=Imm

Figure 78. Corynotrypa voigtiana King

Zooecia encrusting the reverse surface of Synocladia virgulacea.RH2.I.
Bar scale=Imm

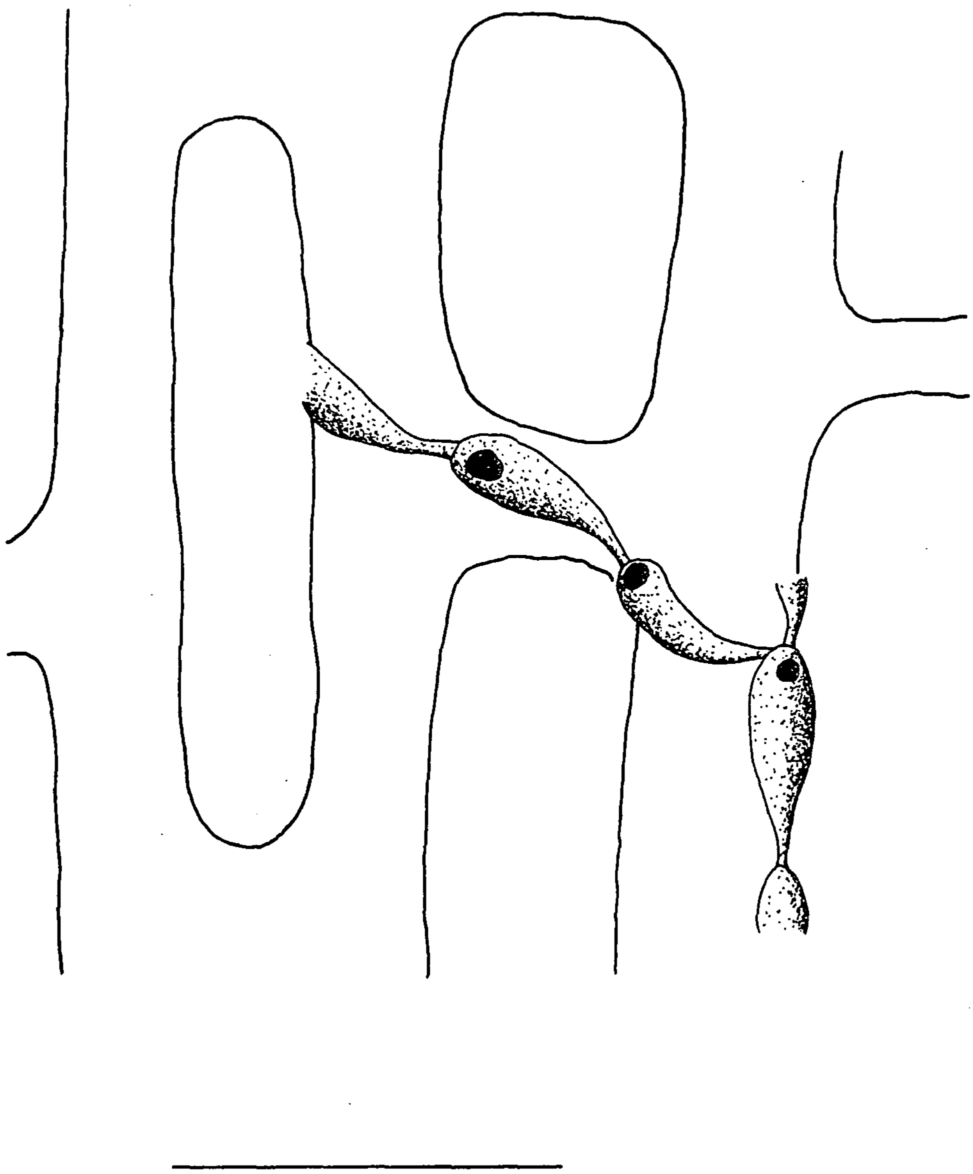


Figure 79. Diagrammatic profile of the Zechstein reef (Tunstall member of the Ford formation) showing the main reef sub-environments. From Smith (I98I).

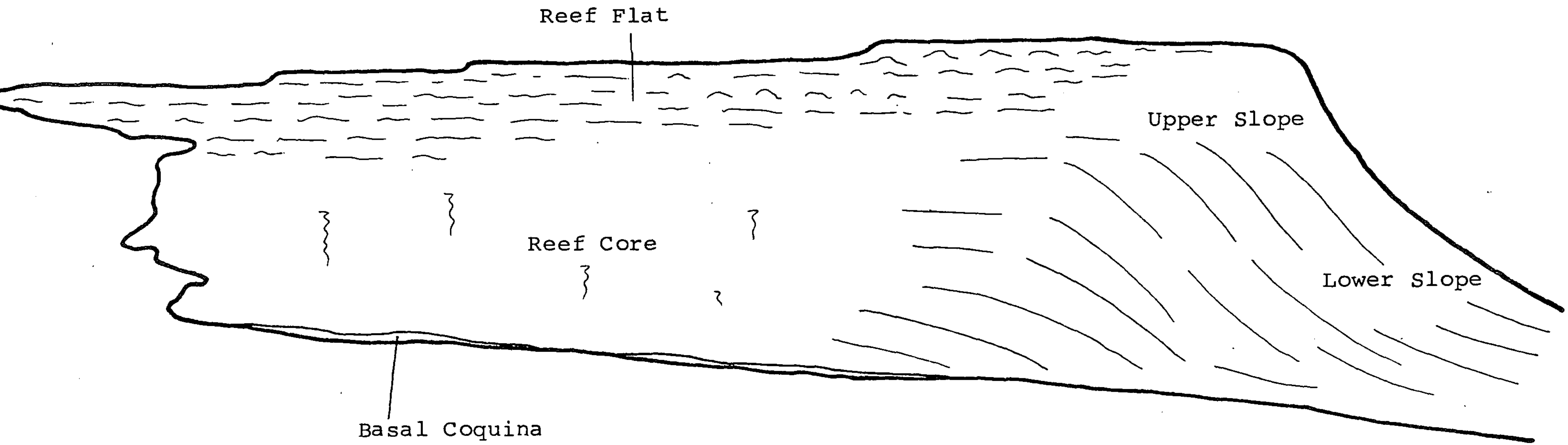

Reef Flat
Upper Slope
Reef Core
Lower Slope
Basal Coquina

Figure 80. Diagrammatic profile of Zechstein reef showing inferred positions of localities in relation to reef sub-environments. After Smith(I98I).

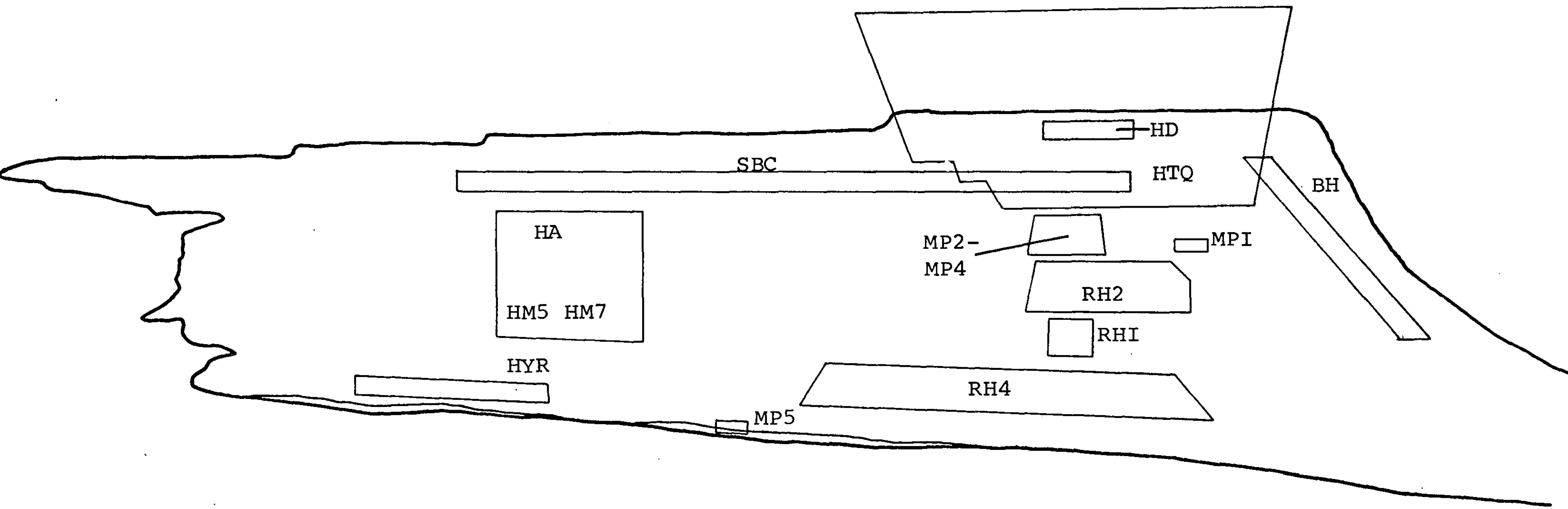

SBC
HD
HTQ
BH
HA
HM5 HM7
HYR
MP2-
MP4
MPI
RH2
RHI
RH4
MP5

Figure 8I. Diagrammatic profile of the main reef and patch reef to show the characteristic distributions of bryozoan species in relation to reef sub-environments.

I - *Dyscritella columnaris*, *Acanthocladia laxa* and *A. diffusus* are the dominant bryozoans of the reef-flat, to the almost total exclusion of other species.

2 - *Synocladia virgulacea* is characteristically abundant in the upper reef slope.

3 - *Fenestella retiformis* is very abundant in the reef core. *Thamniscus dubius* and *F. geinitzi* occur in almost no other sub-environment and are particularly characteristic forms.

4 - *Kingopora ehrenbergi* is very rare throughout the main reef but is relatively common in patch reefs of the back-reef environment.

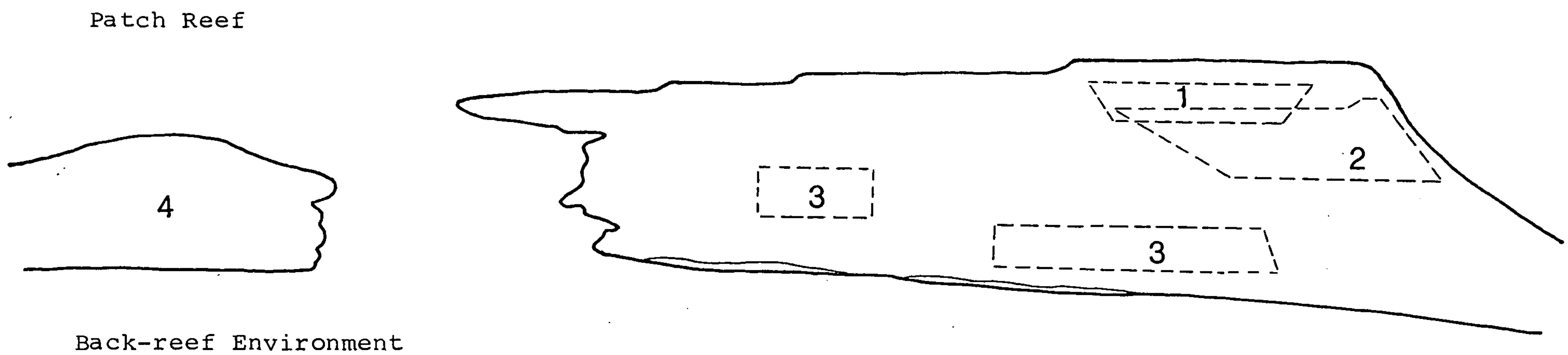

Patch Reef
4
3
1
2
3
Back-reef Environment

Figure 82. Histogram of species abundances at locality MP5.
Abundance categories I-7 are defined in the text, p. 32I 6 is very common and I is very rare.

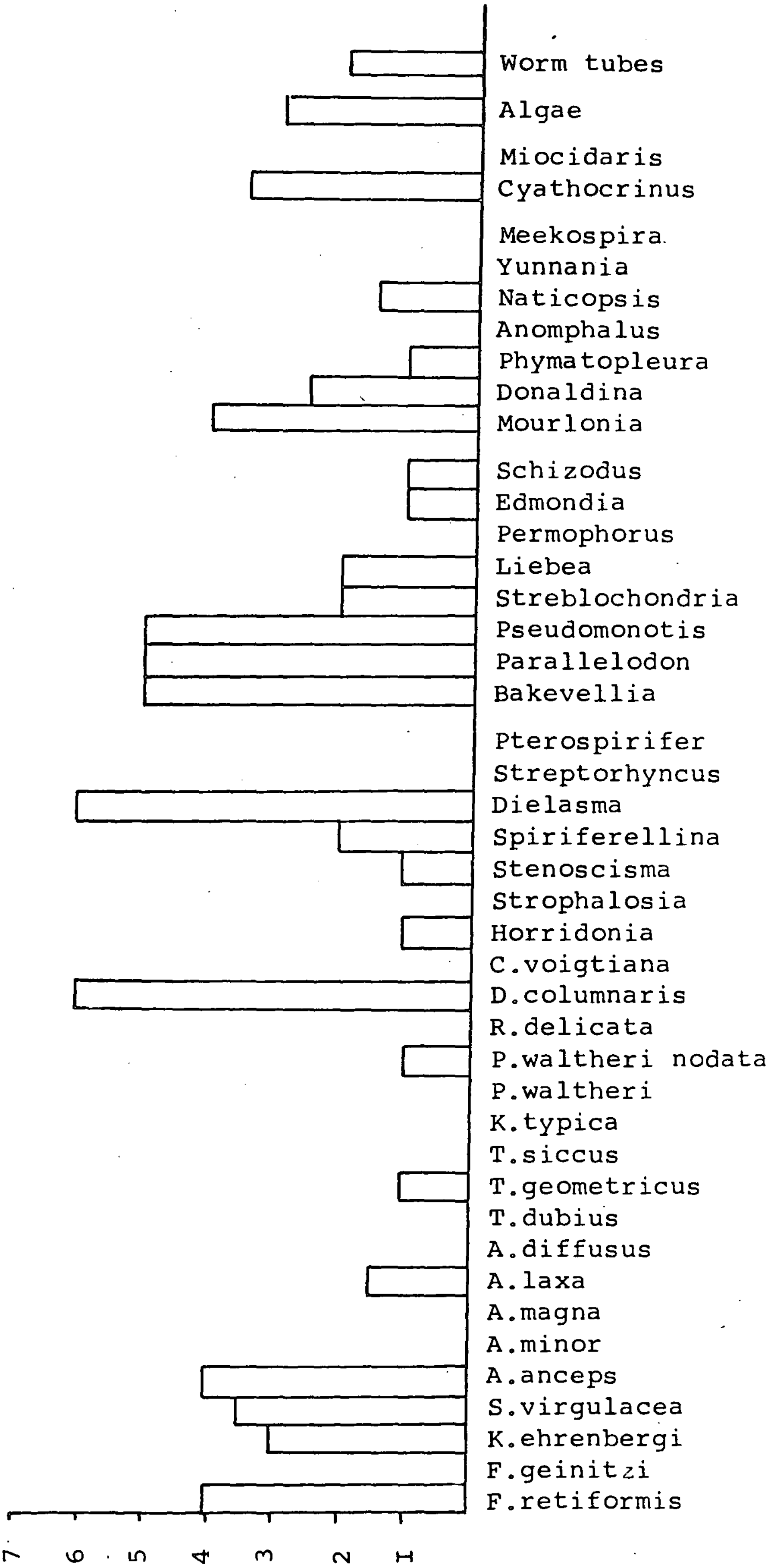

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 83. Histogram of species abundances at locality HYR.

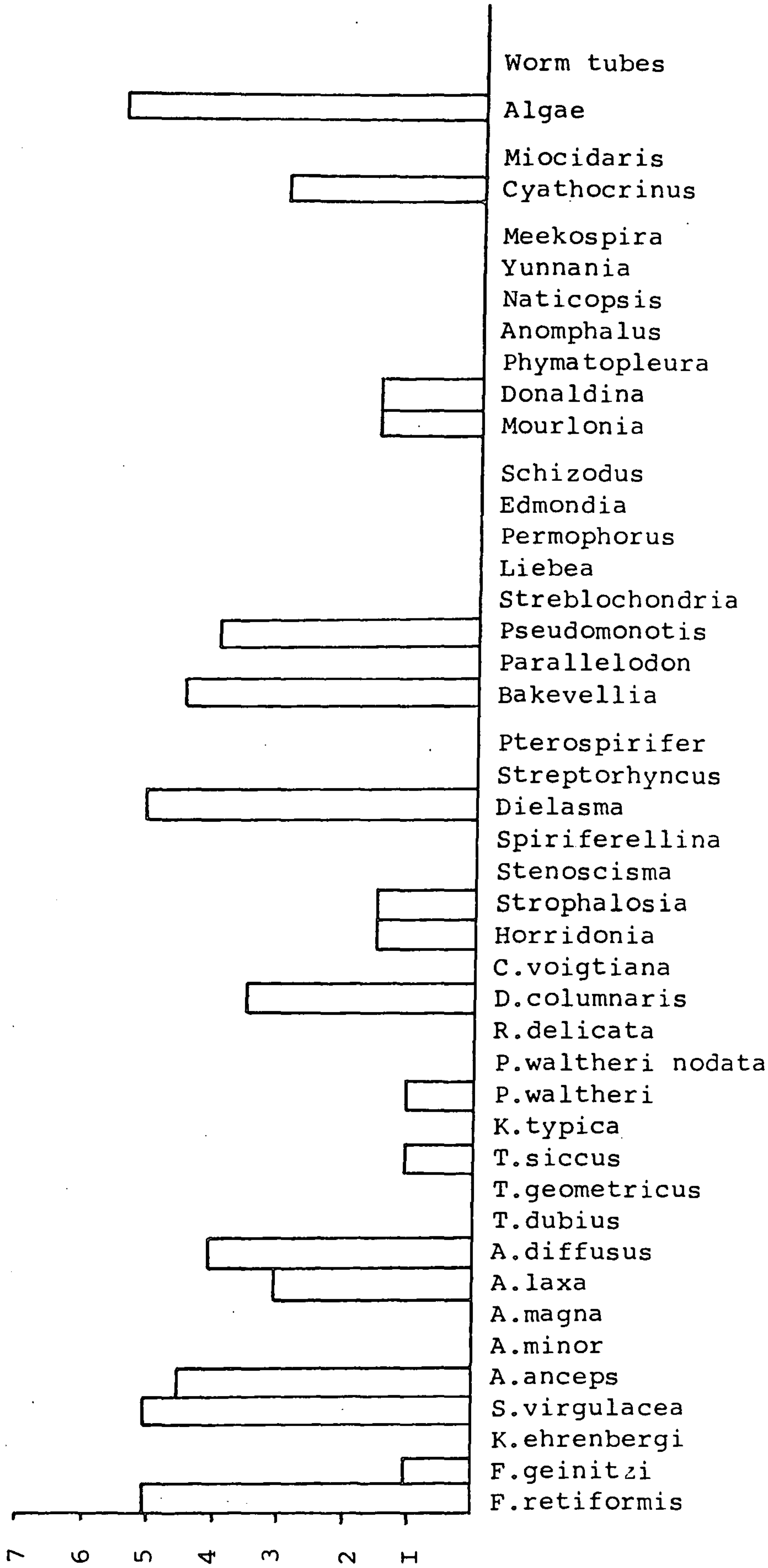

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 84. Histogram of species abundances at locality RH4.

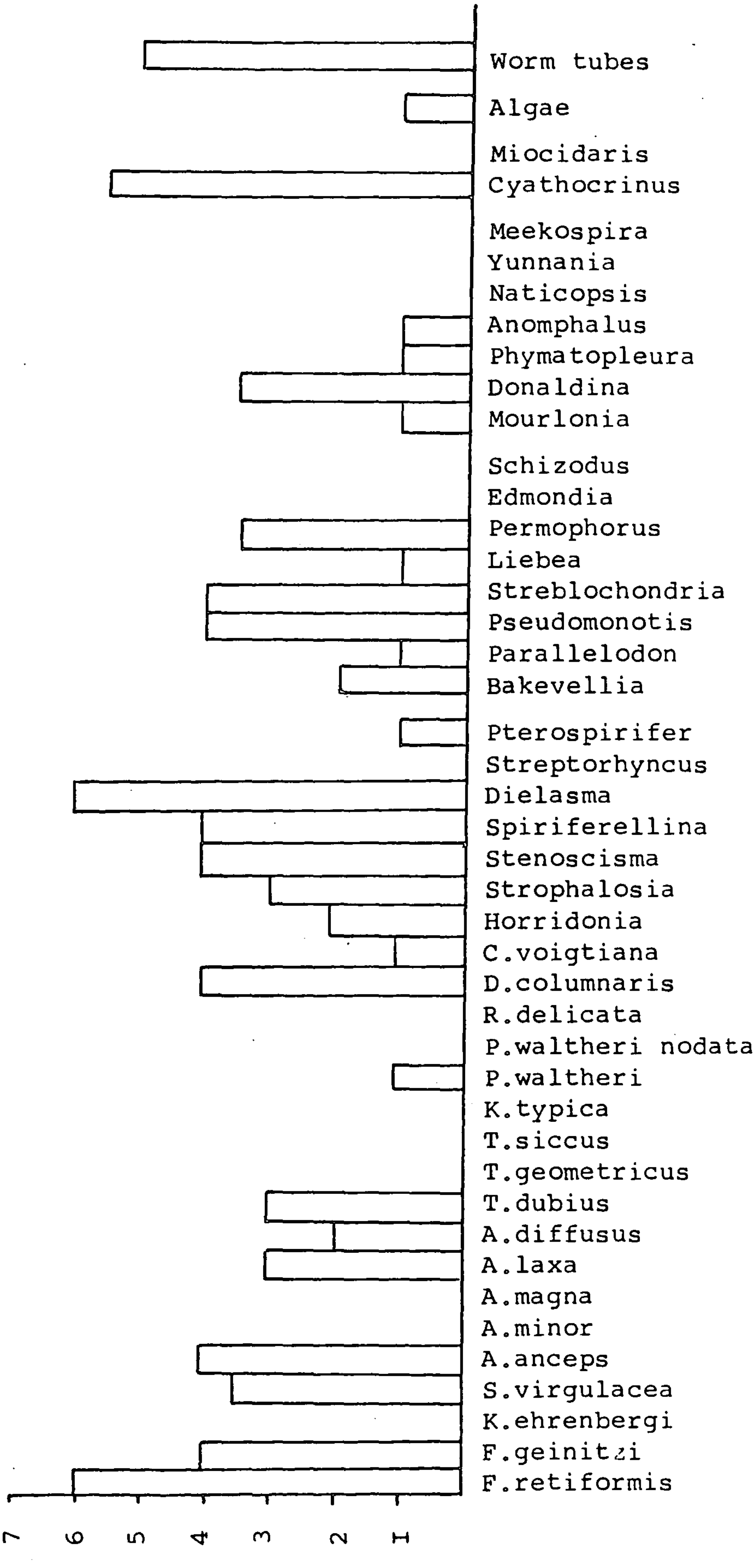
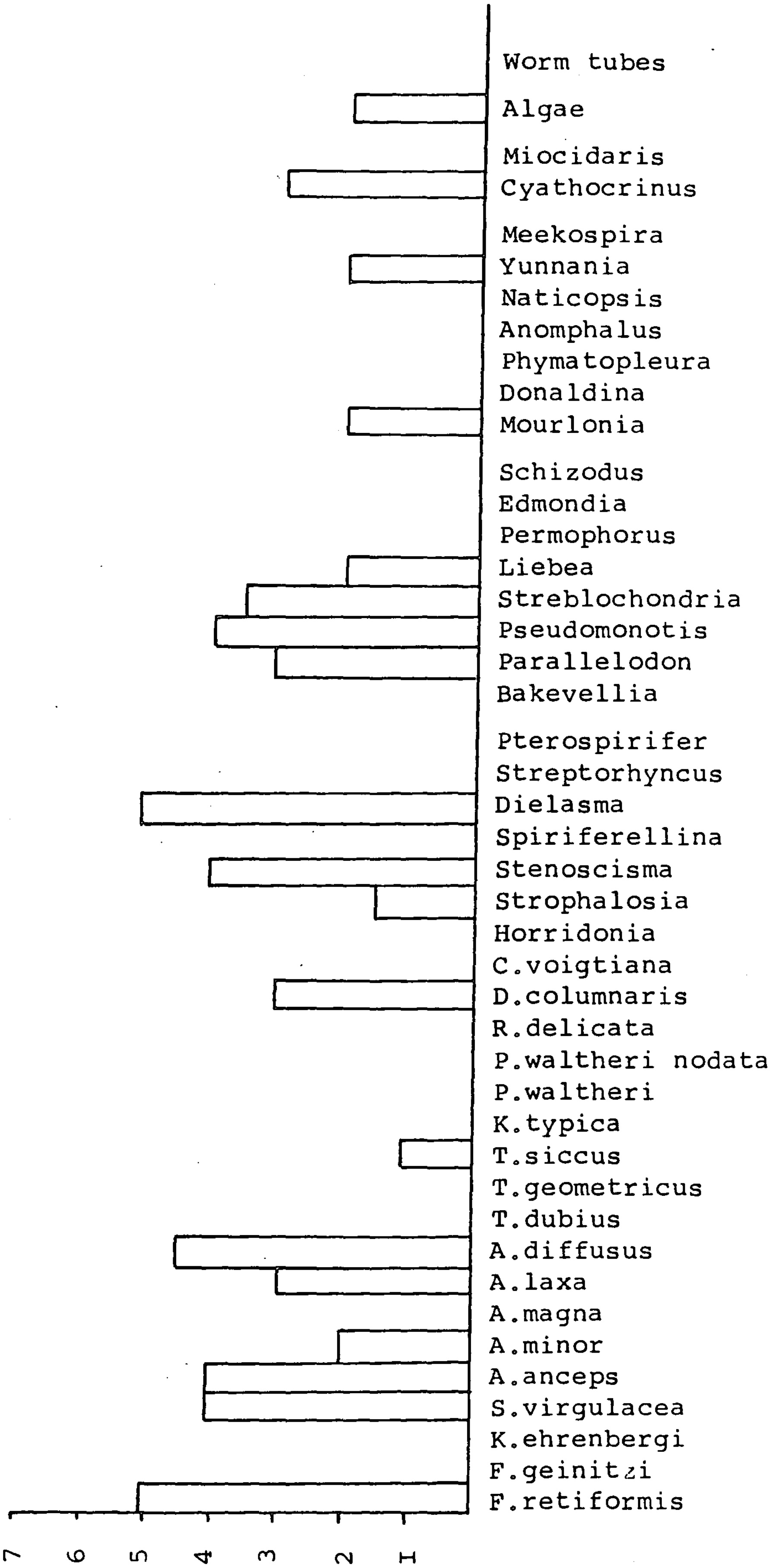

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 85. Histogram of species abundances at locality RHI.



Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 86. Histogram of species abundances at locality RH2.

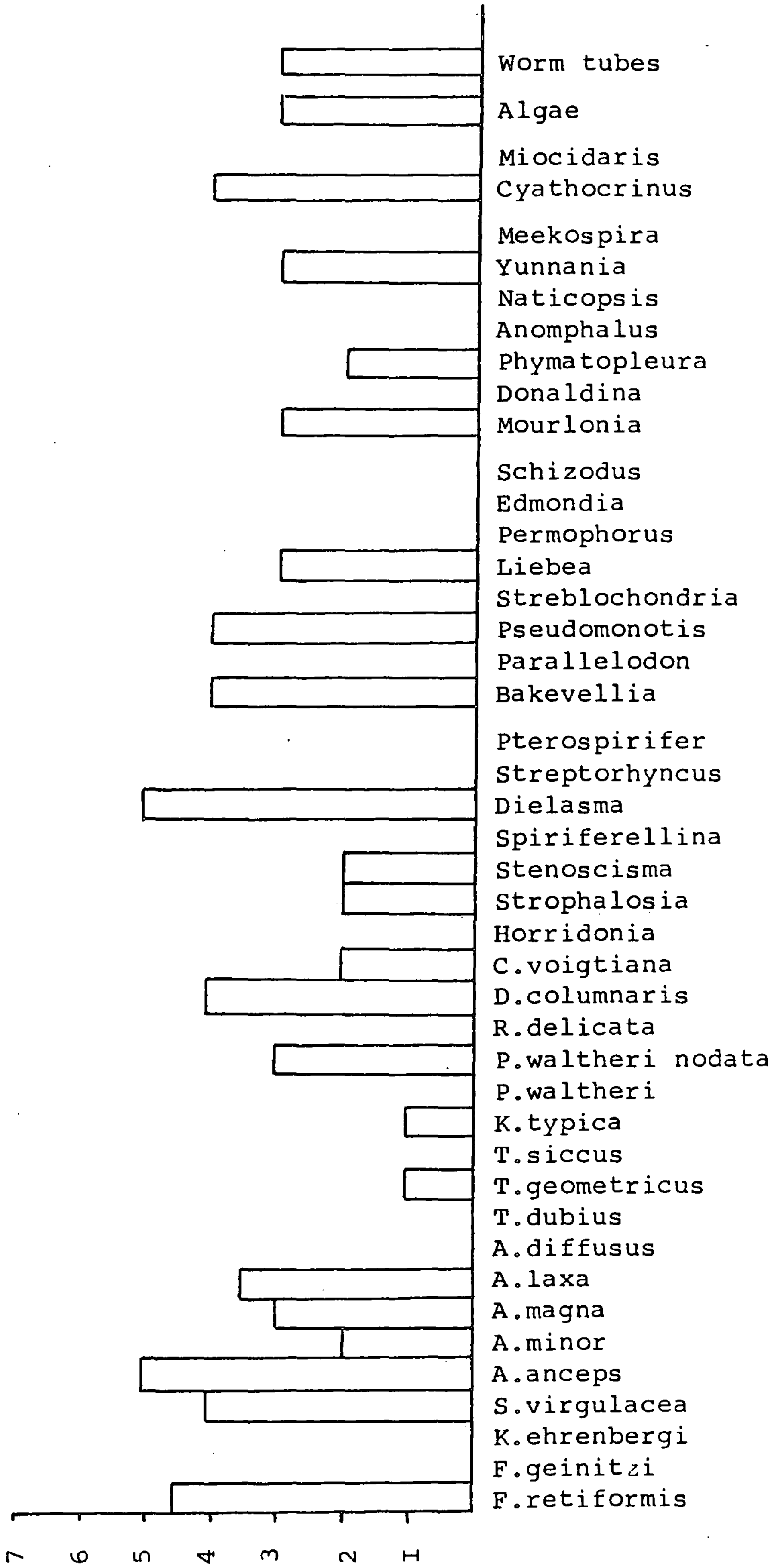

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 87. Histogram of species abundances at locality MPI.

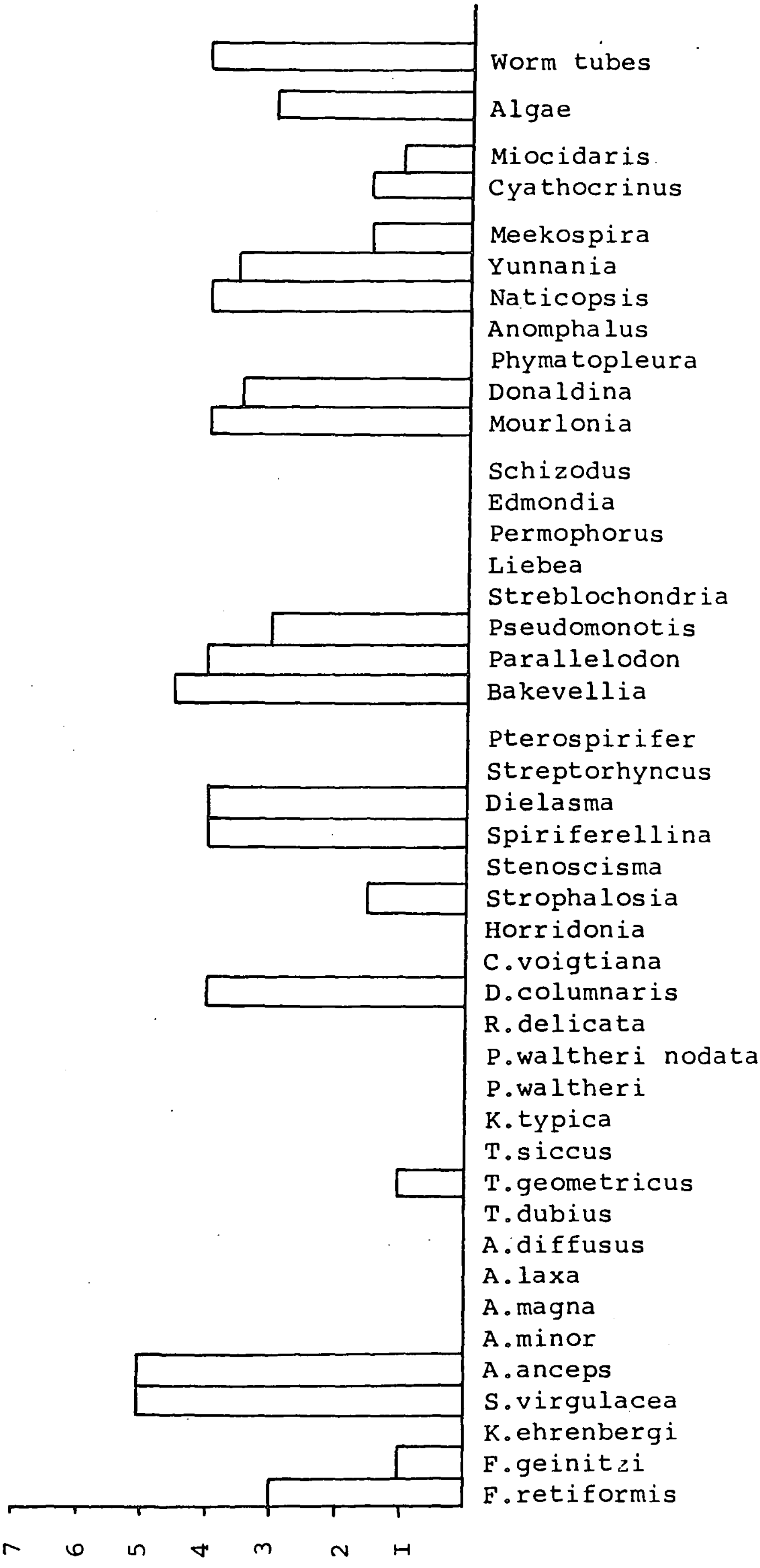

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 88. Histogram of species abundances at locality BH.

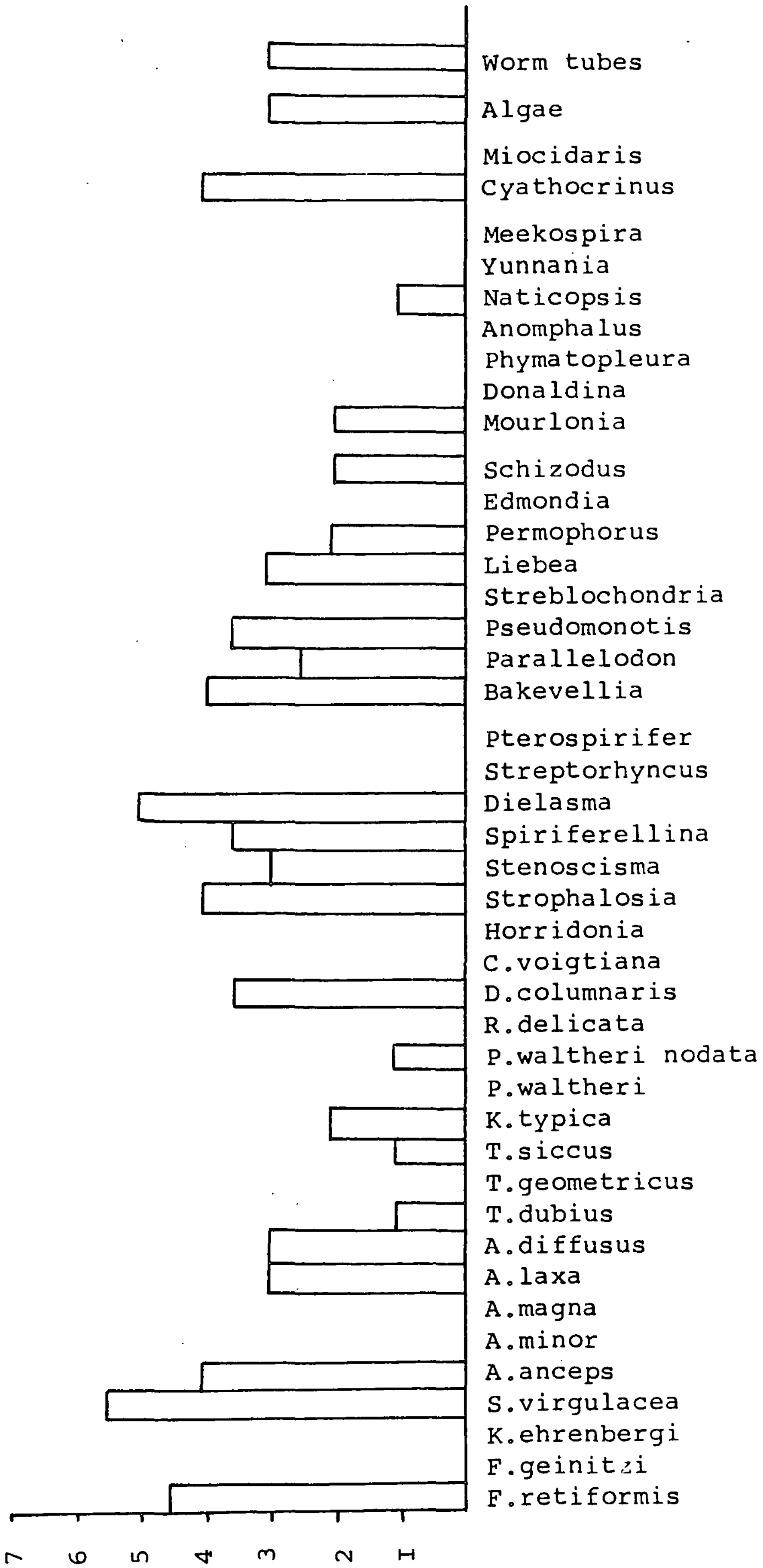

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 89. Histogram of species abundances at localities HM5 and HM7 combined.

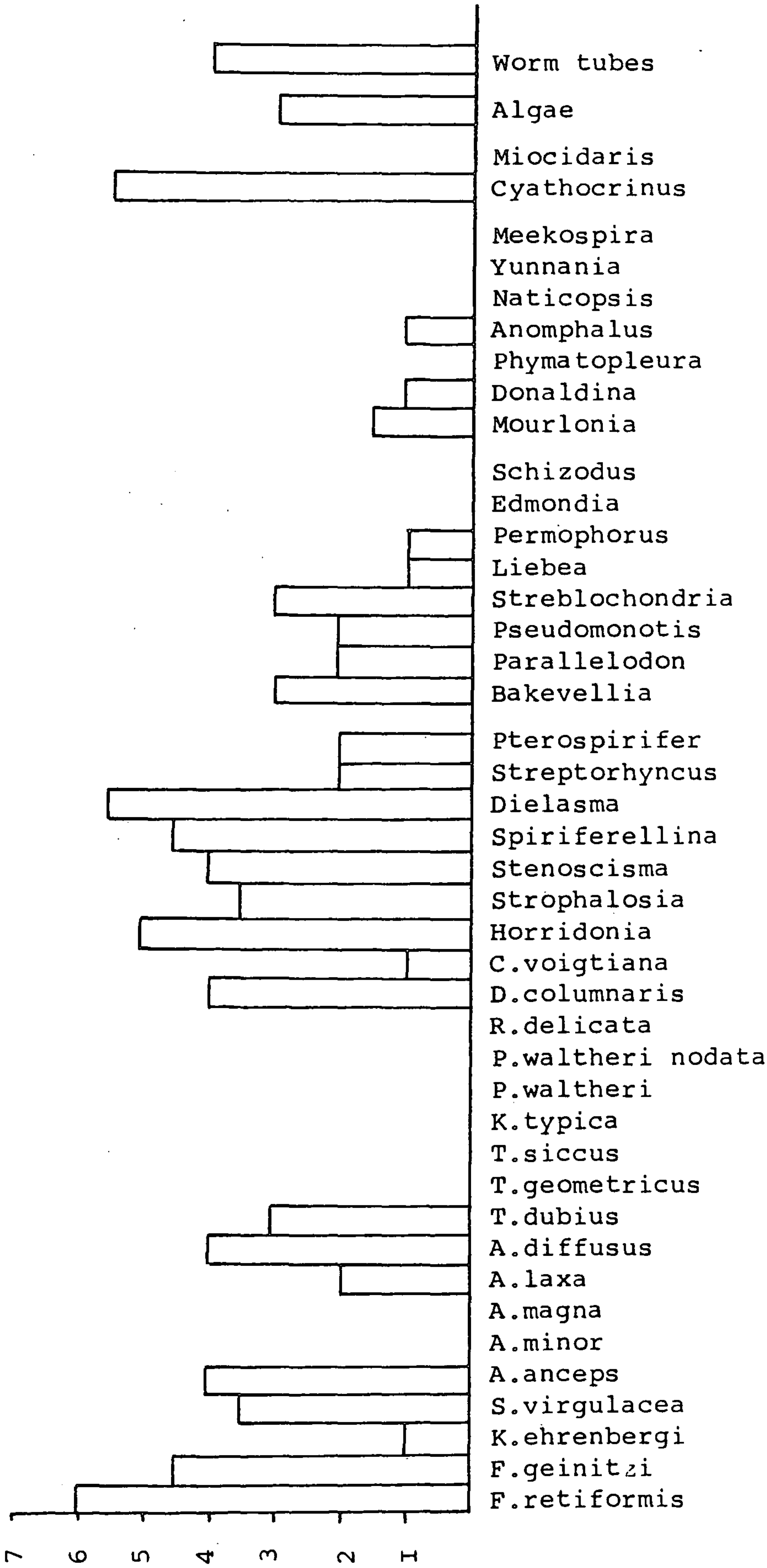

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 90. Histogram of species abundances at localities HAW,HAG and HA combined.

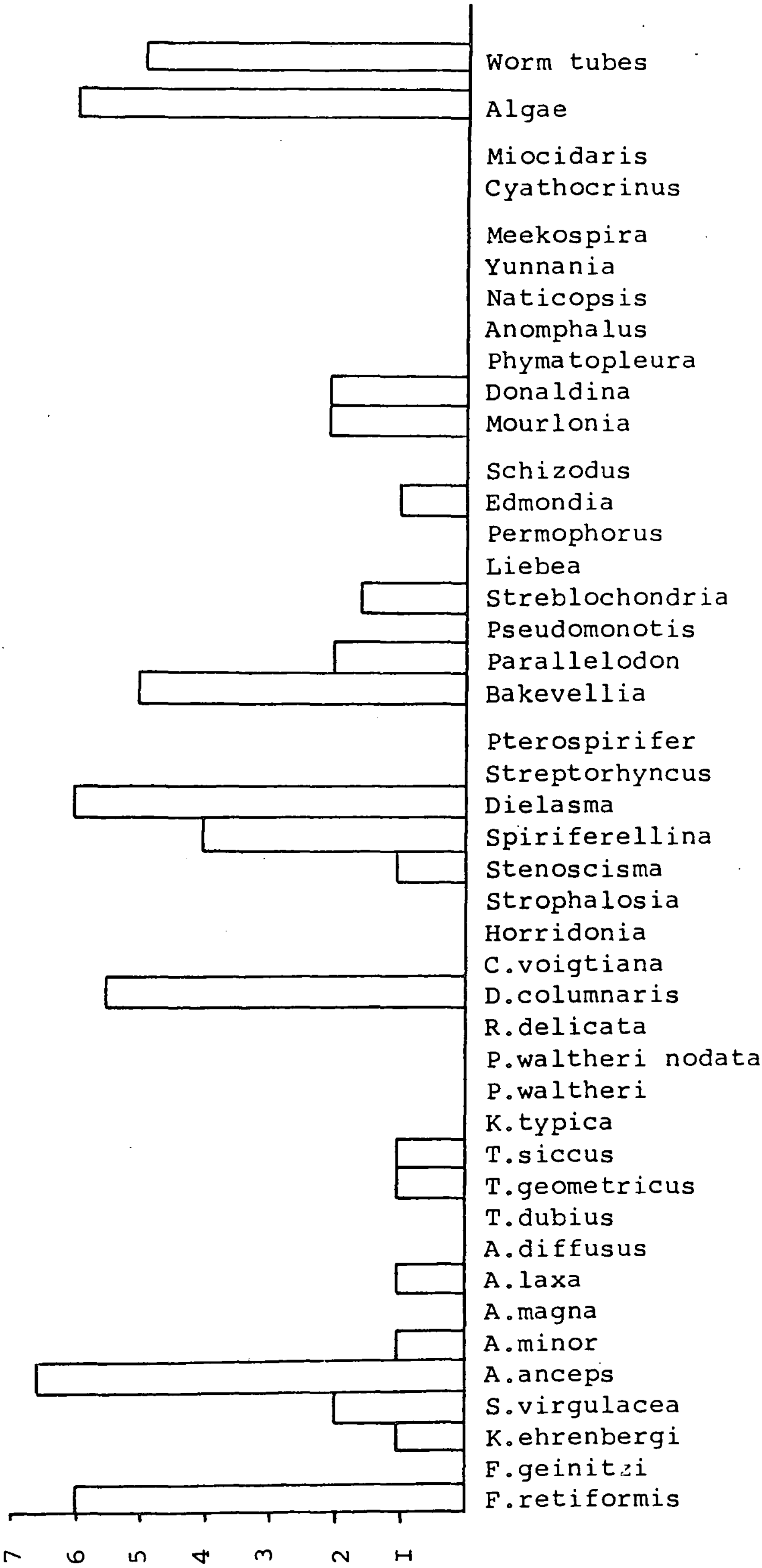
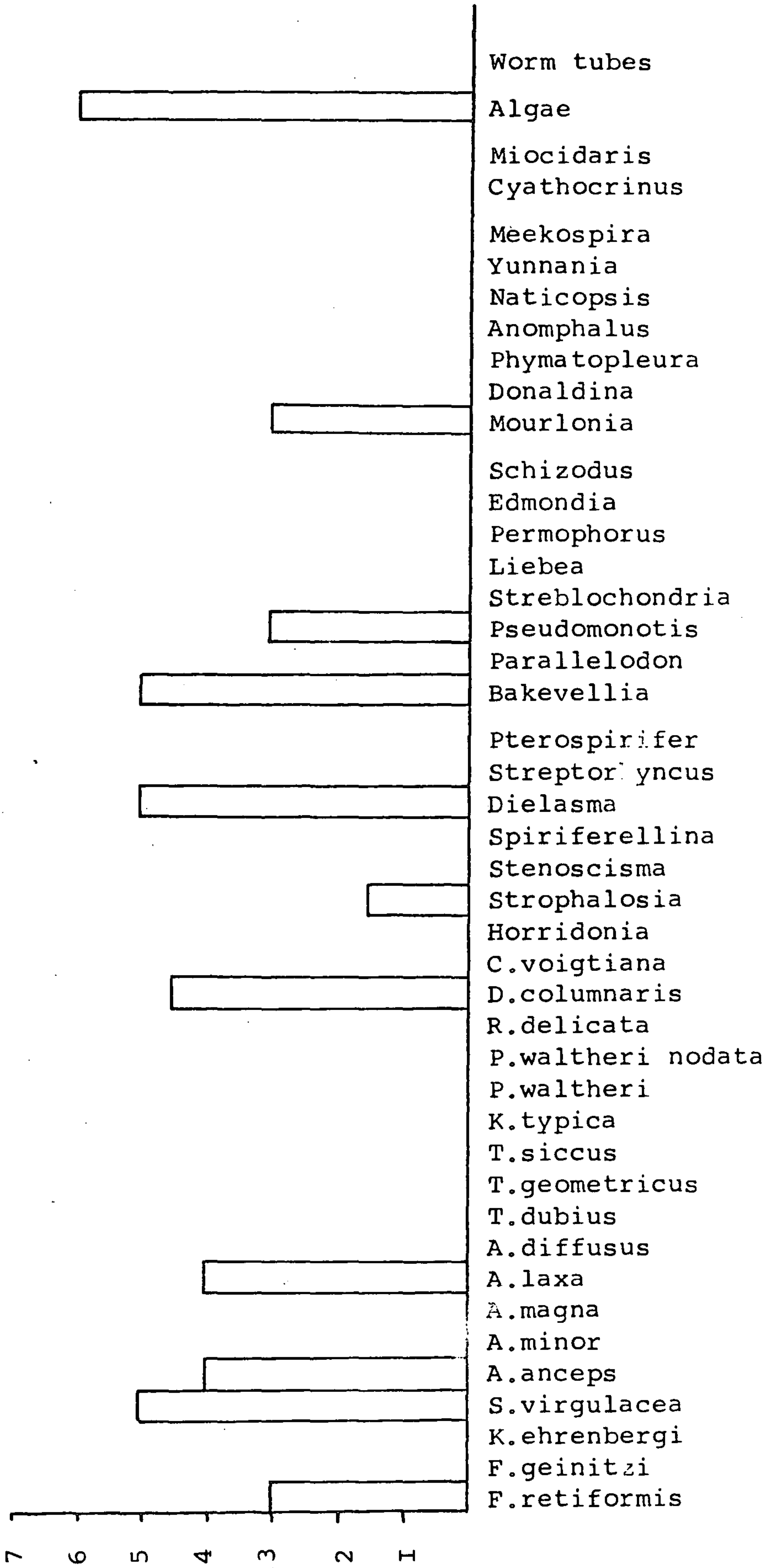

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 9I. Histogram of species abundances at locality SBC.



Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptor yncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 92. Histograms of species abundances at locality HD.

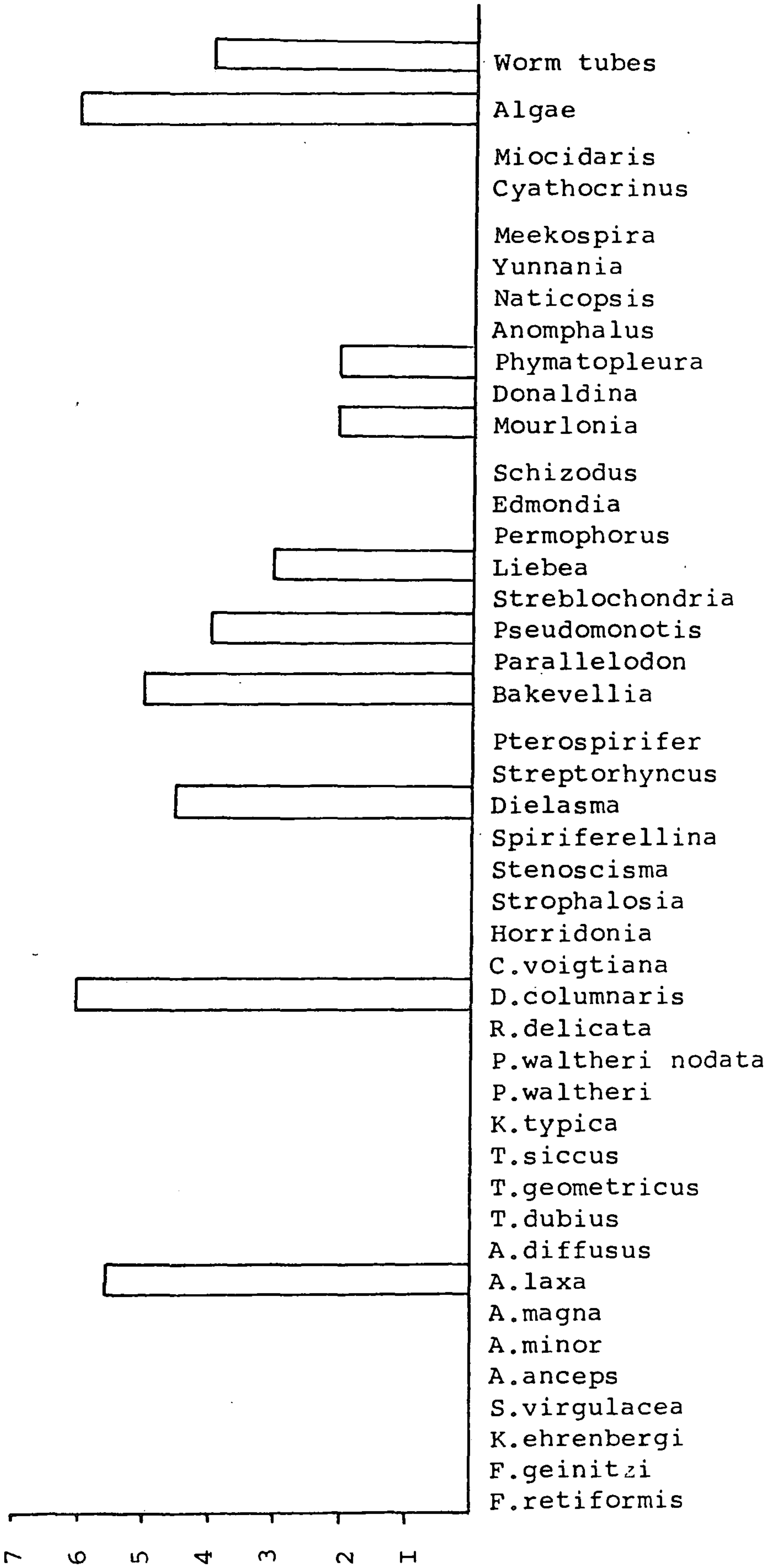

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 93. Histogram of species abundances at locality HTQ.

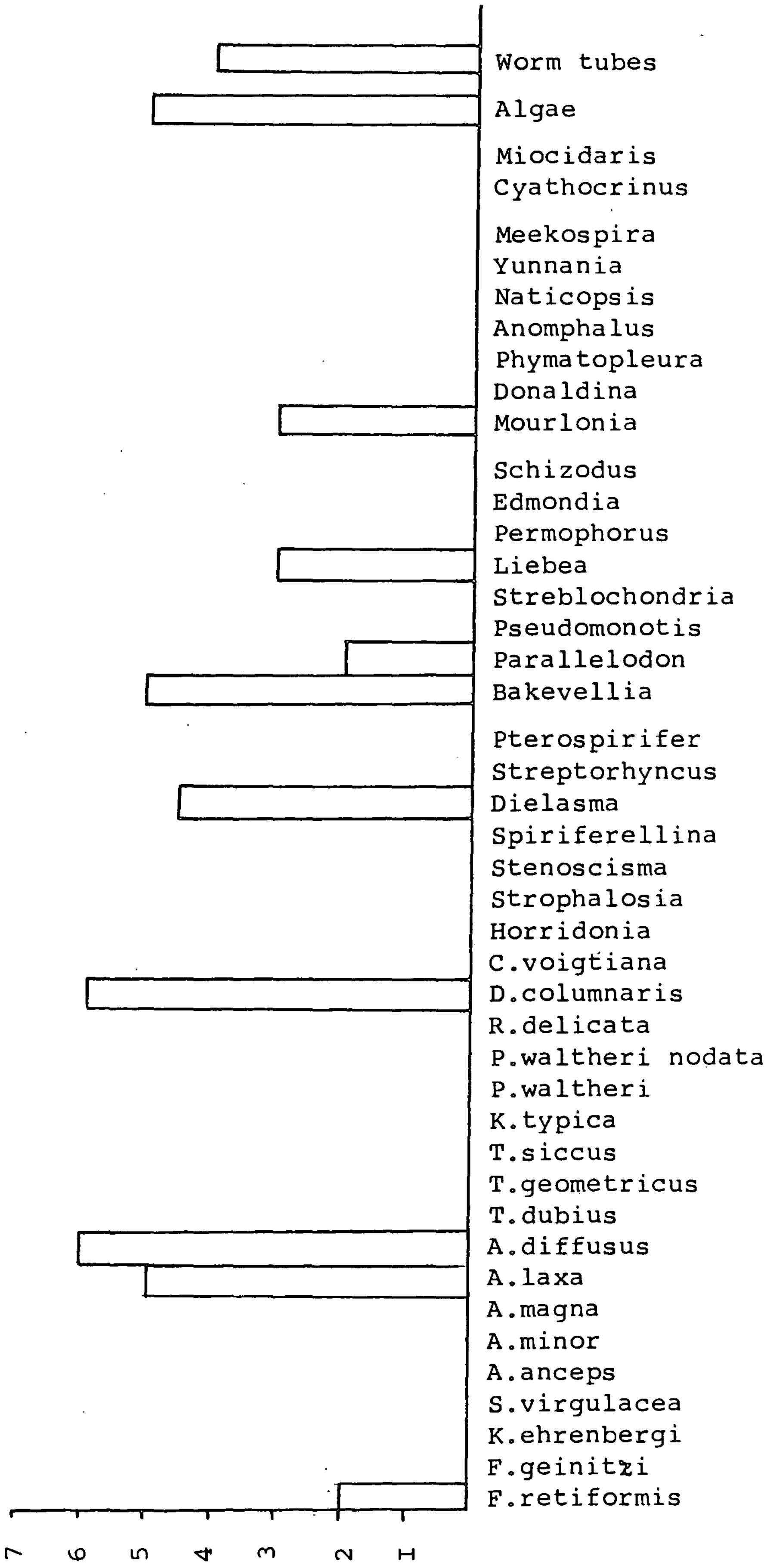

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 94. Histogram of species abundances at locality GLT.

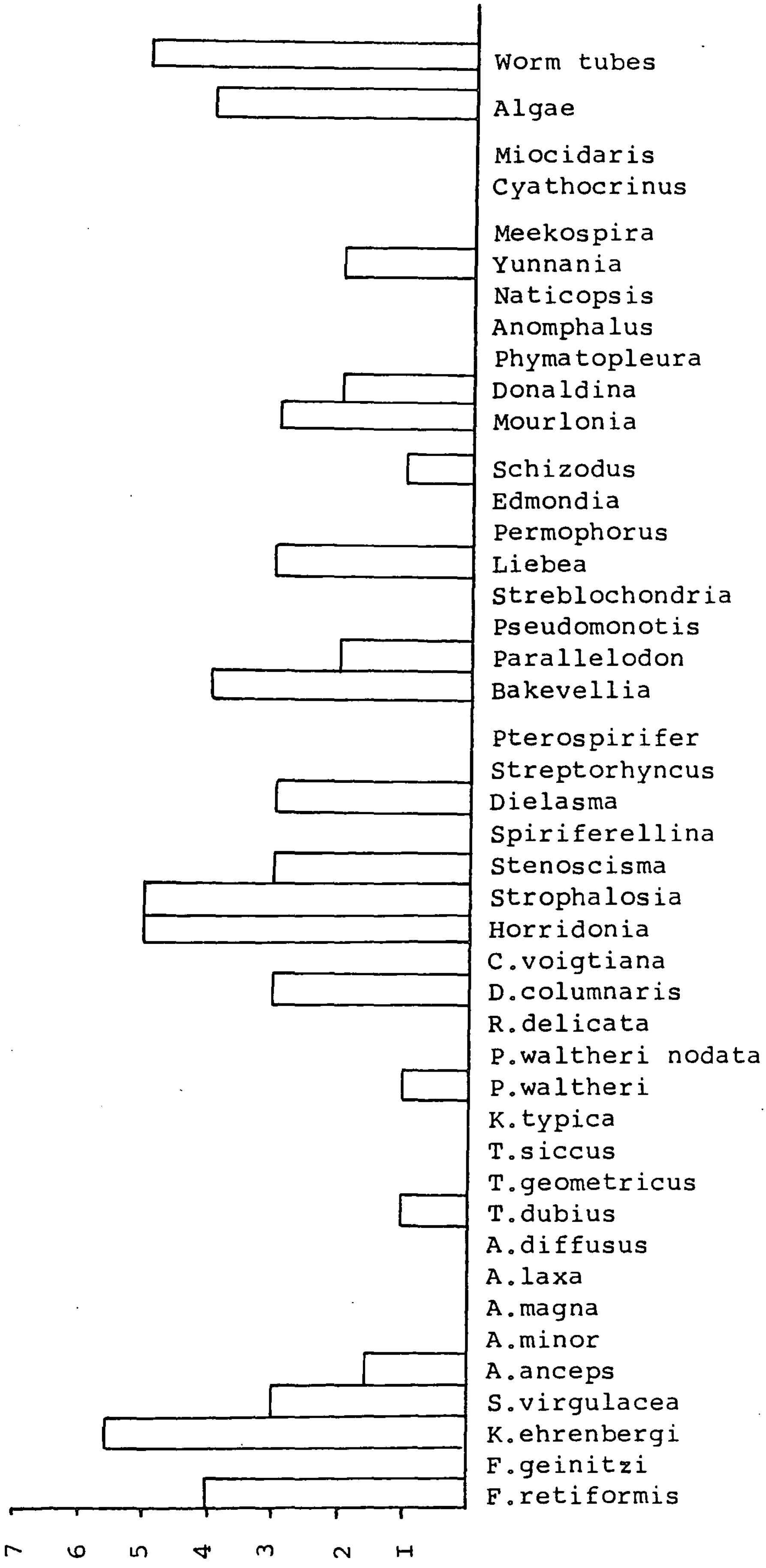

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 95. Histogram of species abundances at locality GLQ.

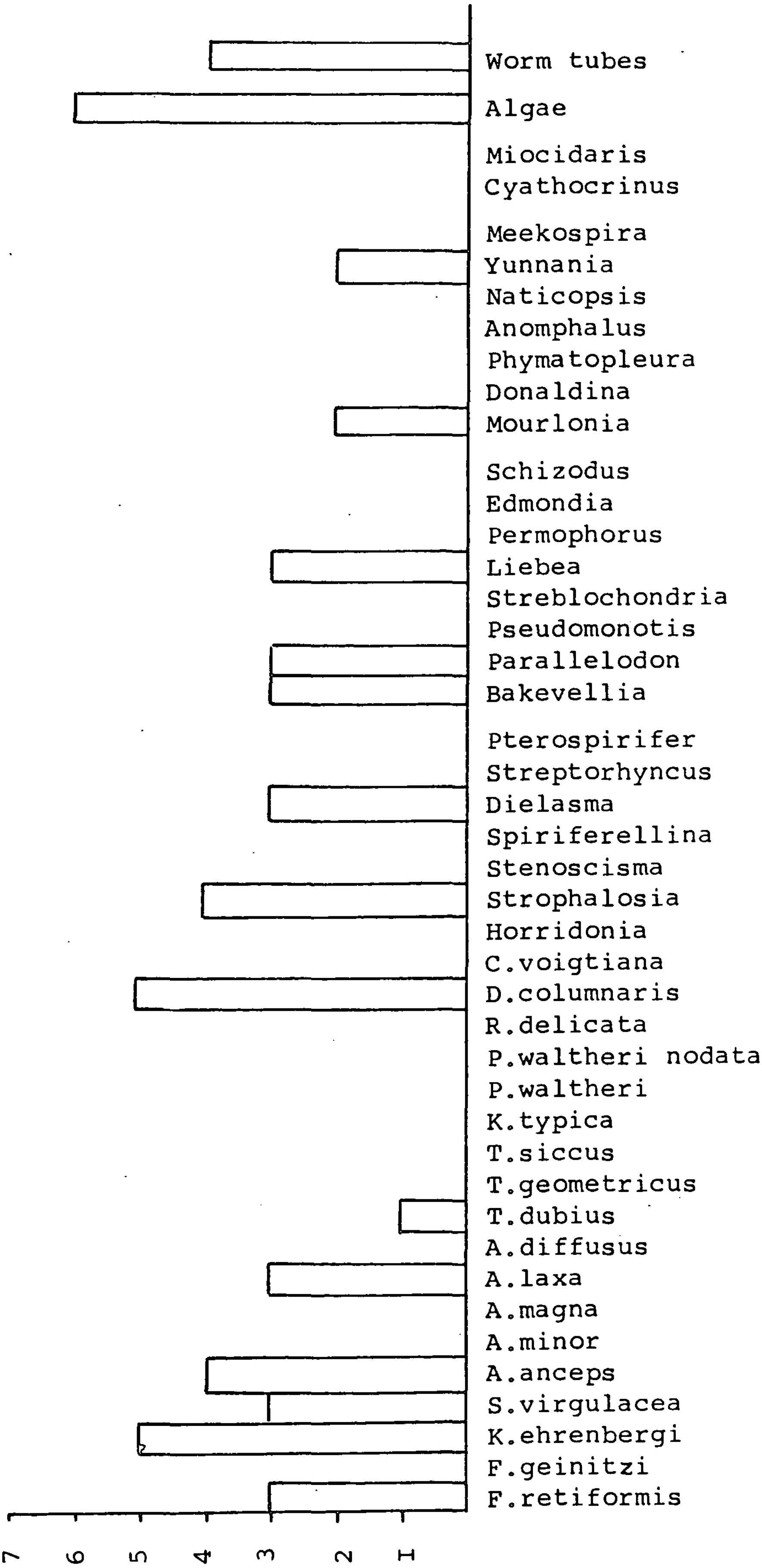

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 96. Histogram of species abundances at locality HN.

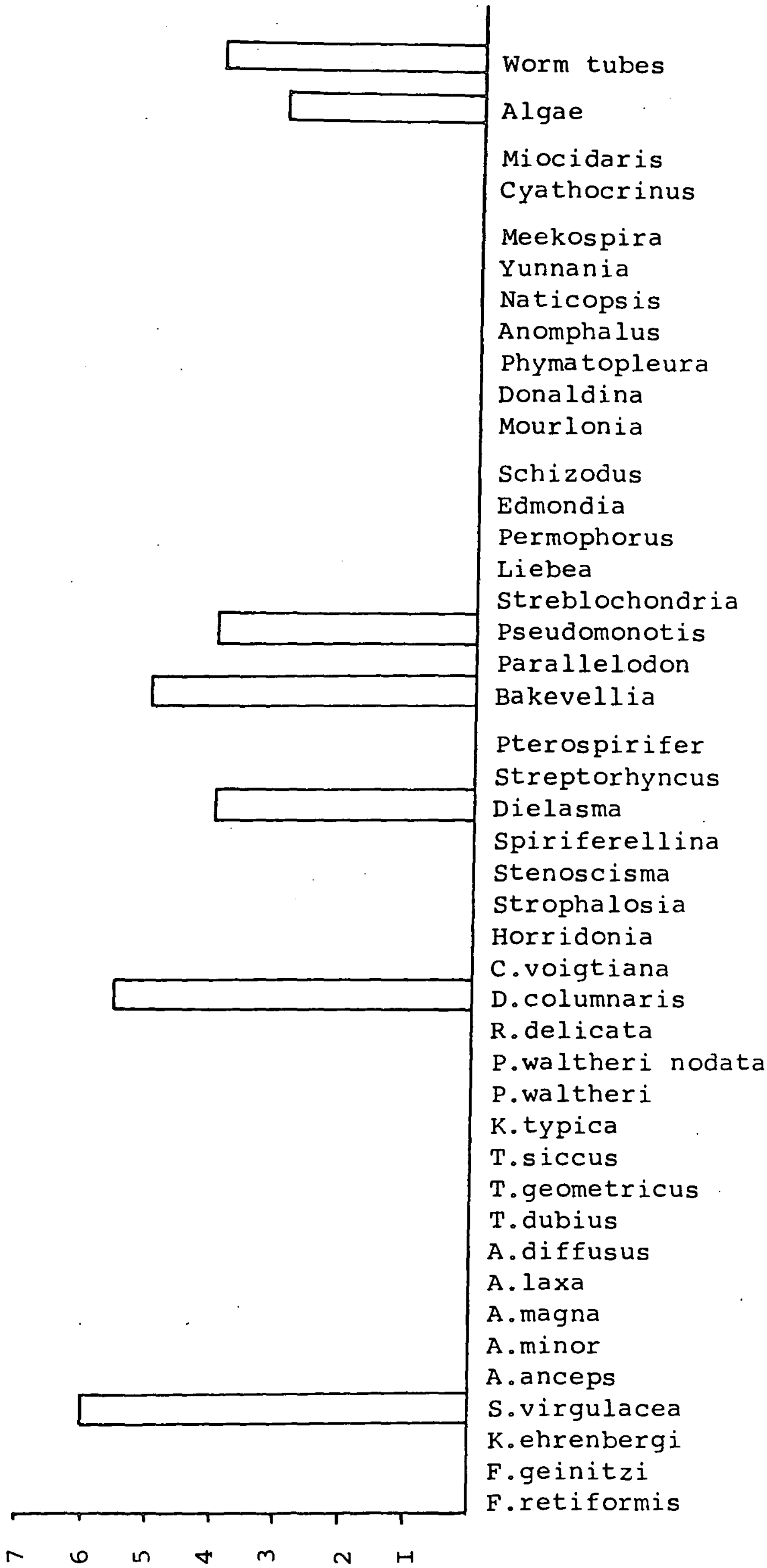

Worm tubes
Algae
Miocidaris
Cyathocrinus
Meekospira
Yunnania
Naticopsis
Anomphalus
Phymatopleura
Donaldina
Mourlonia
Schizodus
Edmondia
Permophorus
Liebea
Streblochondria
Pseudomonotis
Parallelodon
Bakevellia
Pterospirifer
Streptorhyncus
Dielasma
Spiriferellina
Stenoscisma
Strophalosia
Horridonia
C.voigtiana
D.columnaris
R.delicata
P.waltheri nodata
P.waltheri
K.typica
T.siccus
T.geometricus
T.dubius
A.diffusus
A.laxa
A.magna
A.minor
A.anceps
S.virgulacea
K.ehrenbergi
F.geinitzi
F.retiformis
7
6
5
4
3
2
1

Figure 97. Lithified crust. Diagrammatic representation, see also Plates 53 and I36.
Unit"B" is the crust, averaging about 2cm. in thickness.
Unit"A" is above the crust and contains a relatively diverse fauna - a colony of Dyscritella encrusts the hardground but has been overgrown by a colony of Kingopora ehrenbergi (shown in outline drawing).
The lower surface of Unit"B" acts as substratum for algae and ?worm tubes which clearly grow downwards from the surface.

Unit"C" is interpreted as the former site of a crevice beneath the lithified crust - its base is not seen.

The heavy black lines represent the top and bottom of the lithified crust.

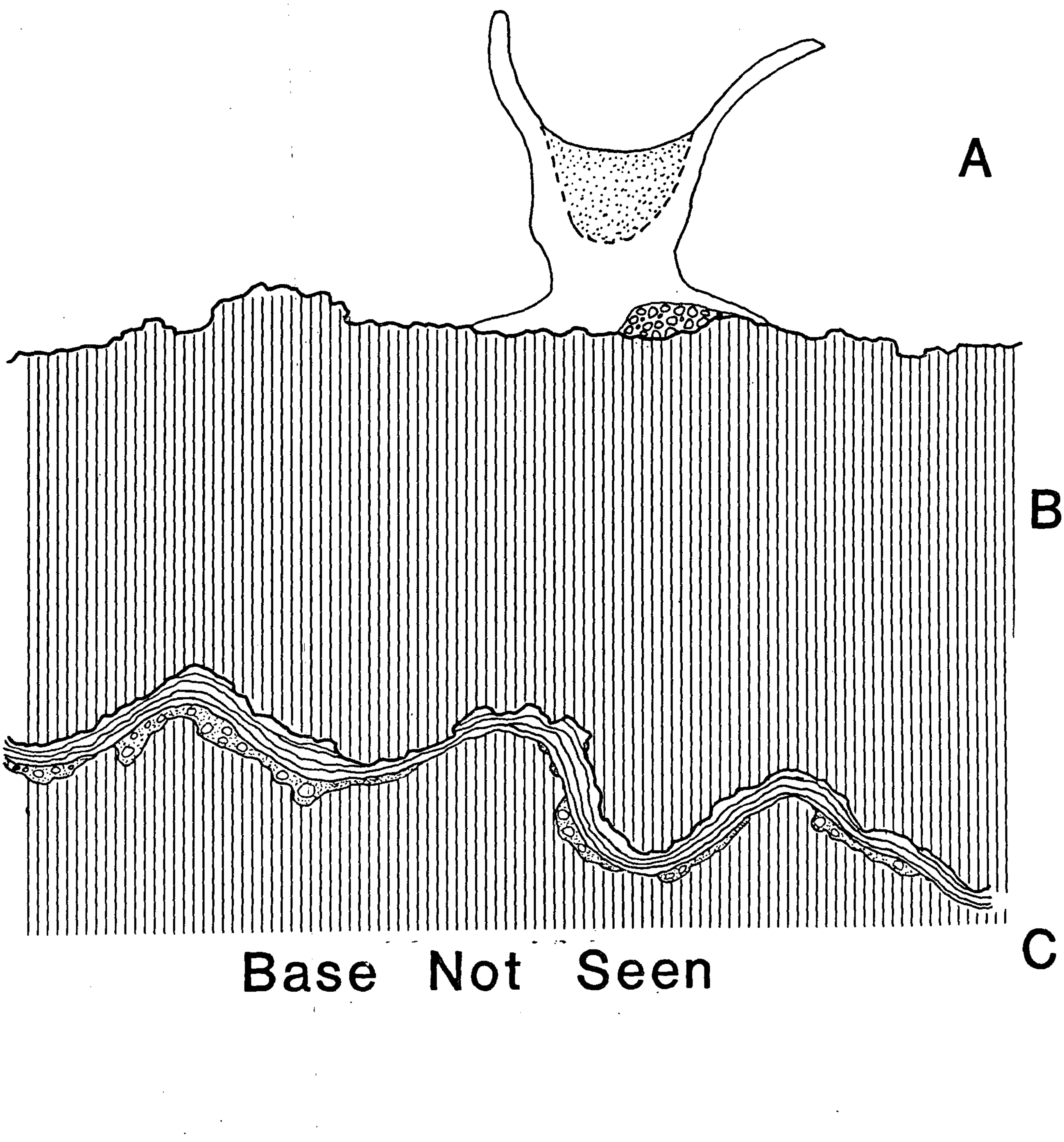
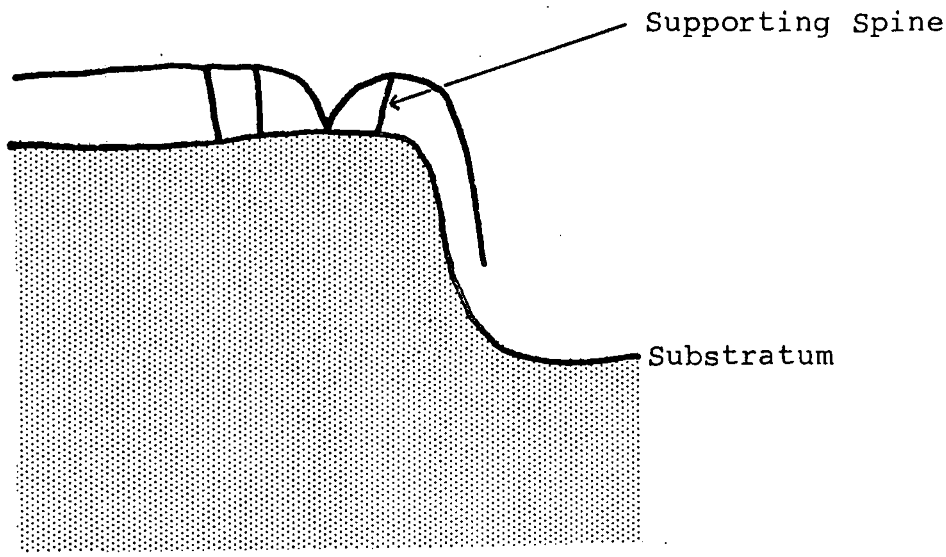

A
B
C
Base Not Seen

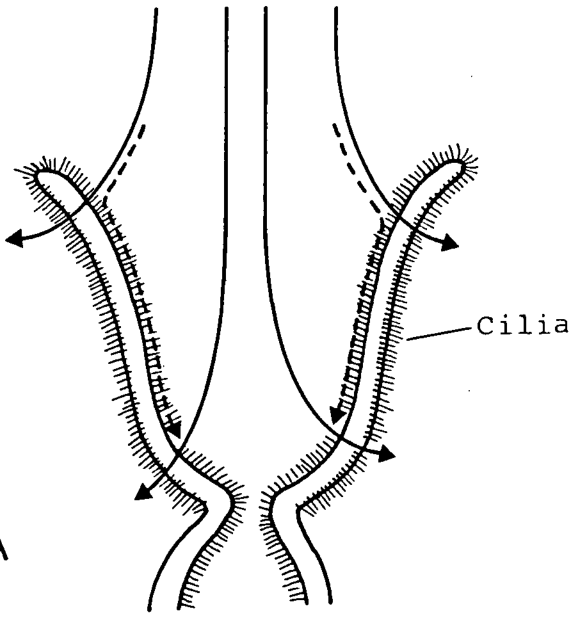
Figure 98. Schematic diagram of _Synocladia_ _virgulacea_ (MPI.80) to show growth of branches 'below' the level of the colony origin - thus demonstrating the existence of small scale topographic irregularities (see Pl.137).



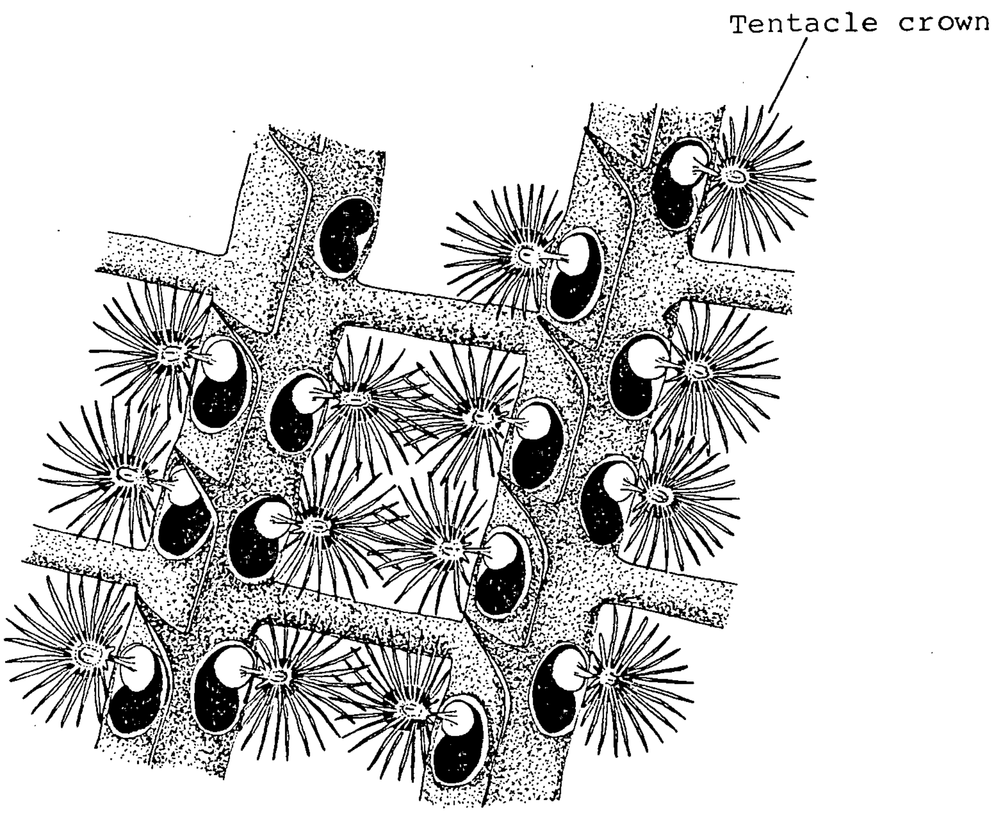
Supporting Spine
Substratum

Figure 99. A. Cross-section through a bryozoan tentacle crown to show the passage of food particles (After Strathmann(I973)).Unbroken line= path of particle when bryozoan is not feeding.Broken line=path of particle retained during active feeding.

B. Cowen and Rider's(I972) model for active filter-feeding in fenestellids.Tentacle crowns are expanded laterally into fenestrules and draw a unidirectional current from the obverse to the reverse side,through the fenestrules.
See p.35I for discussion.



A

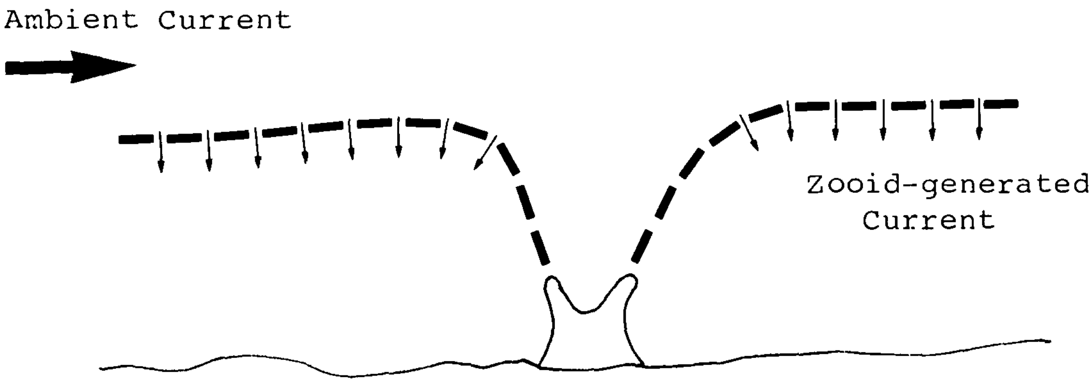


B

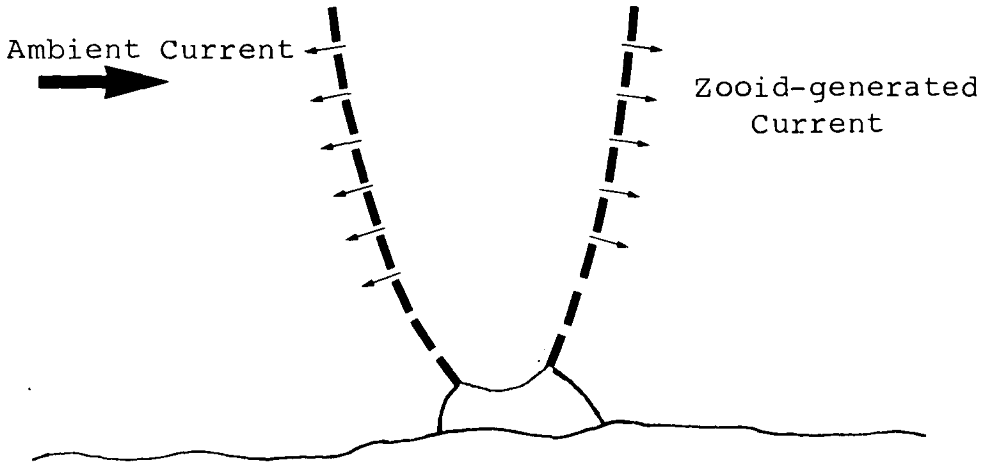
Figure 100. Zooid-generated currents in relation to unidirectional ambient currents for colonies of Fenestella retiformis (assuming filtering from the obverse to the reverse surface).

A. When the zoarium forms a sub-horizontal expansion tentacle crowns are on the upper surface and zooid-generated flow is relatively unperturbed by high energy ambient currents.

B. When the zoarium forms a steeply erect cone, ambient currents impinging on the reverse surface may disrupt zooid-generated flow over a substantial part of the zoarium.


Ambient Current
Zooid-generated Current

A


Ambient Current
Zooid-generated Current

B

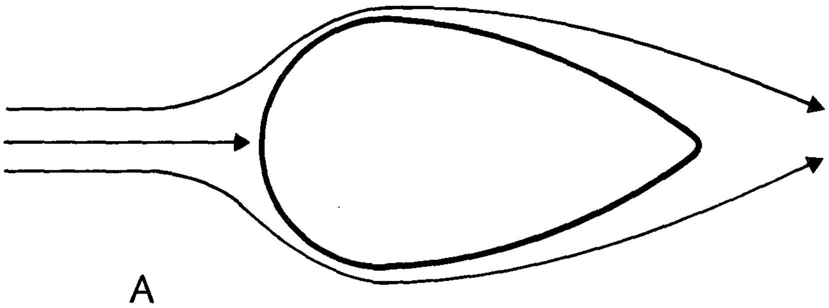
Figure IOI. Flow around various shaped bodies.
Reynolds number approx.=IO.
(From Michell(I970)).

A. Streamlined body - laminar flow maintained.

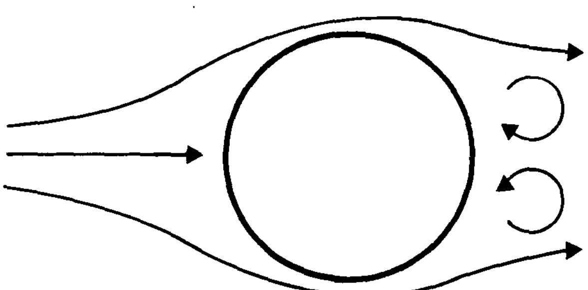
B. Cylindrical body - eddies develop on the lee-side.

C. Flat disc - eddies develop on the lee-side.

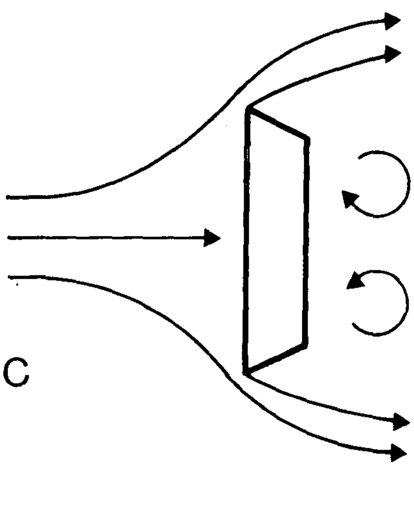
The maintenance of eddies on the lee-side requires energy which is derived from the main stream.



A

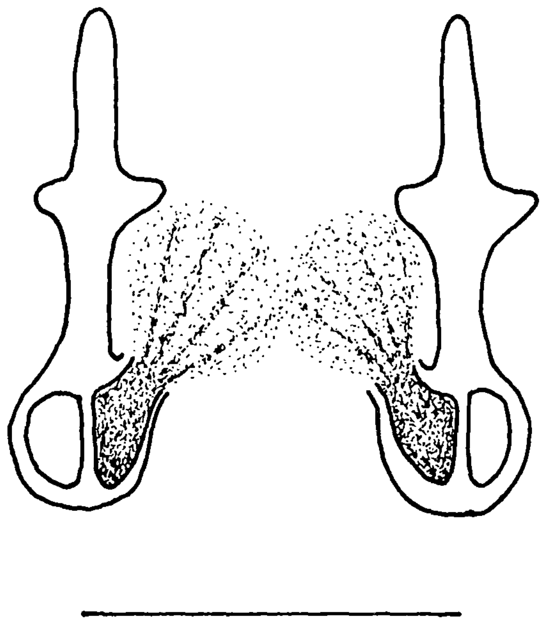


B



C

Figure IO2. Transverse section of branches of *Fenestella retiformis* showing two zooids with tentacles protruded into the fenestrule.Drawn to scale to allow estimation of probable tentacle crown size.



0.5mm

Figure IO3. The relative cross-sectional areas of the open ends of zoaria of _Kingopora ehrenbergi_ - one a perfect cone, the other bilaterally compressed. With the same circumference in each case a perfect cone has a much larger cross-sectional area. Assuming the same pressure head, the velocity of flow through the smaller area is greater.

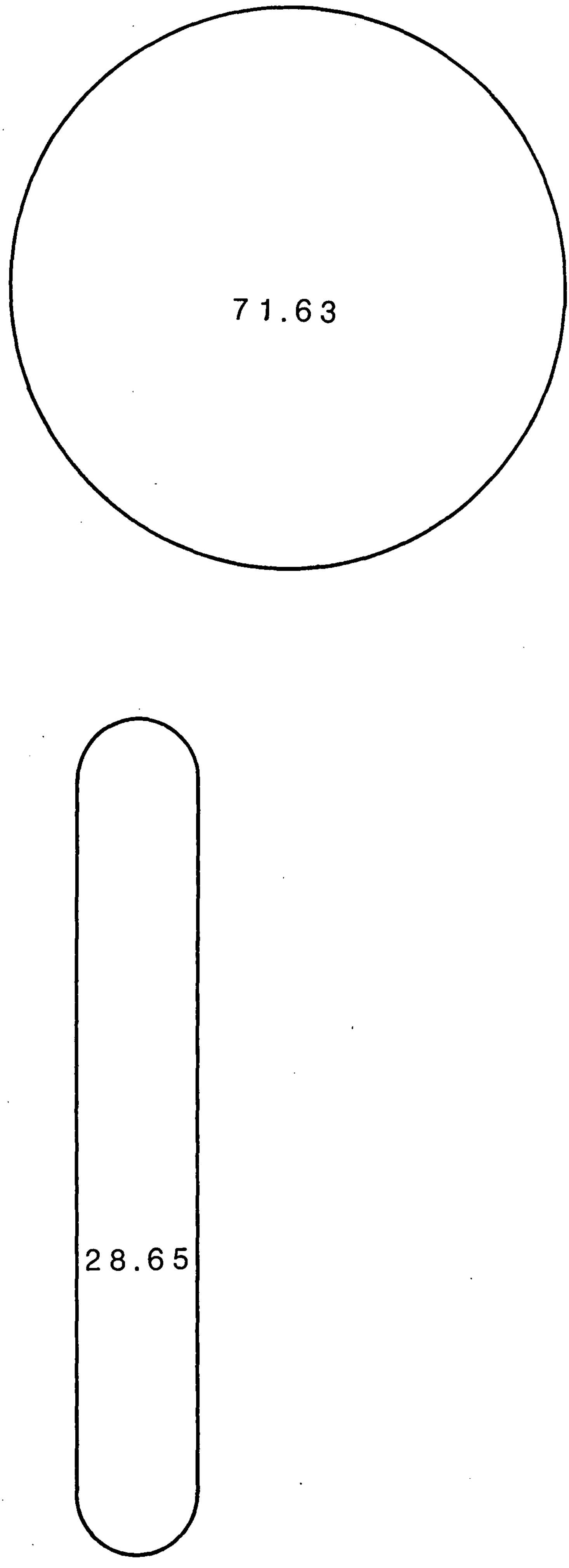

71.63
28.65

Plate I. Fenestella retiformis Schlotheim

Fig.a Sub-horizontal expansion of a zoarium.
HYR 5.Bar scale-Icm

Fig.b Zoarial morphology - festoons well-developed.
B34.Bar scale-Icm

Fig.c Zoarial morphology - festoons well-developed.
B42.Bar scale-3cm

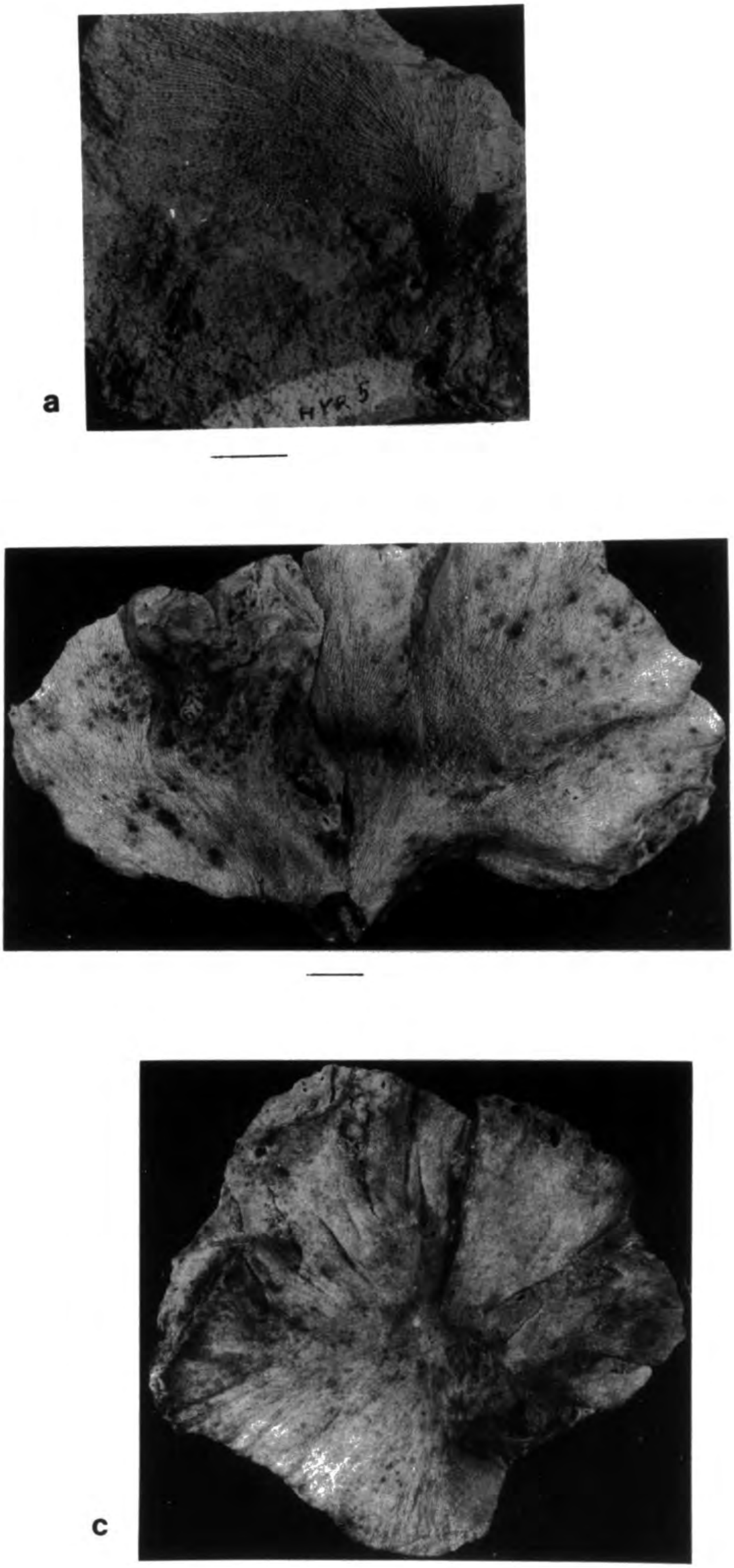

a
HYR 5
b
c

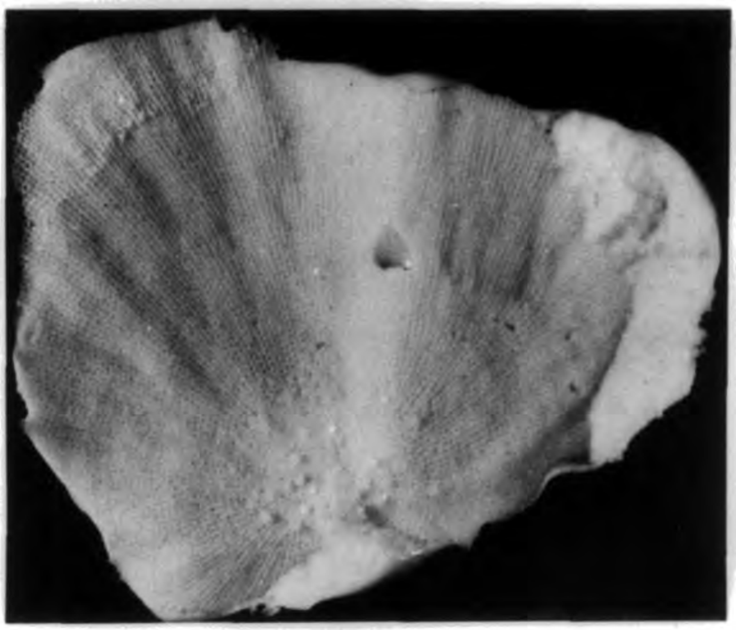
Plate 2. _Fenestella_ _retiformis_ Schlotheim

Fig.a Zoarial morphology-festoons well-developed. HAI.Bar scale-Icm

Fig.b Spines clustered around the zoarial origin.Silicone mould of specimen B27. Bar scale-Icm

Fig.c Zoarial morphology showing a small area with constricted fenestrules(arrowed). HM2.Bar scale-Icm

a



b

c

Plate 3. *Fenestella retiformis* Schlotheim

Fig.a Intra-zoarial fusion of branches.
HAW80.Bar scale-Icm

Fig.b Intra-zoarial fusion of branches.
HAW55.Bar scale-Icm

a

b

Plate 4. *Fenestella retiformis* Schlotheim

Fig.a The occurrence of several branch bifurcations at the same level in the zoarium causes crowding of branches.Colony-wide increase in bifurcations may be related to exogenous factors.BI2I.Bar scale=Icm

Fig.b Growth of branches at right angles to the main colony growth direction. HA7.Bar scale=Icm

Fig.c Fusion of the opposite ends of a spiral zoarial lamina.MPI.63.Bar scale-Icm

Fig.d Branches at a high angle to the main growth direction(arrowed).B35A. Bar scale=Icm

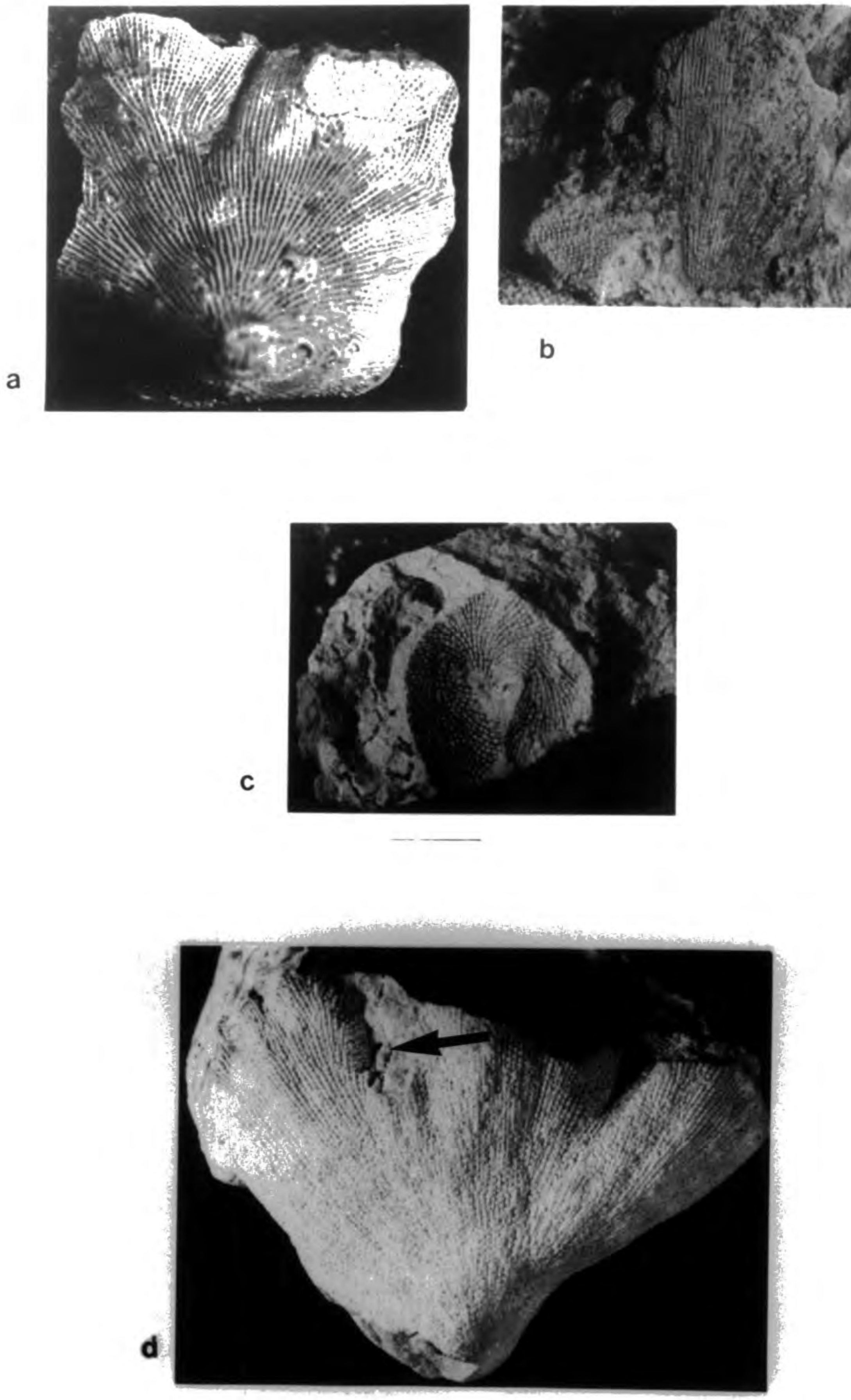
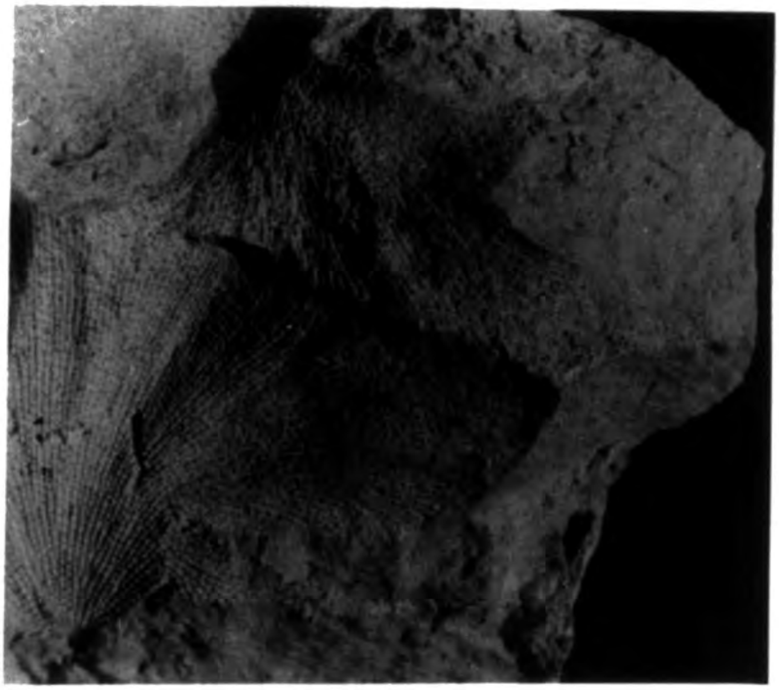

a
b
c
d

Plate 5. Fenestella retiformis Schlotheim

Fig.a Fusion of the branches of two separate colonies of the species.HA20.Bar scale=Icm

Fig.b Detail of above.Bar scale=Icm

a

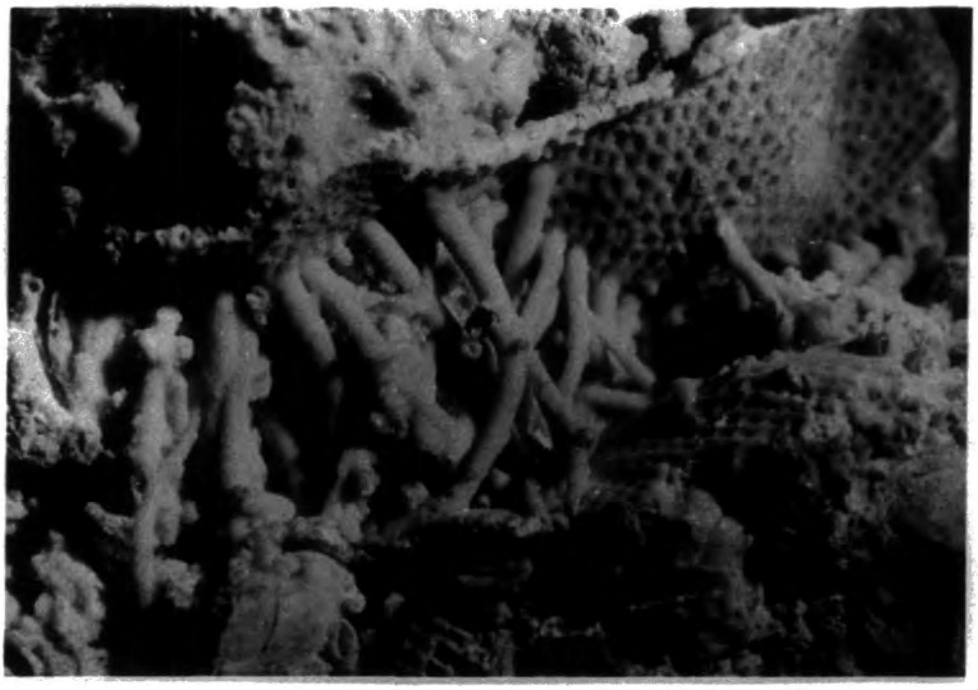


b

Plate 6. <u>Fenestella</u> <u>retiformis</u> Schlotheim

Fig.a Numerous densely-spaced spines joining two zoarial laminae(probably of separate colonies).G3.55.I.Bar scale=Icm

Fig.b Zoarium showing moulds of spines which link adjacent zoarial laminae. B28.Bar scale=Icm



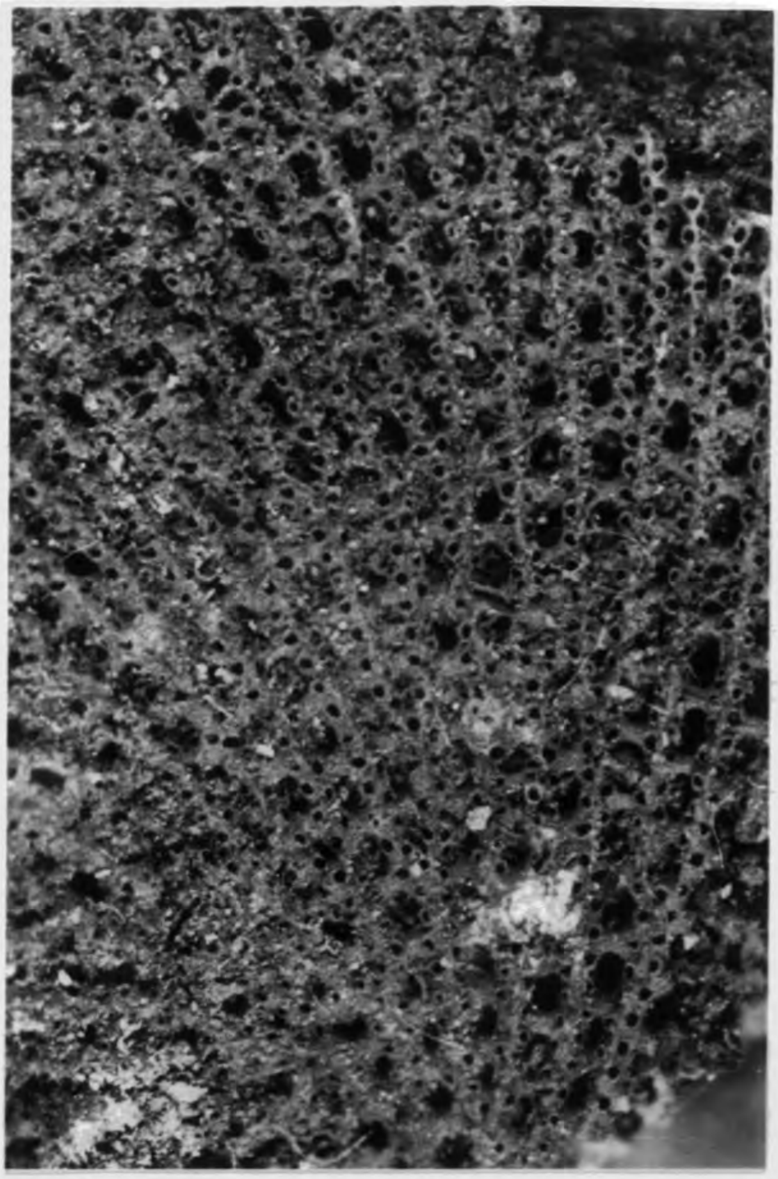
a

b

Plate 7. <u>Fenestella</u> <u>retiformis</u> Schlotheim

Fig.a Obverse surface detail.RH2.24.
Bar scale=Imm

Fig.b S.E.M. photomicrograph.Obverse surface.
RH2.24.Bar scale=Imm



a

b

Plate 8. <u>Fenestella</u> <u>retiformis</u> Schlotheim

Fig.a S.E.M. photomicrograph.Obverse surface. Nanate zooecium is visible in the centre of the figure,proximal to the bifurcation. RH2.24.Bar scale=Imm

Fig.b As above,showing nanate zooecium. Bar scale=O.Imm

Fig.c Obverse surface detail.BIO2D. Bar scale=Imm

a

b

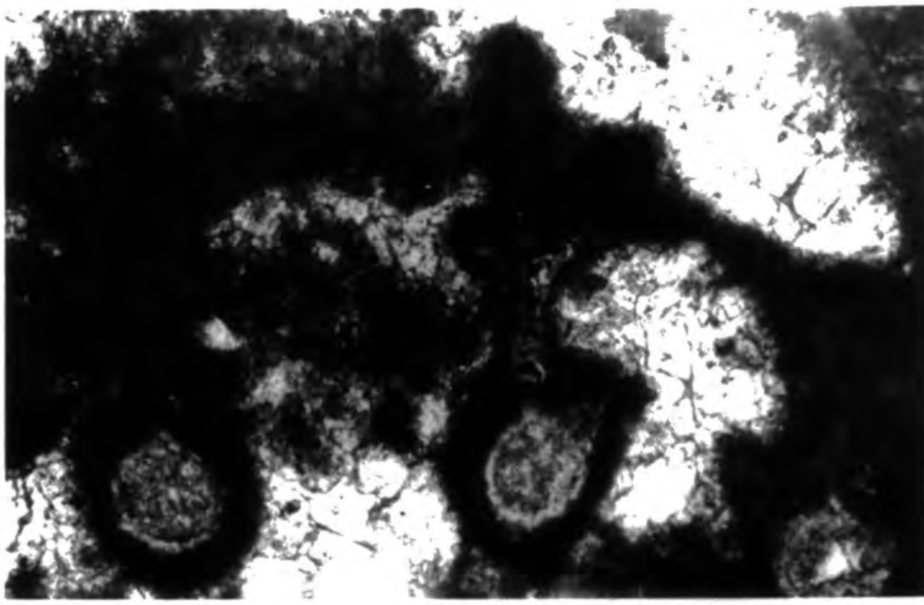
c

Plate 9. Fenestella retiformis Schlotheim

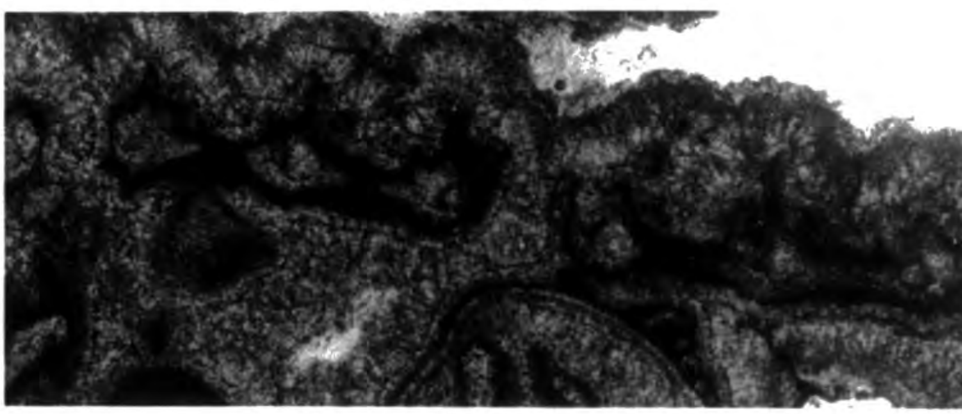
Fig.a Transverse section showing the highly developed node with lateral projections. GLFI.Bar scale-0.5mm

Fig.b Transverse section.MP5.48.Bar scale=Imm

Fig.c As above at higher magnification,showing bifurcation of a node.Bar scale=0.5mm



a



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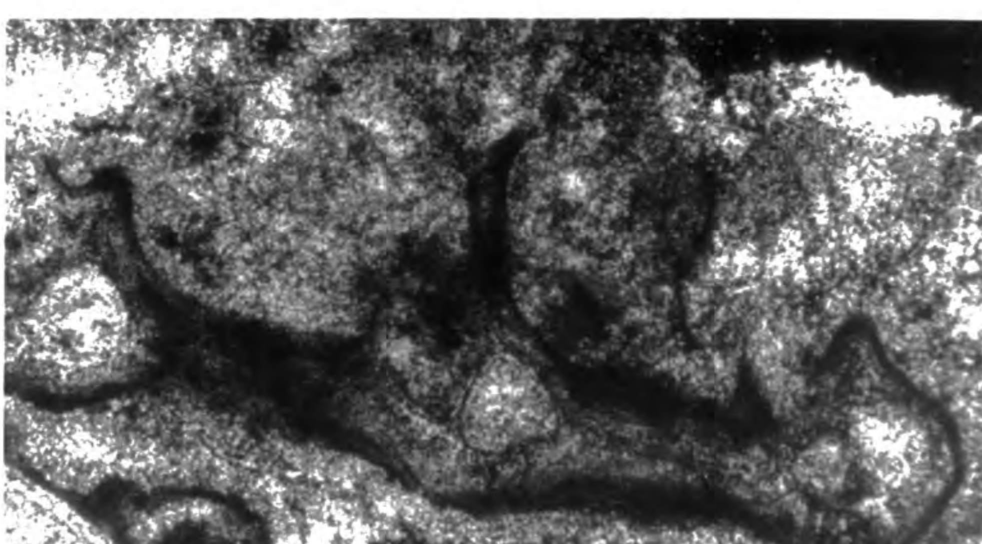
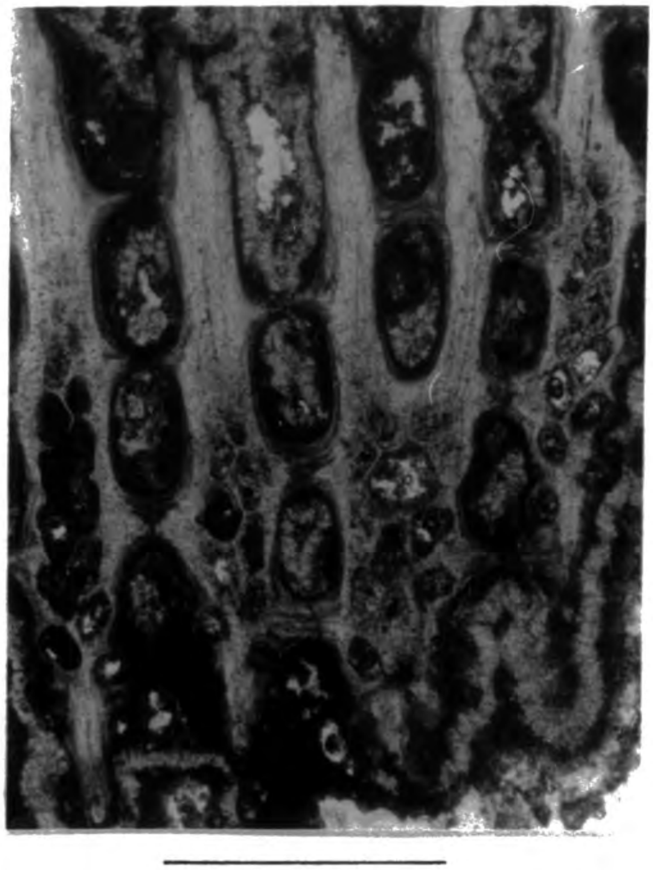


c

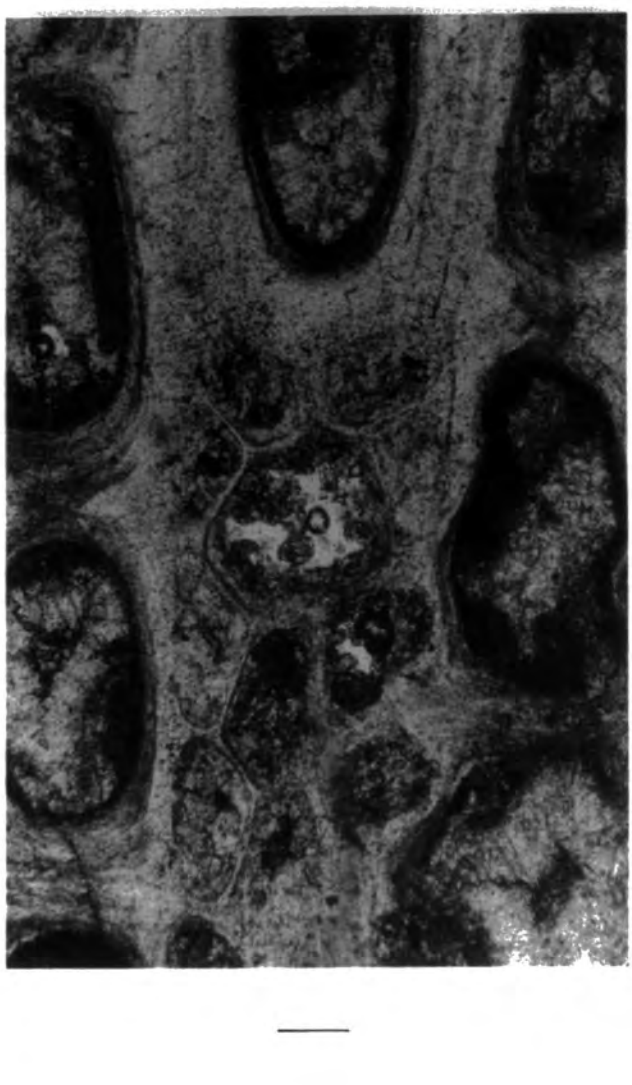
Plate IO. *Fenestella* *retiformis* Schlotheim

Fig.a Oblique tangential section,showing kenozooecium proximal to branch bifurcation.MP5/5.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=O.Imm



a

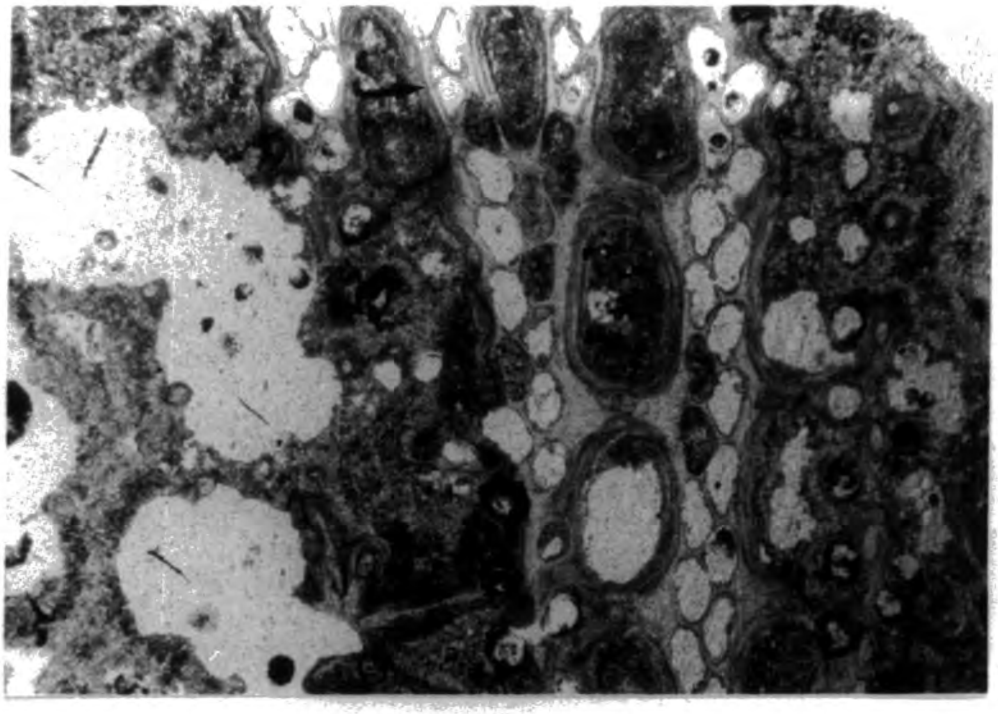


b

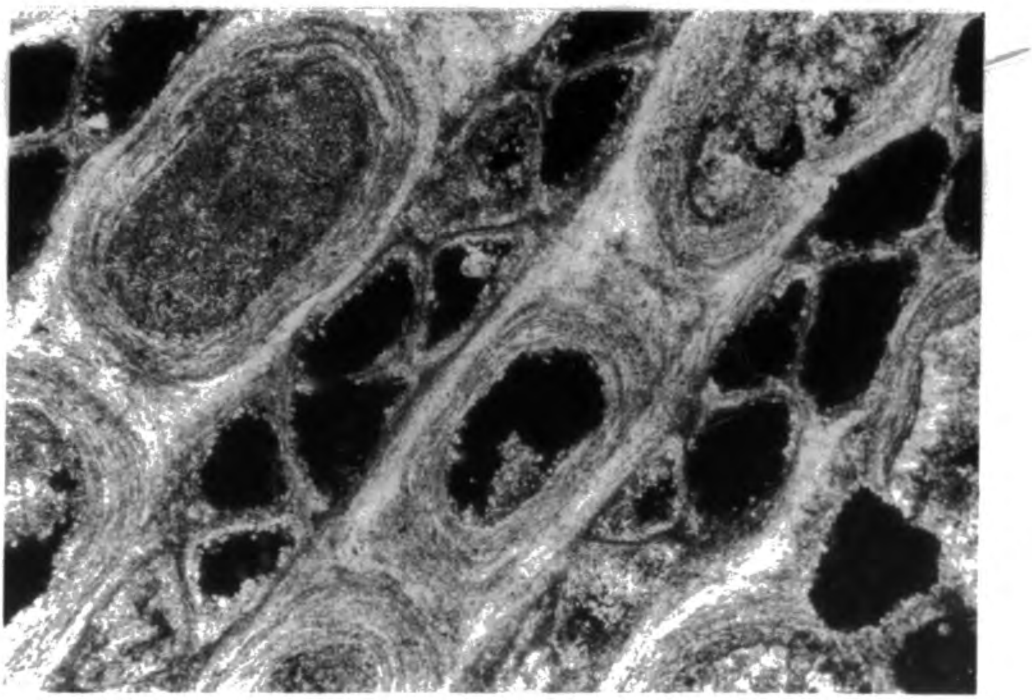
Plate II. Fenestella retiformis Schlotheim

Fig.a Slightly oblique tangential section. Partition at the distal end of a zooecium arrowed.The proximal margin of the specimen shows processes developed around carinal nodes.MP5.29.Bar scale=Imm

Fig.b Tangential section,showing zooecial chamber base shape and elements of the microstructure visible in crossed polars.MP5.29.XPL. Bar scale=O.Imm



a

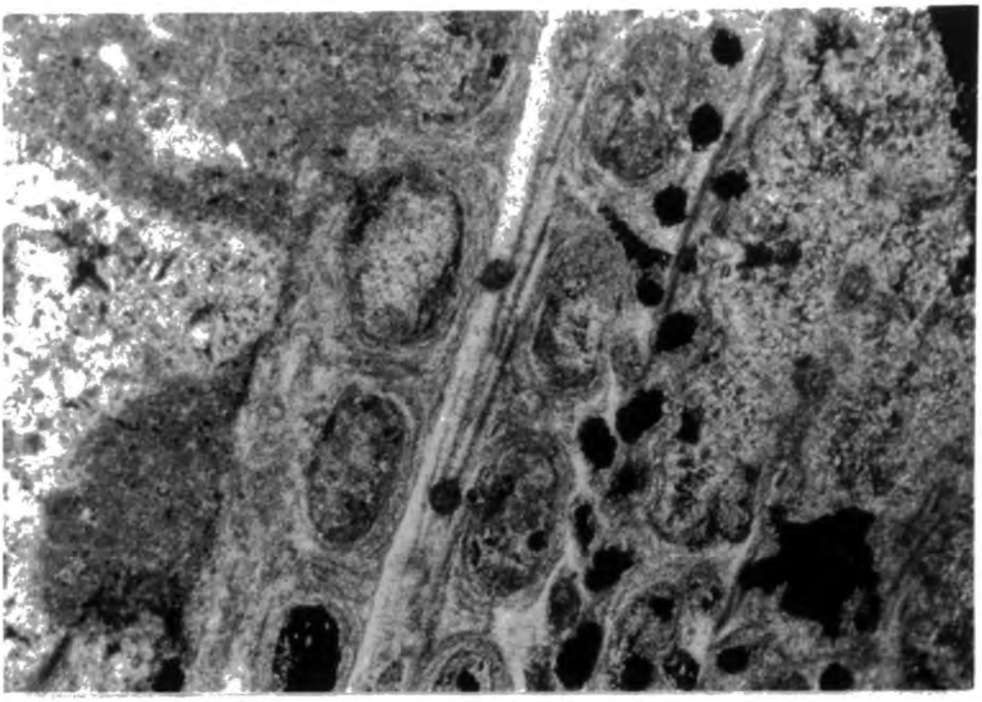


b

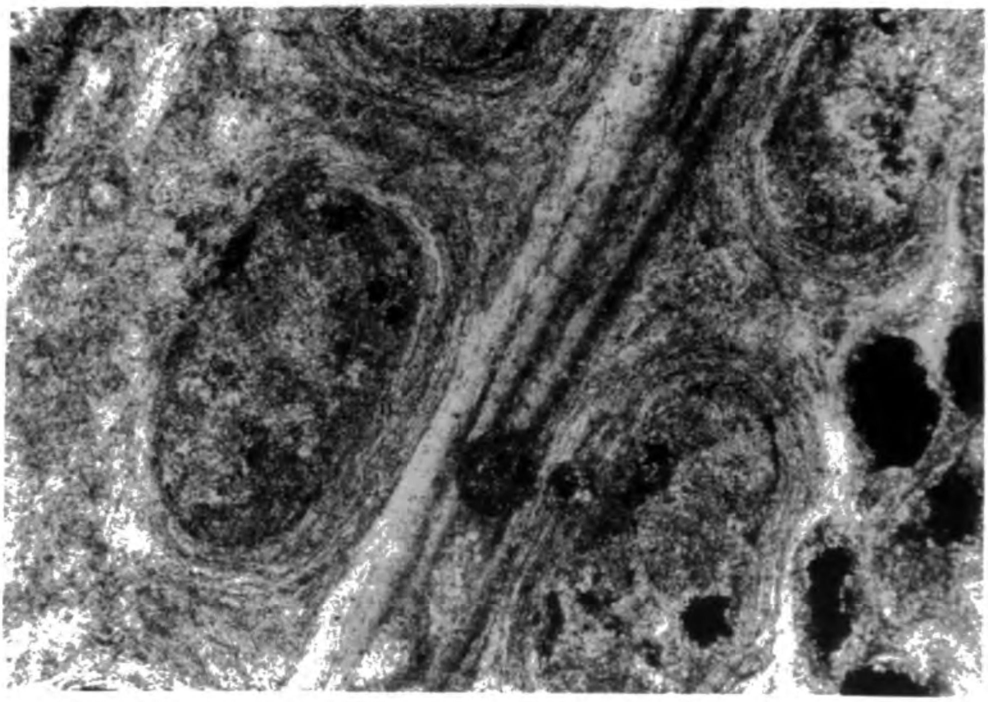
Plate I2. *Fenestella retiformis* Schlotheim

Fig.a Oblique tangential section showing two borings which cut through the longitudinal striae(cf.accessory pores).MP5.29.XPL. Bar scale=Imm

Fig.b As above at higher magnification. Bar scale=O.Imm



a

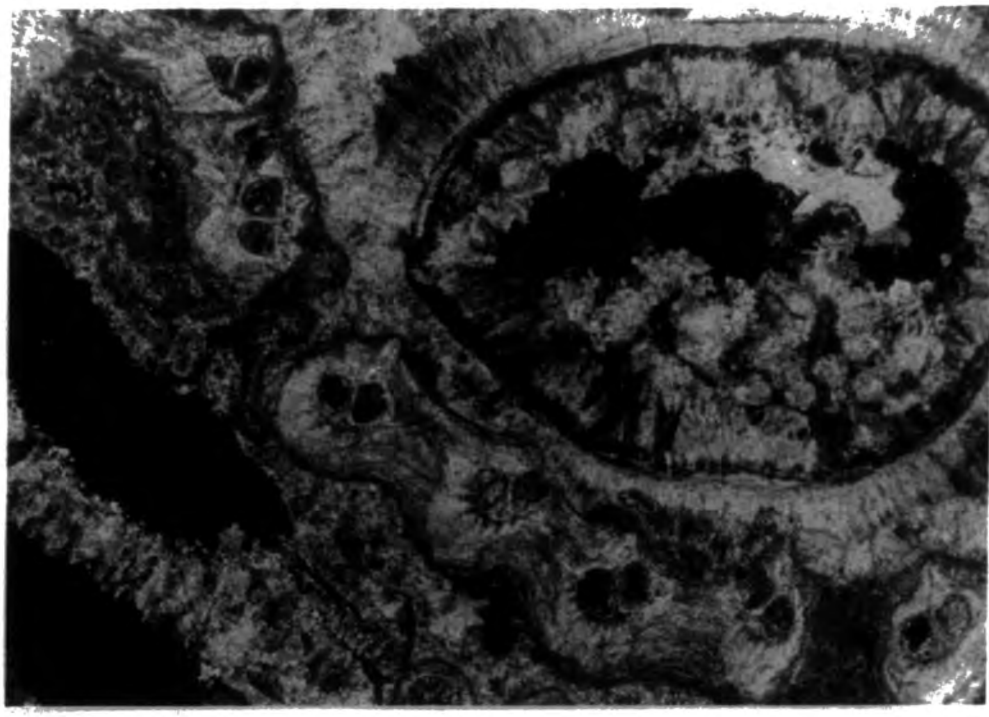


b

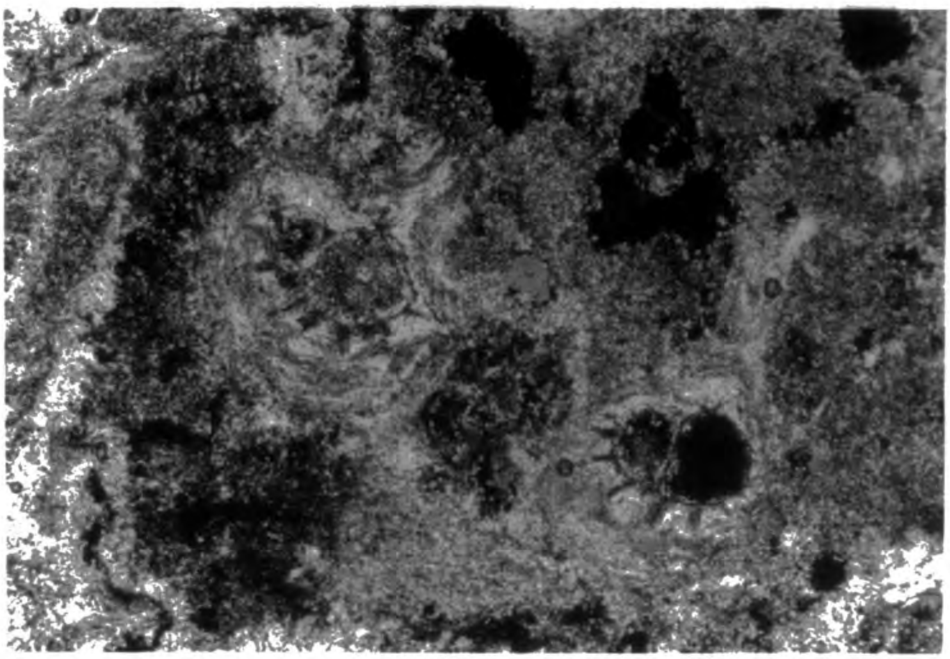
Plate I3. *Fenestella retiformis* Schlotheim

Fig.a Transverse section.MP5.62.XPL.
Bar scale=Imm

Fig.b Transverse section showing the extent of the 'inner platy core'(in extinction).
MP5/3.XPL.Bar scale=O.Imm



a



b

Plate I4. *Fenestella retiformis* Schlotheim

Fig.a Transverse section showing the distinction between primary granular layer and outer laminated layer.MP5 FI.Bar scale=O.Imm

Fig.b As above in crossed polars.

Fig.c Transverse section.MP5 FI.Bar scale=Imm

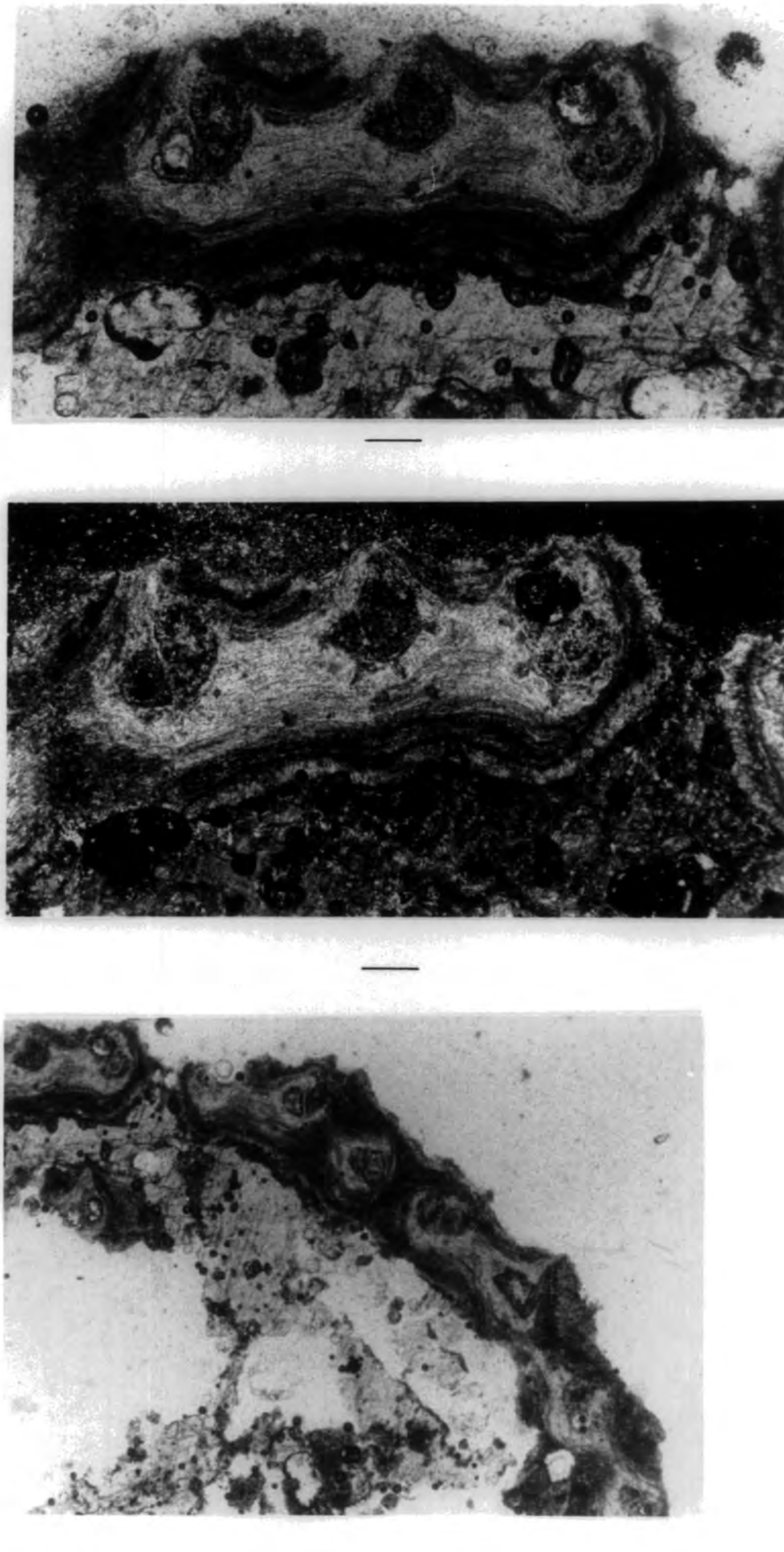

a
b
c

Plate I5. _Fenestella_ _retiformis_ Schlotheim

Fig.a Transverse section showing traces of laminar structure within the primary granular layer. MP5 FI.Bar scale=O.Imm

Fig.b As above in crossed polars.


a

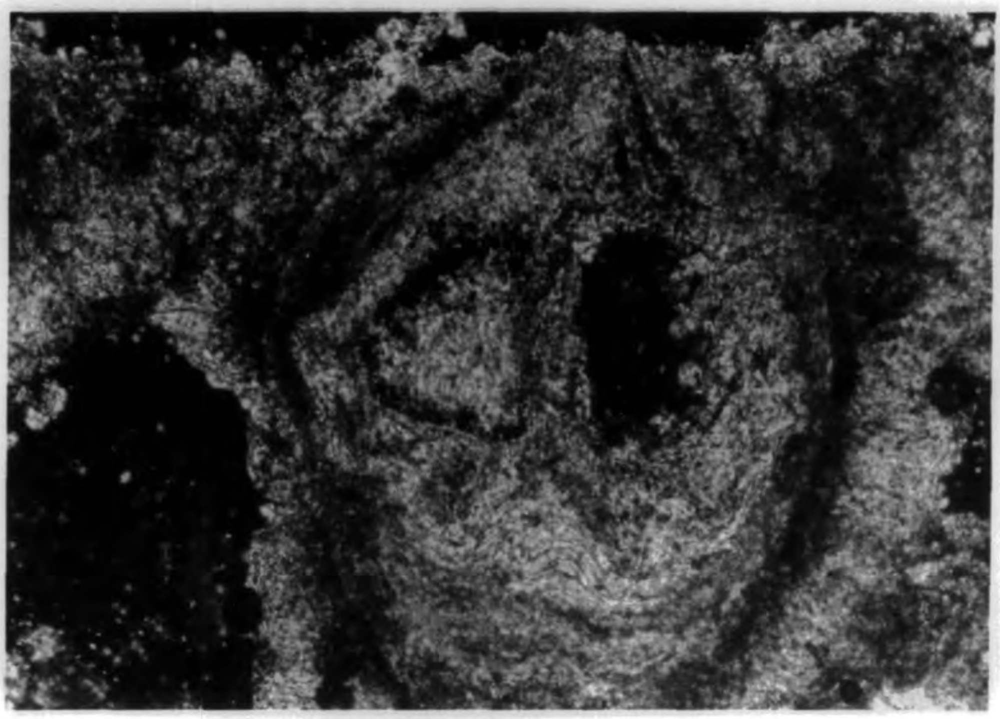
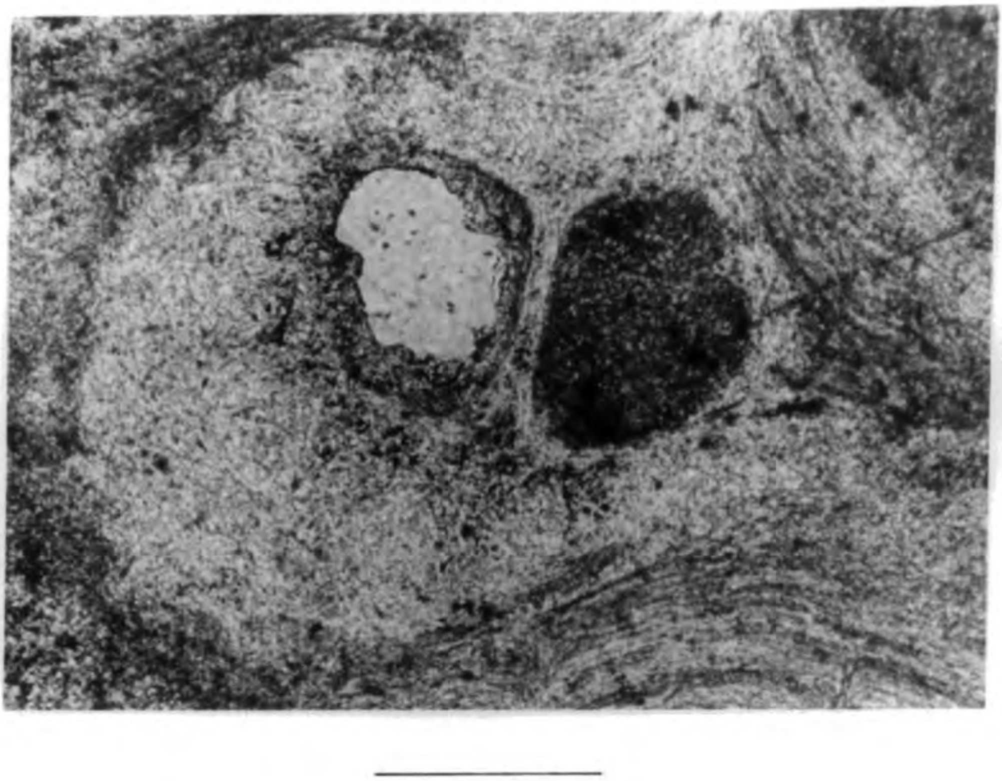

b

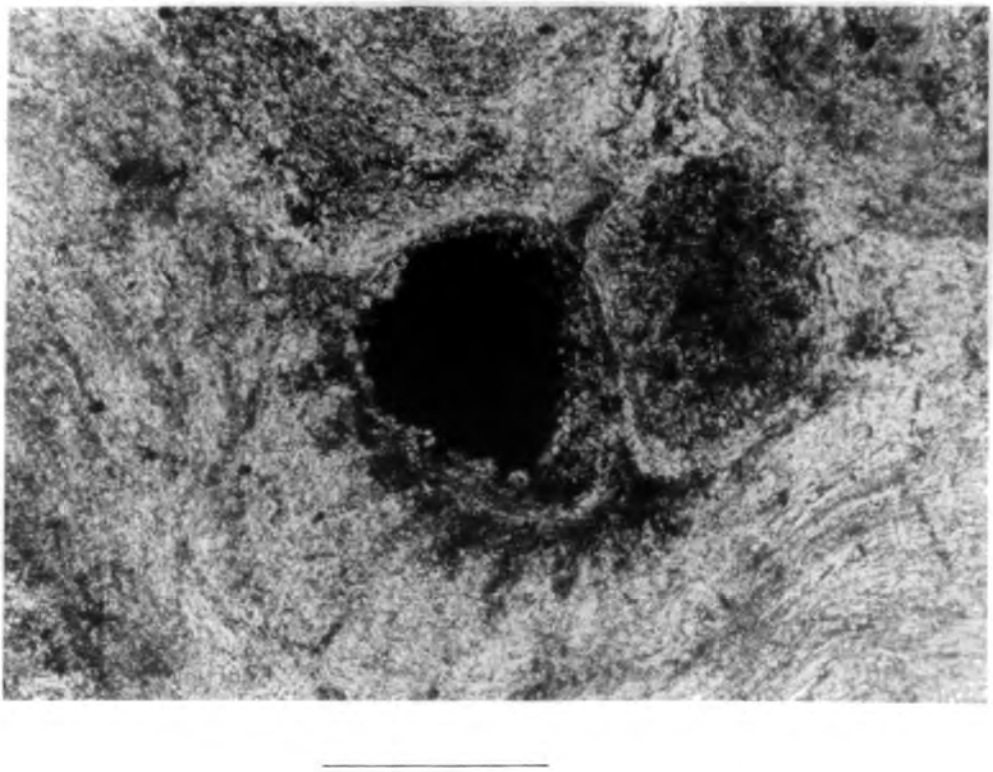
Plate I6. <u>Fenestella</u> <u>retiformis</u> Schlotheim

Fig.a Transverse section showing fine dark granules within the 'inner platy core'.MP5.62. Bar scale=O.Imm

Fig.b As above in crossed polars.



a



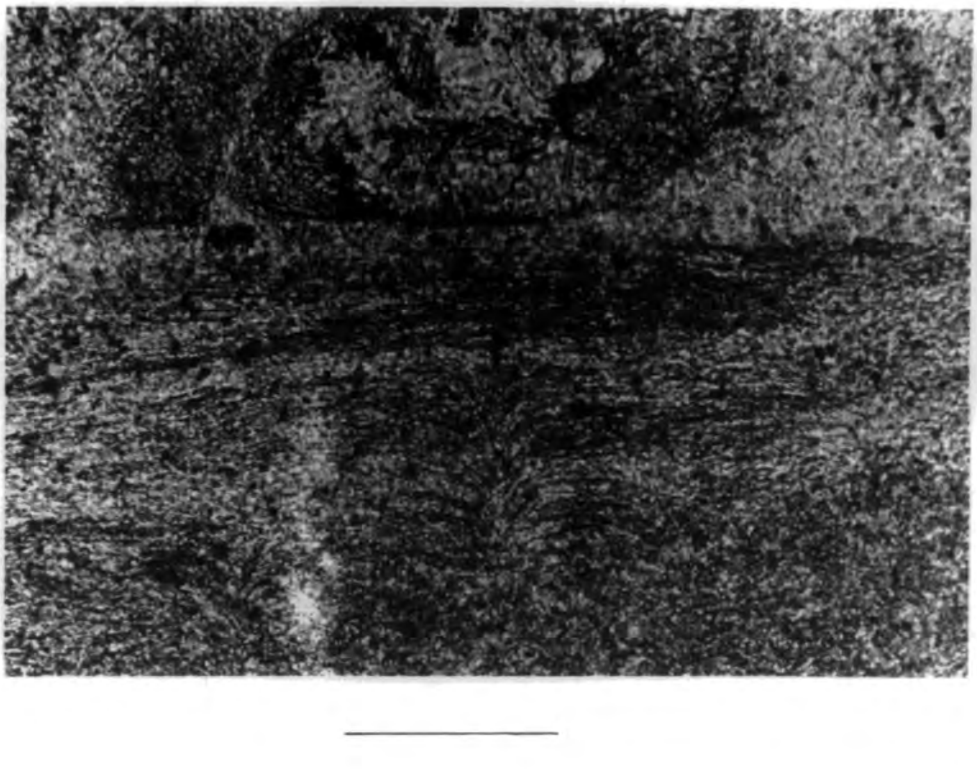
b

Plate I7. <u>Fenestella</u> <u>retiformis</u> Schlotheim

Fig.a Longitudinal section which shows the irregularity of the boundary between the primary granular layer and the outer laminated layer.MP5.5O.
Bar scale=O.5mm

Fig.b Longitudinal section showing deflection of laminae around a presumed skeletal rod(centre bottom of figure).MP5.52a.
Bar scale=O.Imm

a

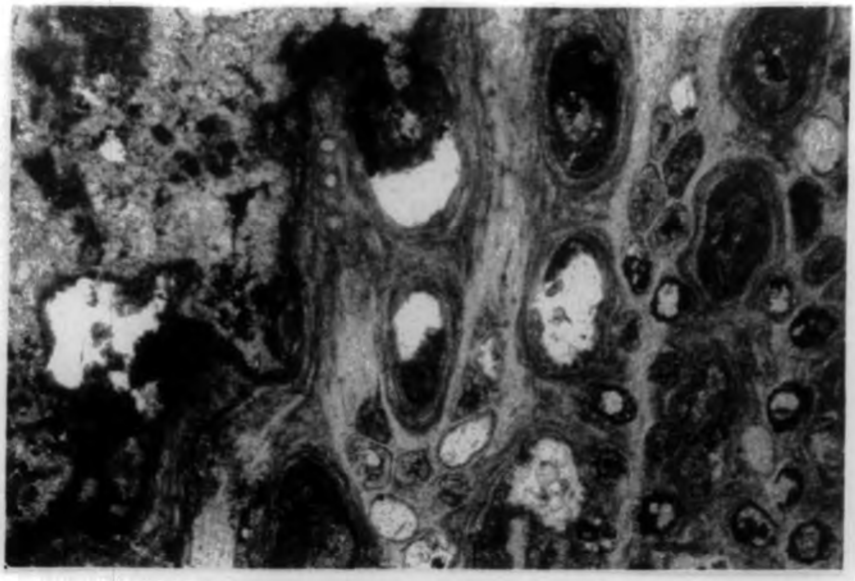


b

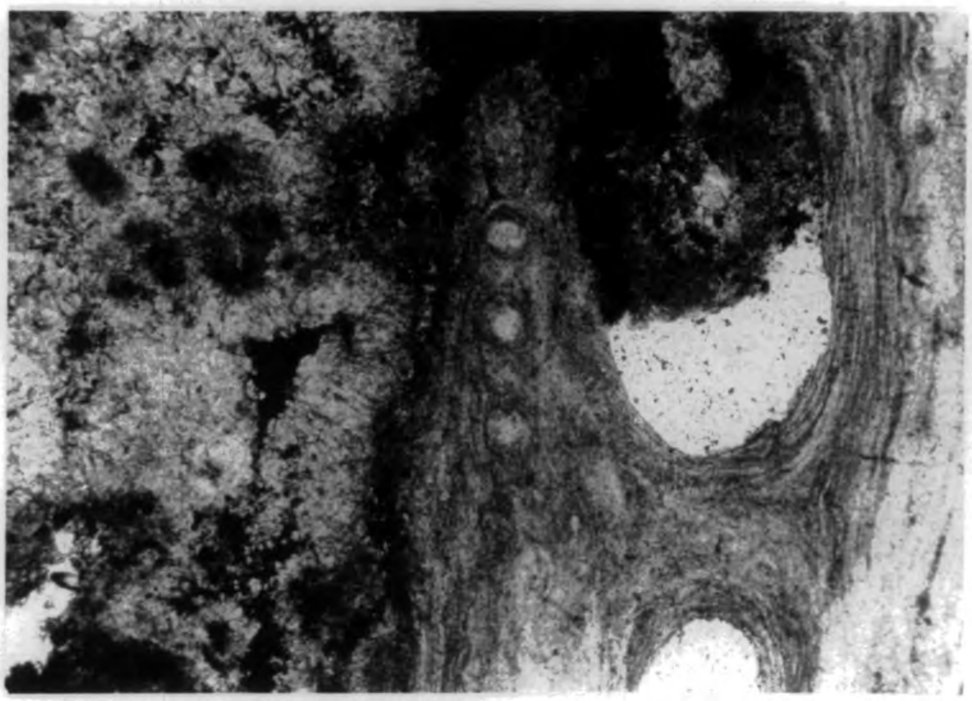
Plate I8. *Fenestella retiformis* Schlotheim

Fig.a Oblique tangential section showing three reverse surface nodes.MP5.29. Bar scale=Imm

Fig.b As above at higher magnification.The nodes have a granular core surrounded by laminated skeleton.Bar scale=0.5mm



a



b

Plate I9. _Fenestella_ _retiformis_ Schlotheim

Fig.a Reverse surface and mould.K20,from Schlotheim's collection. Bar scale=Imm

Fig.b As above at lower magnification. Bar scale=Icm

a

b

Plate 20. *Fenestella retiformis* Schlotheim

Fig.a Specimen Taf.I fig.I,2 from the Korn collection.Bar scale=Icm

Fig.b Specimen Taf.I fig.4 from the Korn collection. Bar scale=Icm

a

b

Plate 2I. *Fenestella retiformis* Schlotheim

Fig.a Specimen Taf.I fig.I3,I4,Taf.III fig.IO, assigned to "*Fenestella minuta*" by Korn(I930). Bar scale=Icm

Fig.b As above at higher magnification.Bar scale=Icm

a

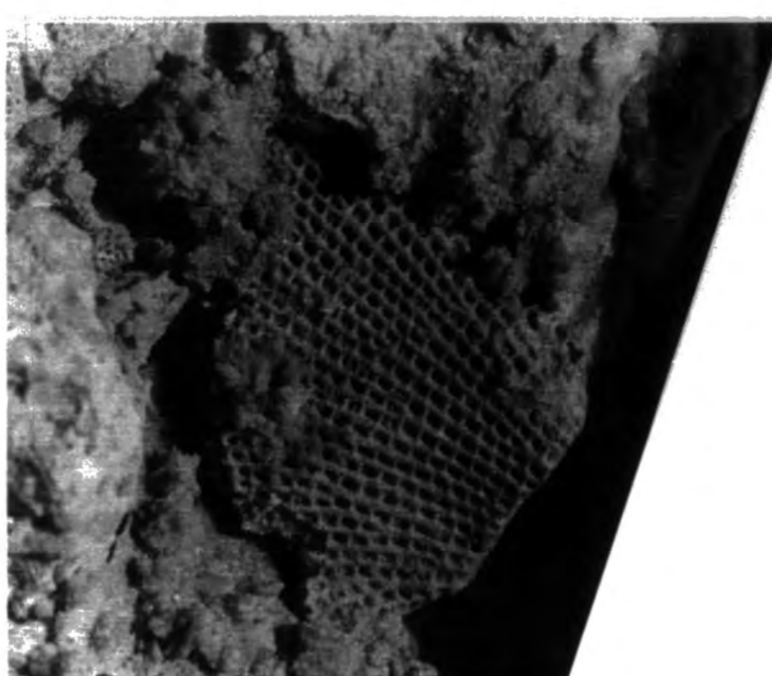
b

Plate 22. _Fenestella_ _retiformis_ var. _thuringiaca_ Korn

Fig.a Specimen Taf.I fig.5,assigned to _Fenestella geinitzi_ var._thuringiaca_ by Korn(I930). Bar scale=Icm

Fig.b As above at higher magnification.Bar scale=Icm

a



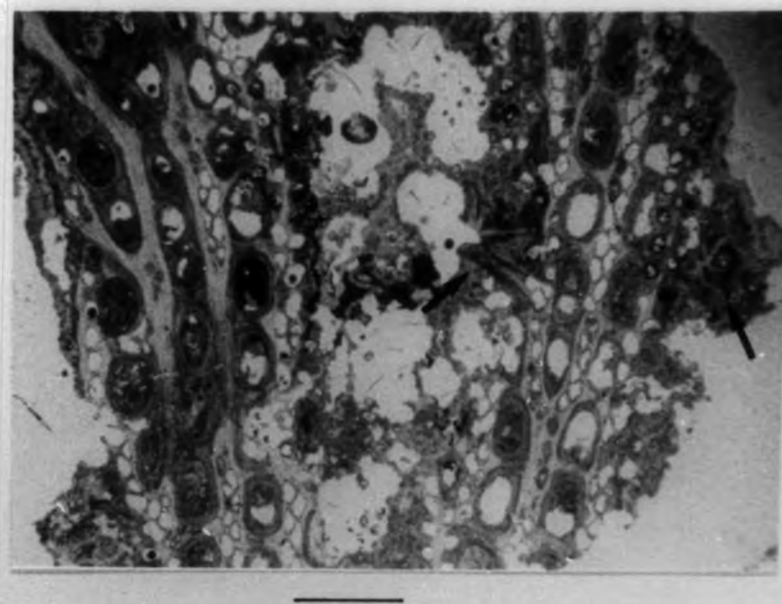
b

Plate 23. <u>Fenestella</u> <u>retiformis</u> Schlotheim

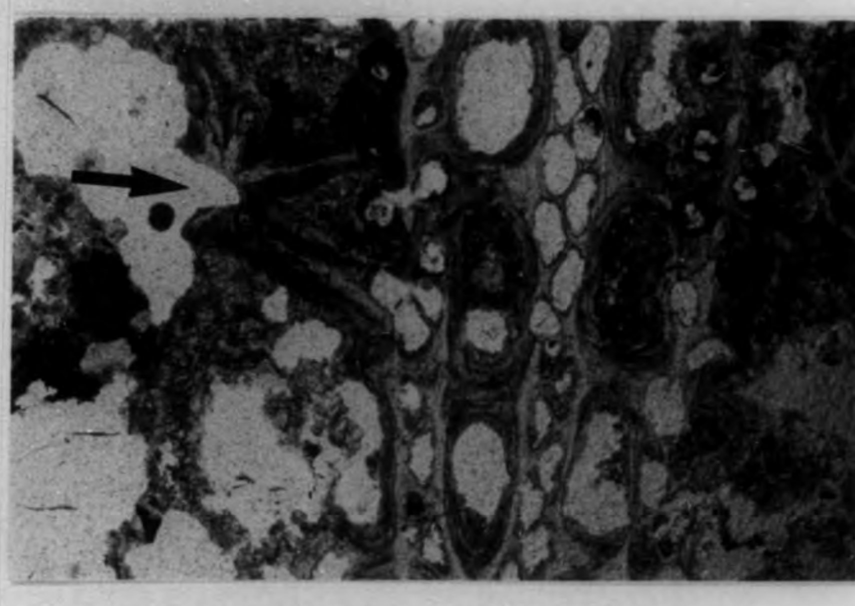
Fig.a Tangential section.Arrowed are stellate processes which are interpreted as the tips of zoarial spines which expand palmately where they contact the obverse surface. MP5.29.Bar scale=Icm

Fig.b As above at higher magnification. Bar scale=Icm

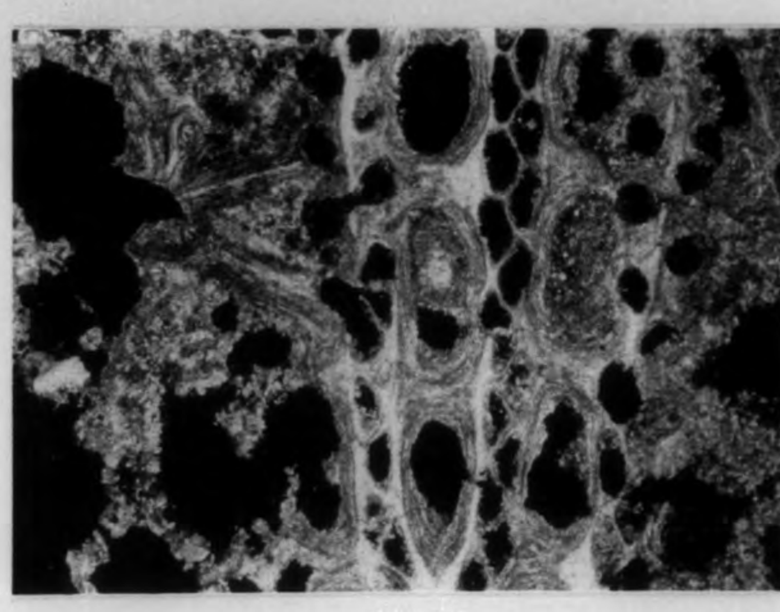
Fig.c As in fig.b above but in crossed polars. The primary granular core of the spinose process is visible and is surrounded by outer laminated skeleton.The granular core of the process extends around the outside of the outer laminated layer of the branch which it is in contact with.



a



b

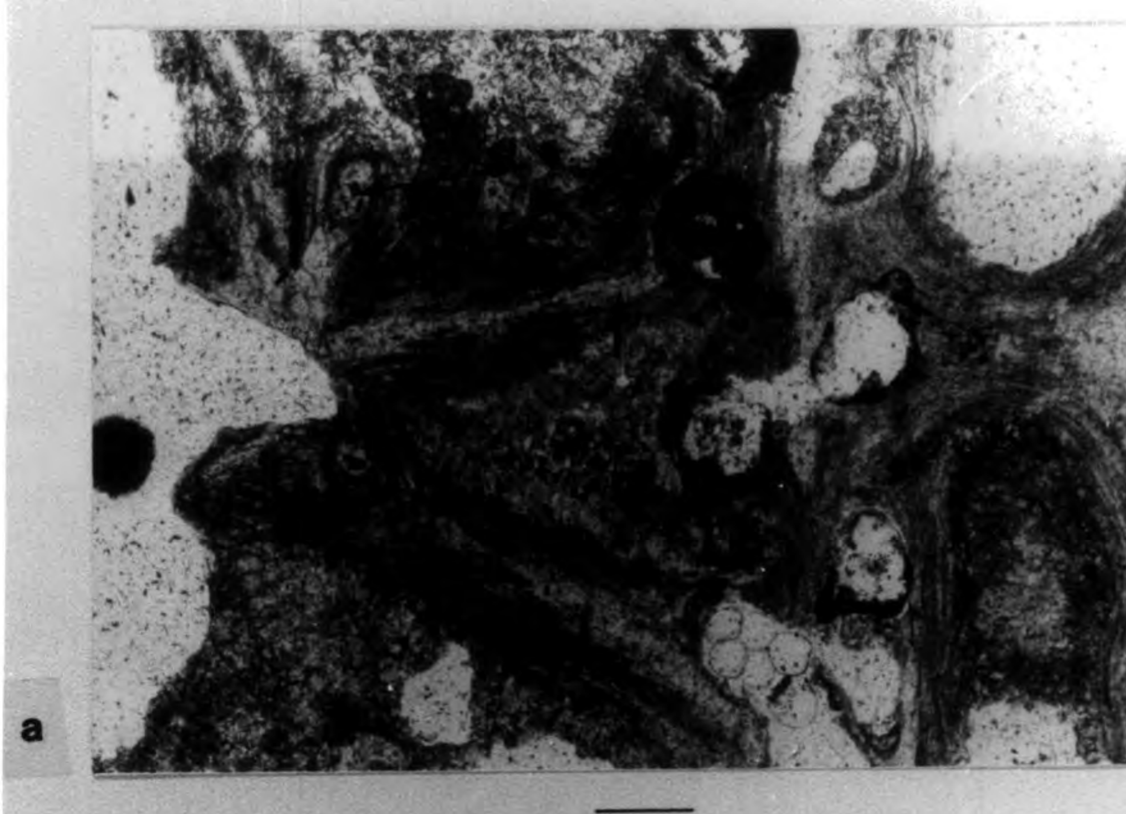


c

Plate 24. *Fenestella retiformis* Schlotheim

Fig.a Detail of spinose process.Short arrow marks the primary granular core of the process. Long arrow marks the node which the process is centred on.MP5.29.
Bar scale=O.Imm

Fig.b As above but in crossed polars.



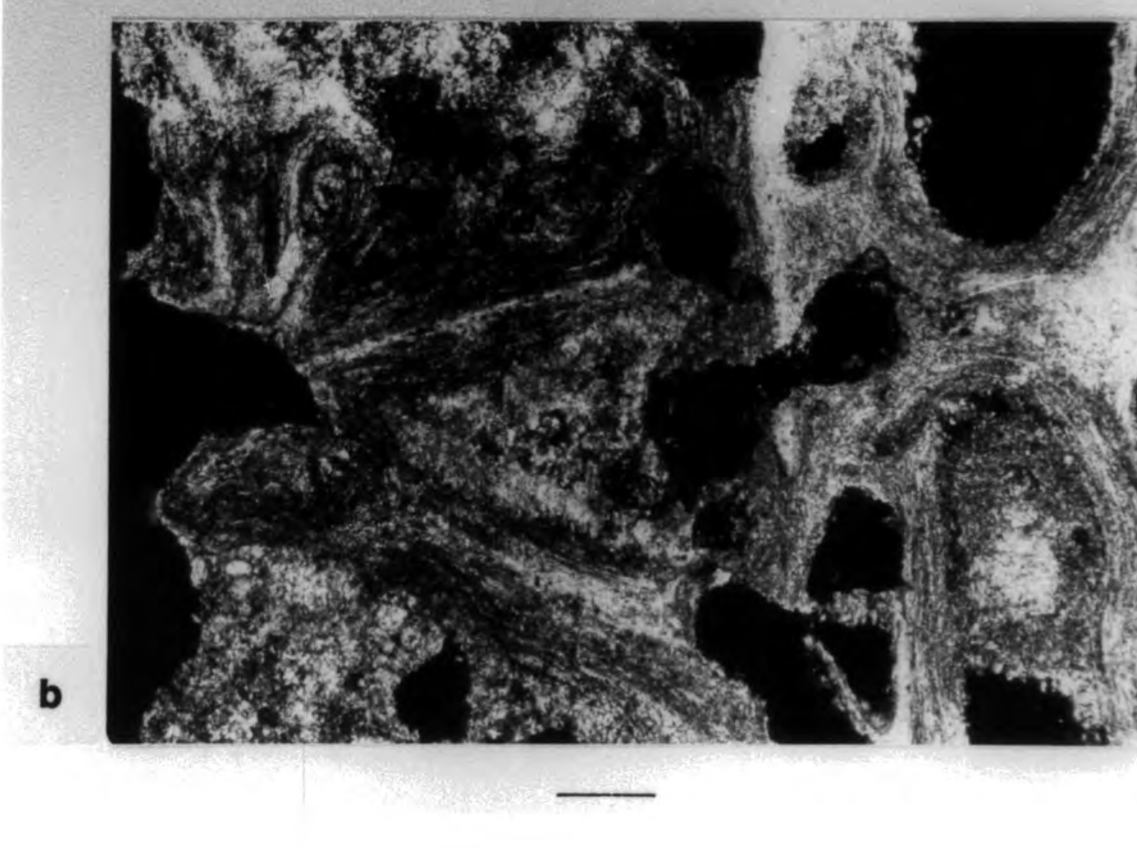
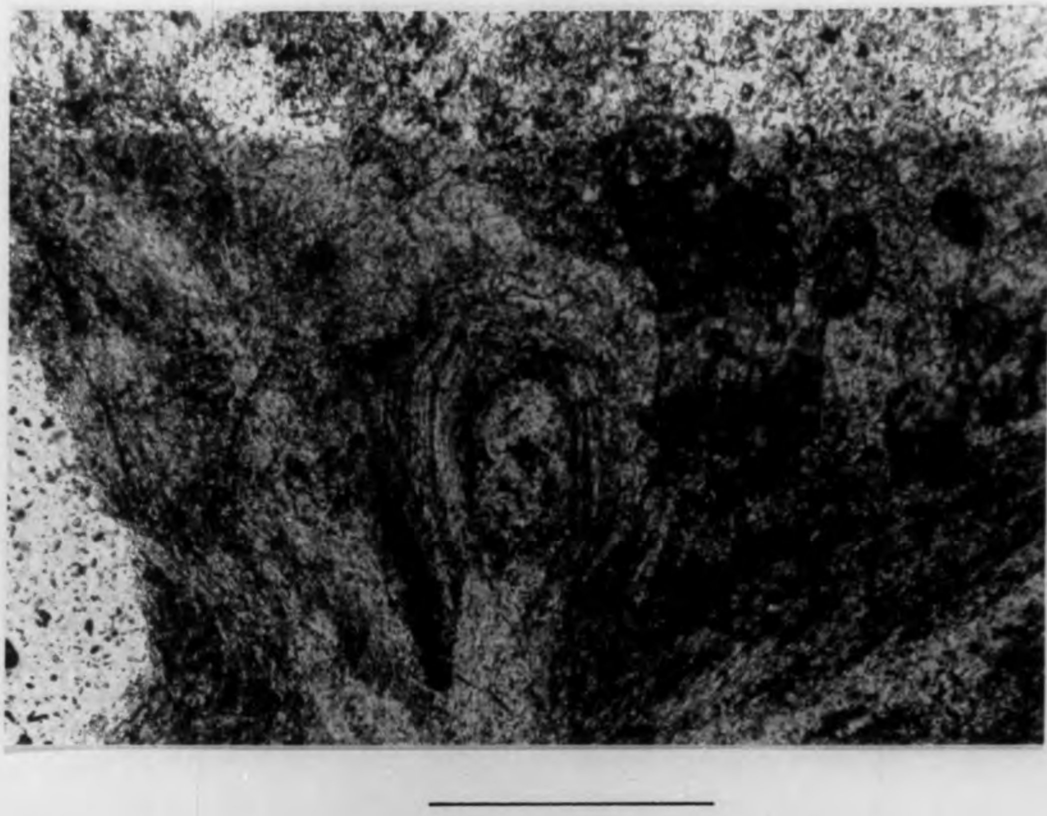


Plate 25. *Fenestella retiformis* Schlotheim

Fig.a Close-up of node in tangential section with skeleton of the spinose process surrounding it,not in optical continuity. MP5.29.Bar scale=O.Imm

Fig.b As above in crossed polars.



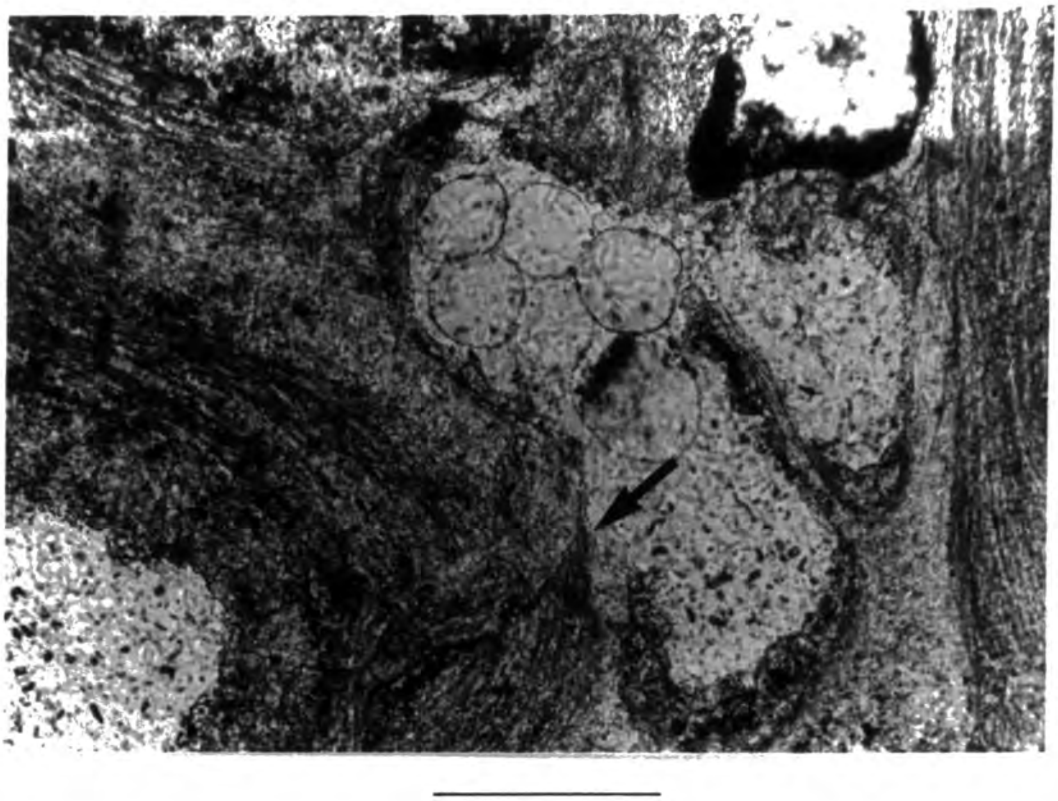
a

b

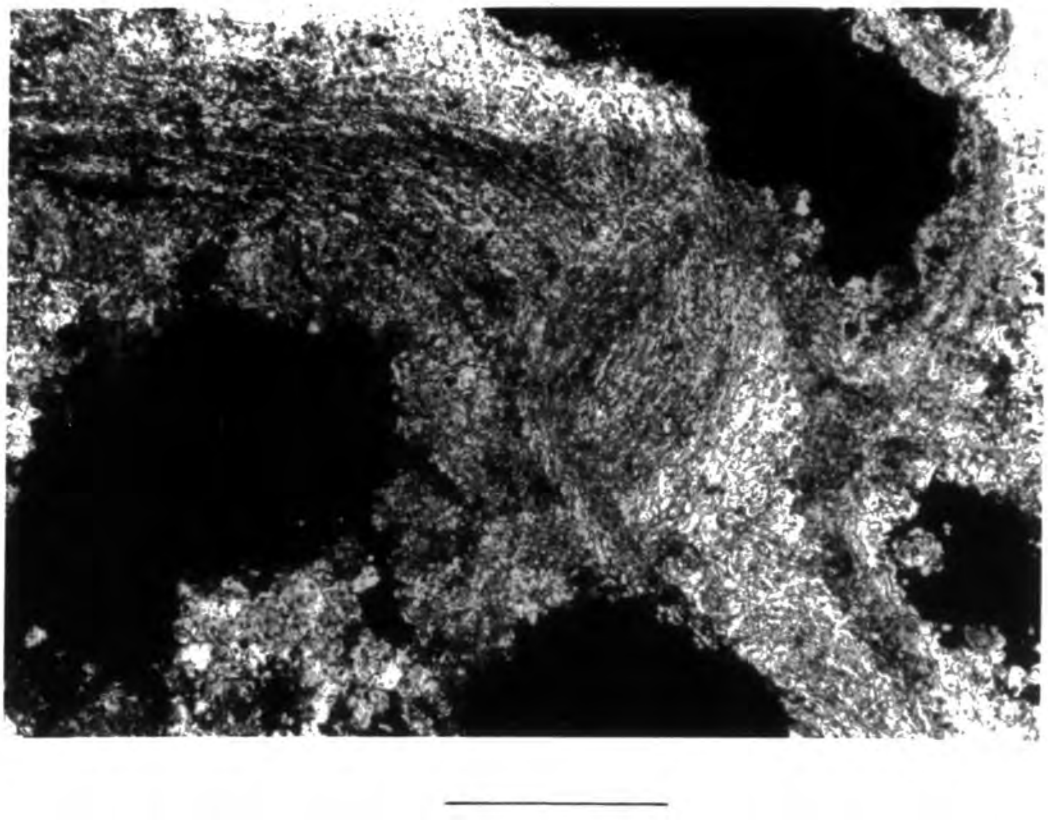
Plate 26. *Fenestella retiformis* Schlotheim

Fig.a Contact between skeleton of the spinose process and that of the branch against which it abuts(arrowed).MP5.29.
Bar scale=0.Imm

Fig.b As above in crossed polars.



a



b

Plate 27. <u>Fenestella retiformis</u> Schlotheim

Fig.a Tangential section showing stellate process centred on a carinal node(arrowed).MP5.29. Bar scale=Imm

Fig.b As above at higher magnification. Bar scale=O.Imm

Fig.c As in fig.b above but in crossed polars.

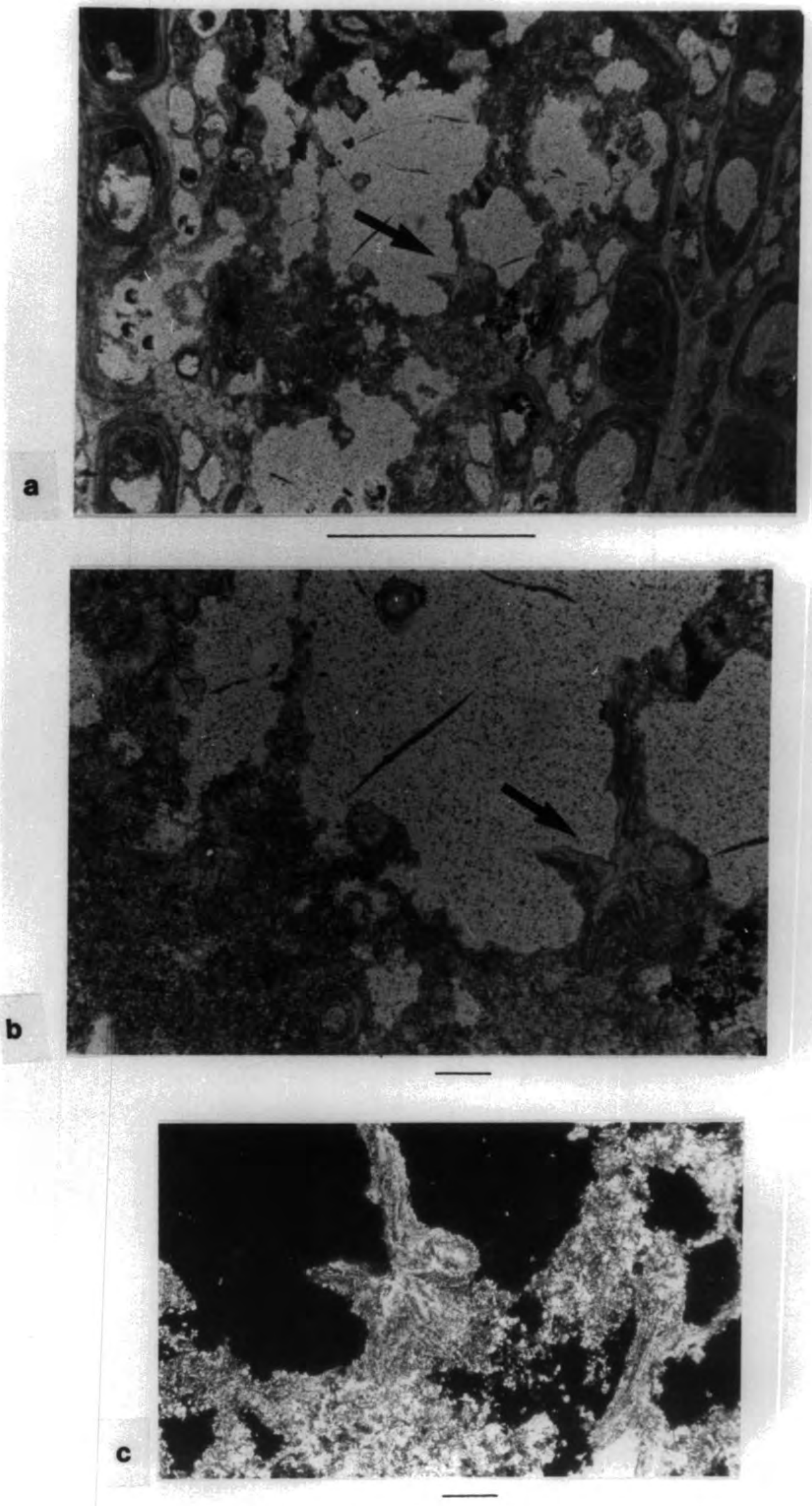
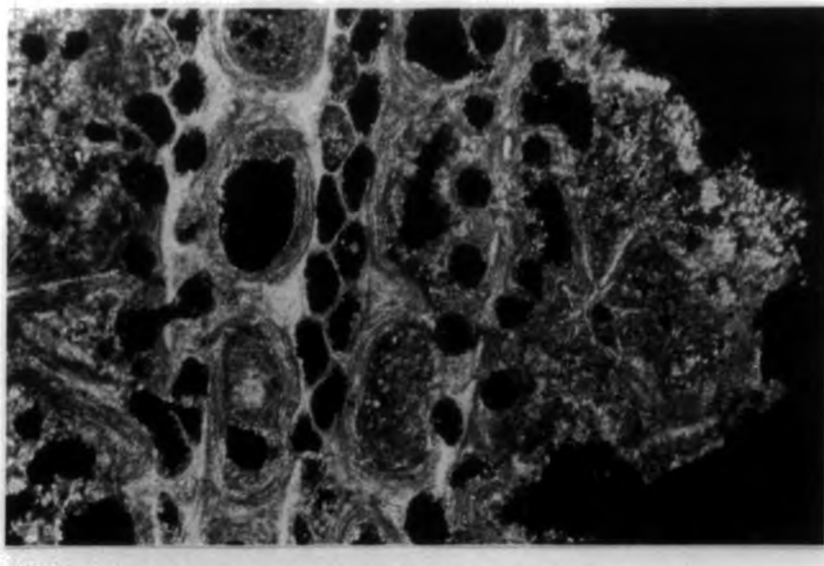

a
b
c

Plate 28. *Fenestella retiformis* Schlotheim

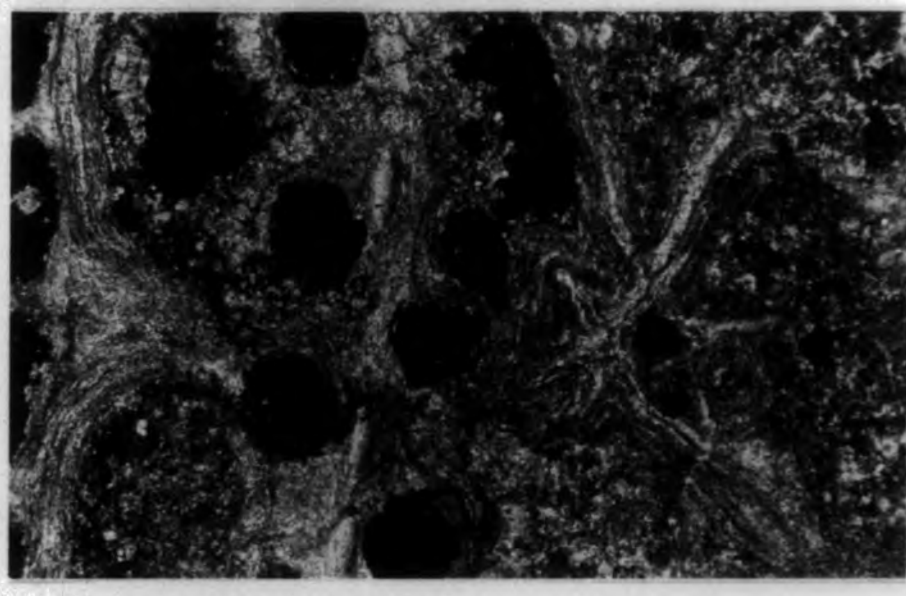
Fig.a Tangential section showing stellate process.MP5.29.XPL.Bar scale=Imm

Fig.b As above at higher magnifiœation.Bar scale=O.Imm

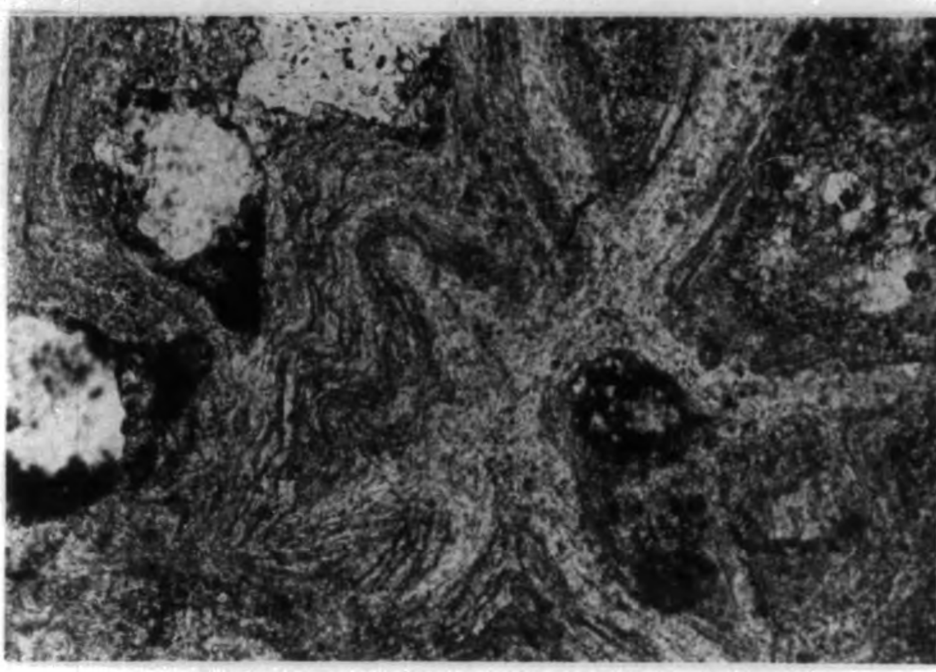
Fig.c As above at higher magnification and in plane polarised light.The granular core is surrounded by outer laminated layer. Bar scale=O.Imm



a



b



c

Plate 29. _Fenestella_ _retiformis_ Schlotheim

Fig.a Colony origin.MP5.2.Bar scale=Icm

Fig.b As above at higher magnification. Bar scale=Imm.Surface polished close to origin.

Fig.c Colony origin.Side view showing a robust supporting spine.MP5.57. Bar scale=Imm

Fig.d As in fig.c above,viewed from above. Bar scale=Imm

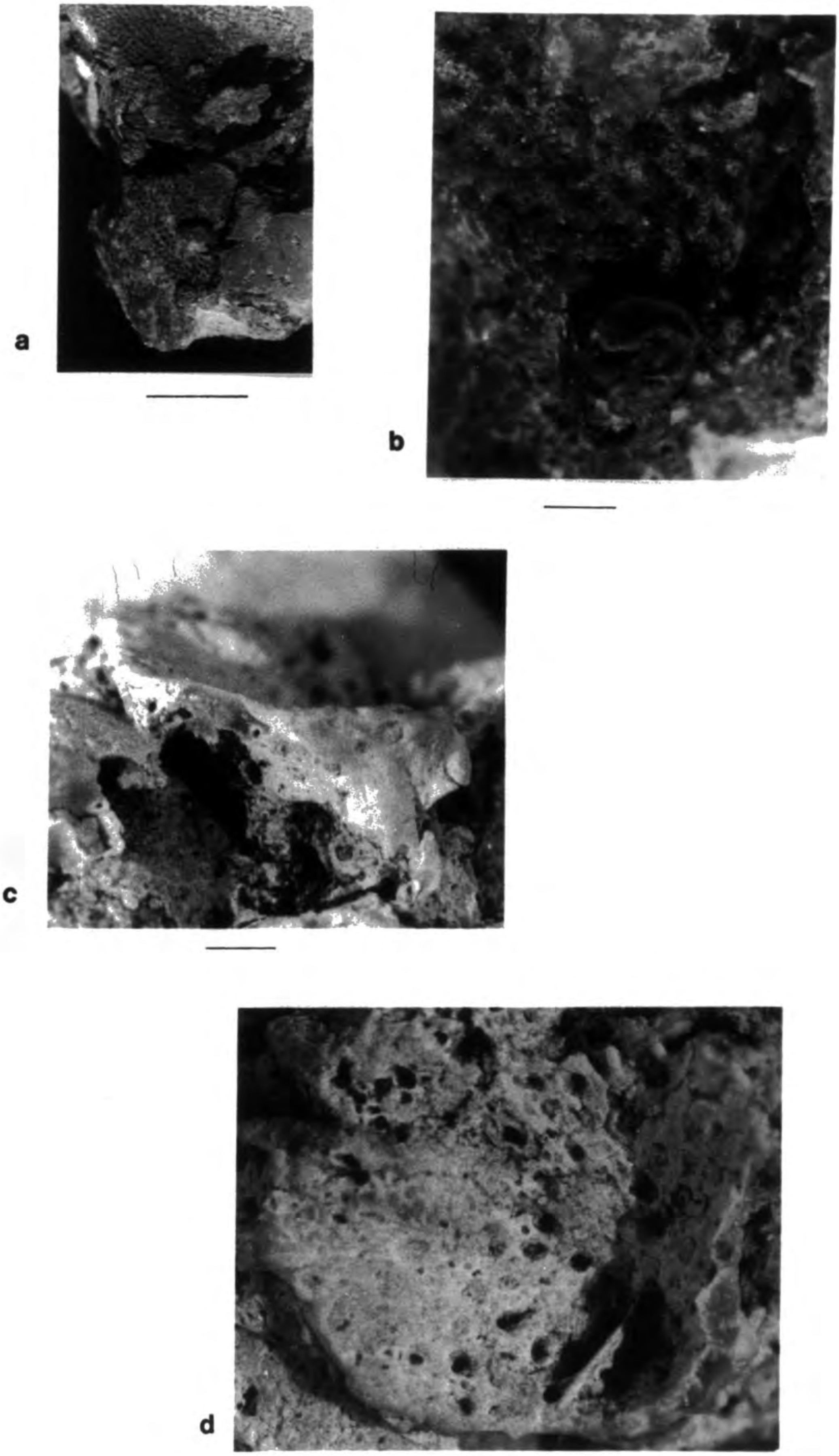

a
b
c
d

Plate 30. *Fenestella retiformis* Schlotheim

Tangential section showing deflection of the wall of the zooecial chamber towards a dissepiment(arrowed).MP5/3.
Bar scale=0.Imm

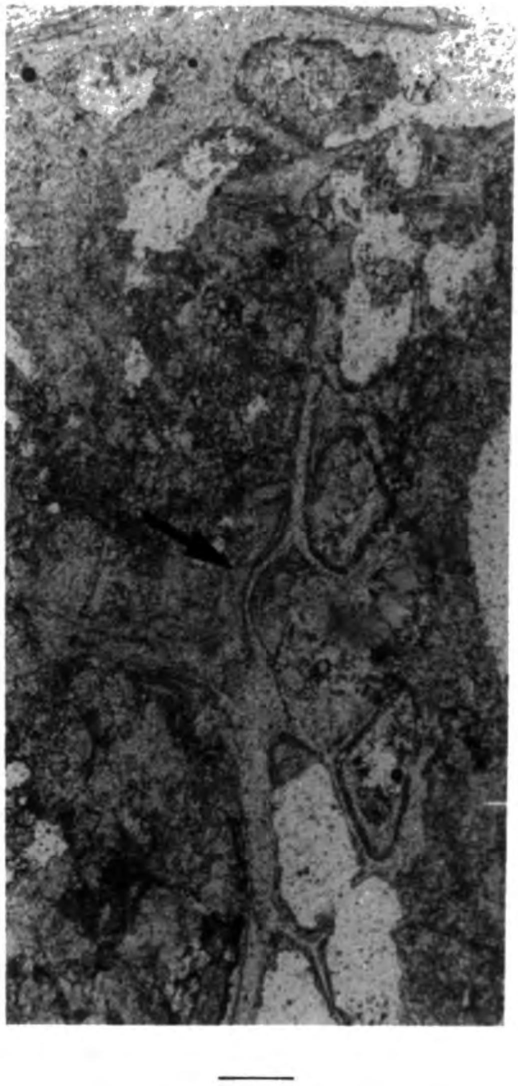
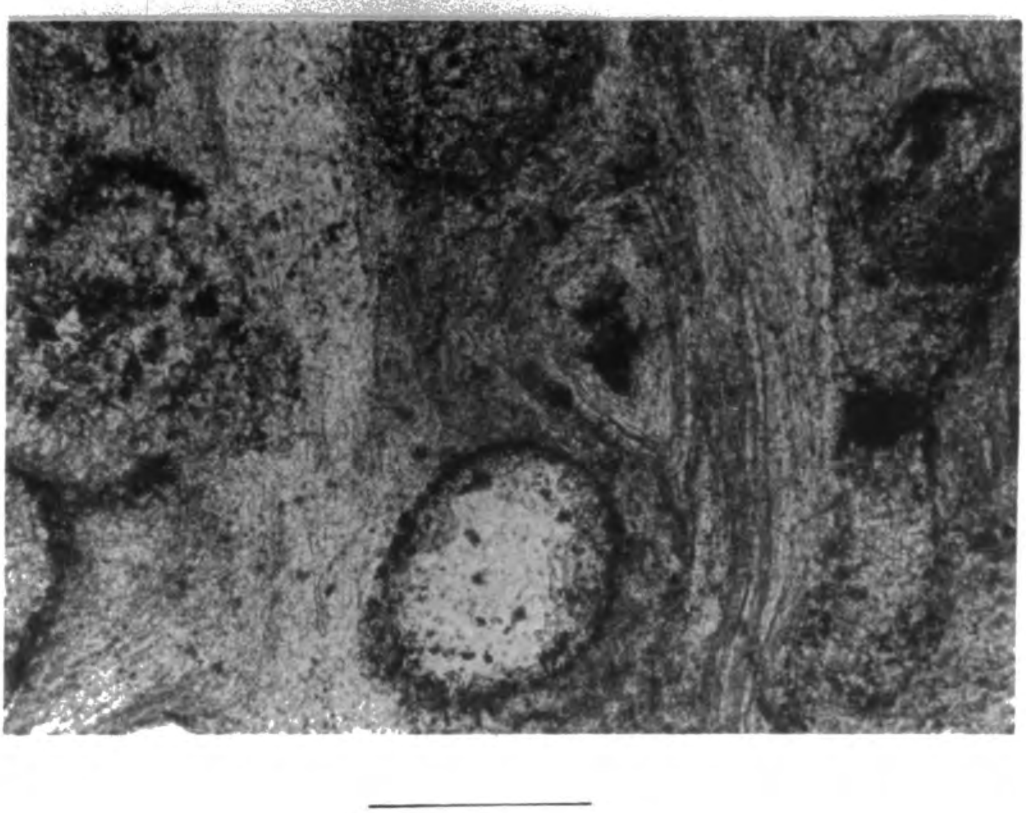


Plate 3I. Fenestella retiformis Schlotheim

Fig.a Tangential section showing ?bioimmuration at the branch margin.A sub-triangular cavity is lined by laminated skeleton which extends well into the fenestrule. MP5.29.Bar scale=0.Imm

Fig.b Close-up of above structure.Bar scale=0.Imm

a



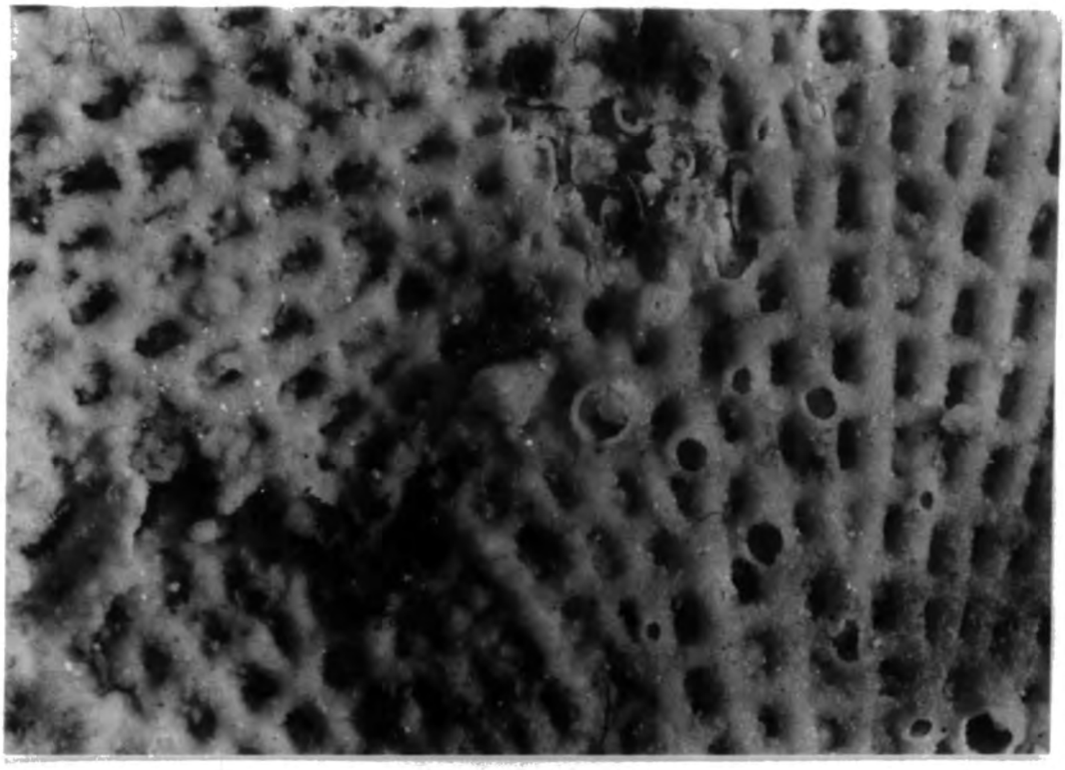
b

Plate 32. <u>Fenestella</u> <u>geinitzi</u> d'Orbigny

Fig.a Reverse surface.Specimen heavily encrusted with dolomite but the former positions of spines can be seen.RH4.28.
Bar scale=Imm

Fig.b Reverse surface.Some of outer laminated skeleton removed in top left corner of specimen revealing longitudinal striae.
HM7.6+3.Bar scale=Imm

a



b

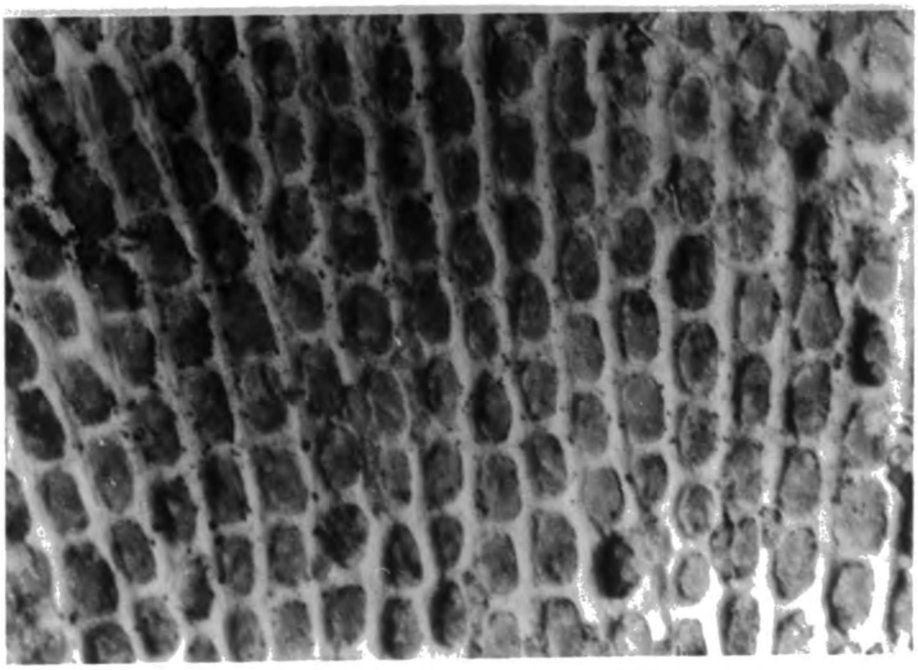
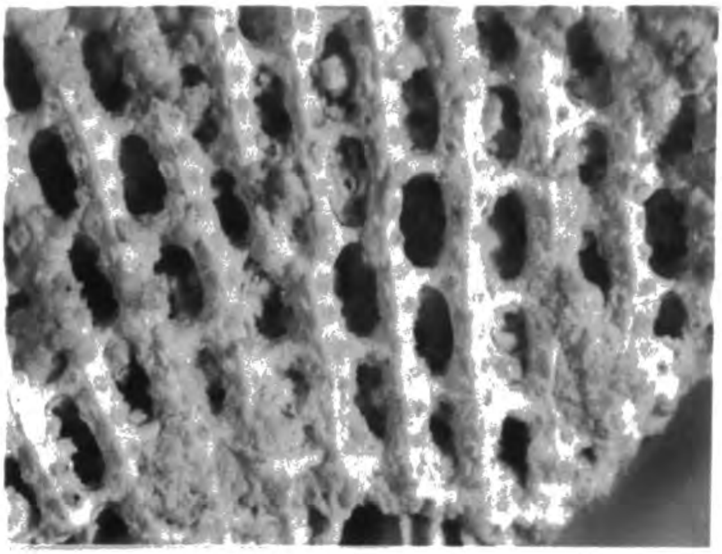


Plate 33. *Fenestella geinitzi* d'Orbigny

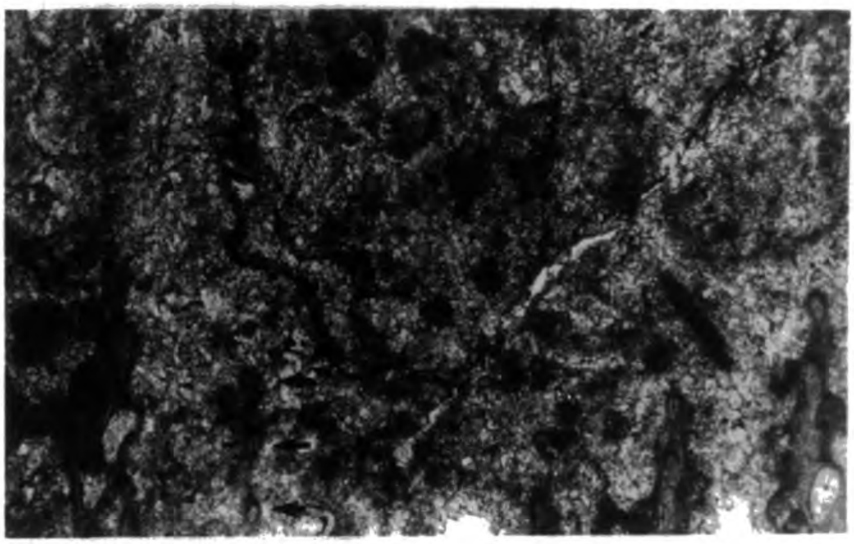
Fig.a Obverse surface detail.RH4.27.
Bar scale=Imm

Fig.b Tangential section.Carinal nodes arrowed.
RH4.IO.Bar scale=Imm

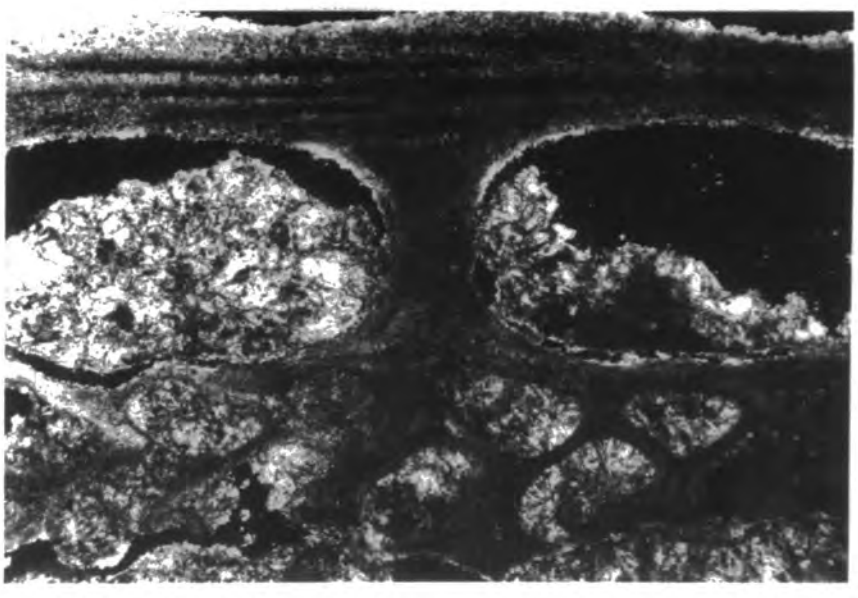
Fig.c Slightly oblique tangential section showing longitudinal striae and zooecial chamber shape.
RH4.I2.Bar scale=O.Imm XPL.



a



b



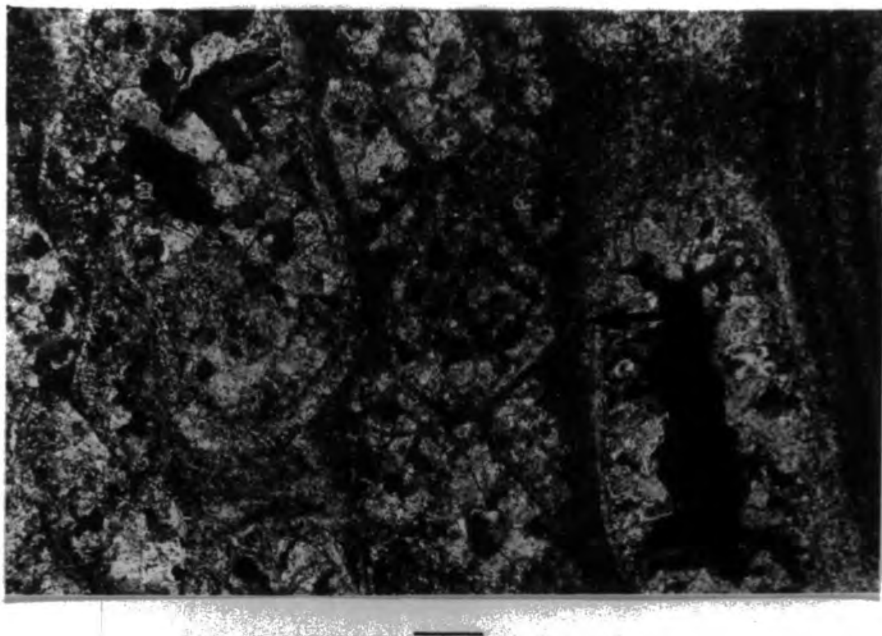
c

Plate 34. Fenestella geinitzi d'Orbigny

Fig.a Tangential section.Abnormal zooecial chamber (kenozooecium) arrowed.HM5/I.
Bar scale=O.Imm

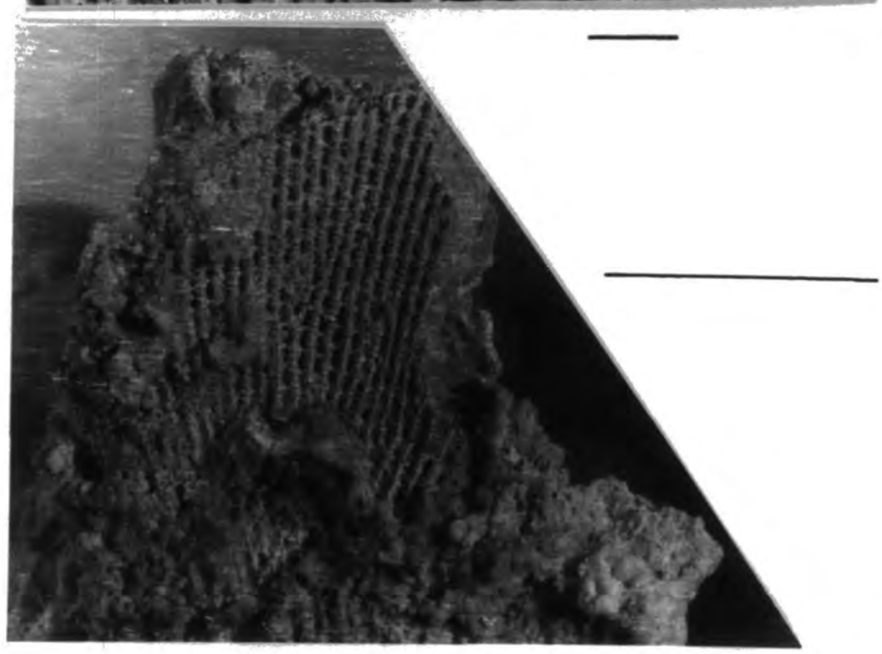
Fig.b Reverse surface.Skeleton removed over most of specimen revealing zooecial chambers in cast preservation.HM7.6.
Bar scale=Imm

Fig.c Specimen Taf.I fig.3 from the Korn collection, labelled as Fenestella retiformis by Korn(I930).
Bar scale=IOmm



a

b



c

Plate 35. *Kingopora ehrenbergi* Geinitz

Fig.a Zoarial morphology.B52A.Bar scale=3cm

Fig.b Zoarial morphology,showing colony origin. Apertures open onto the outside of the cone. NHI.Bar scale=IOmm

Fig.c Zoarial morphology.Zoarium a bilaterally compressed cone.GLT 3b. Bar scale=IOmm

Fig.d As above,fig.c.Bar scale=IOmm

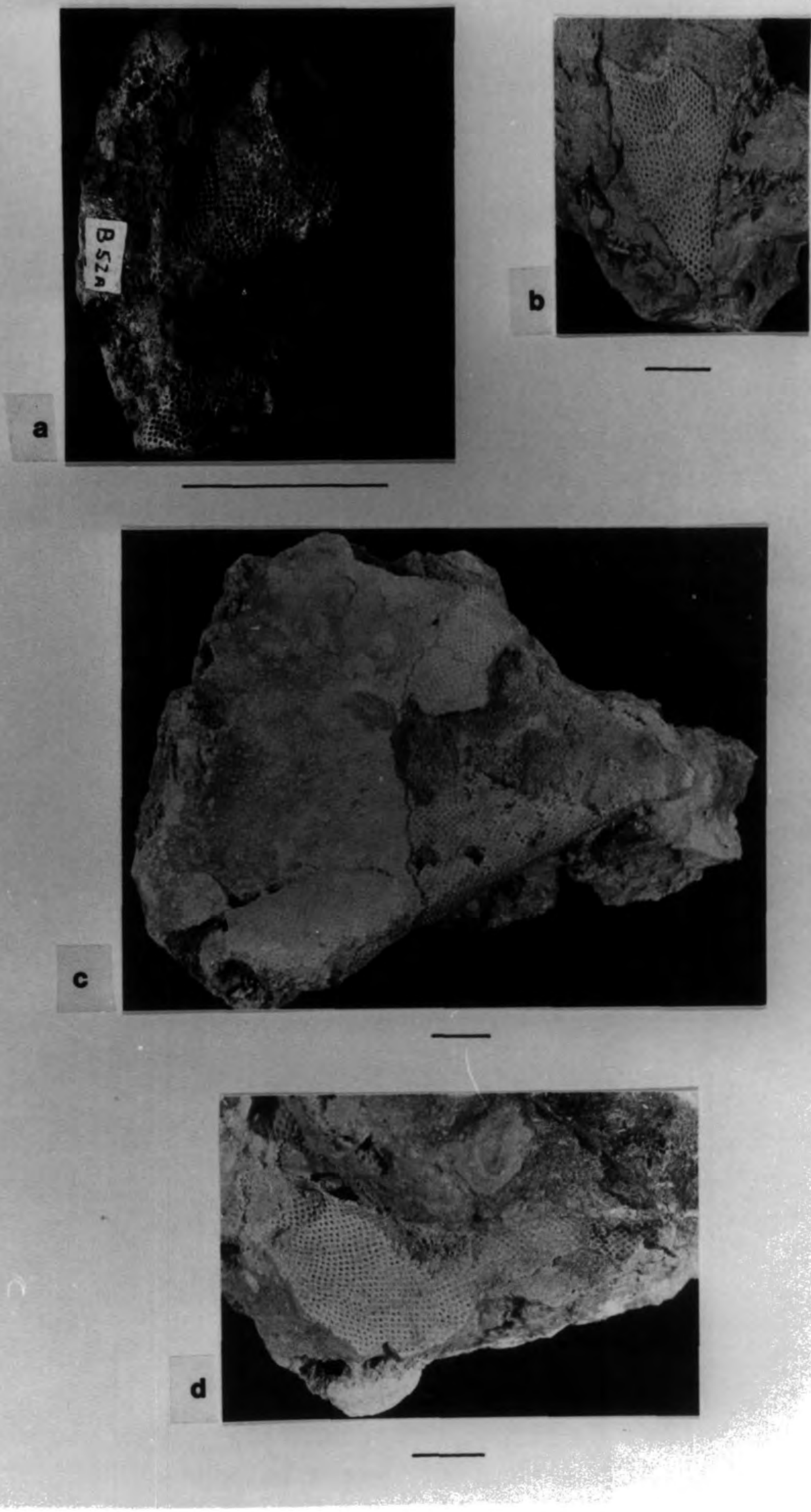

B52A
a
b
c
d

Plate 36. Kingopora ehrenbergi Geinitz

Fig.a Origin of zoarium,attached to the brachiopod Strophalosia.GLT4a. Bar scale=IOmm

Fig.b As above.GLT4.Bar scale=IOmm

Fig.c As above,fig.a,at higher magnification. Bar scale=IOmm.Thick development of extrazooidal skeleton around colony origin is visible.

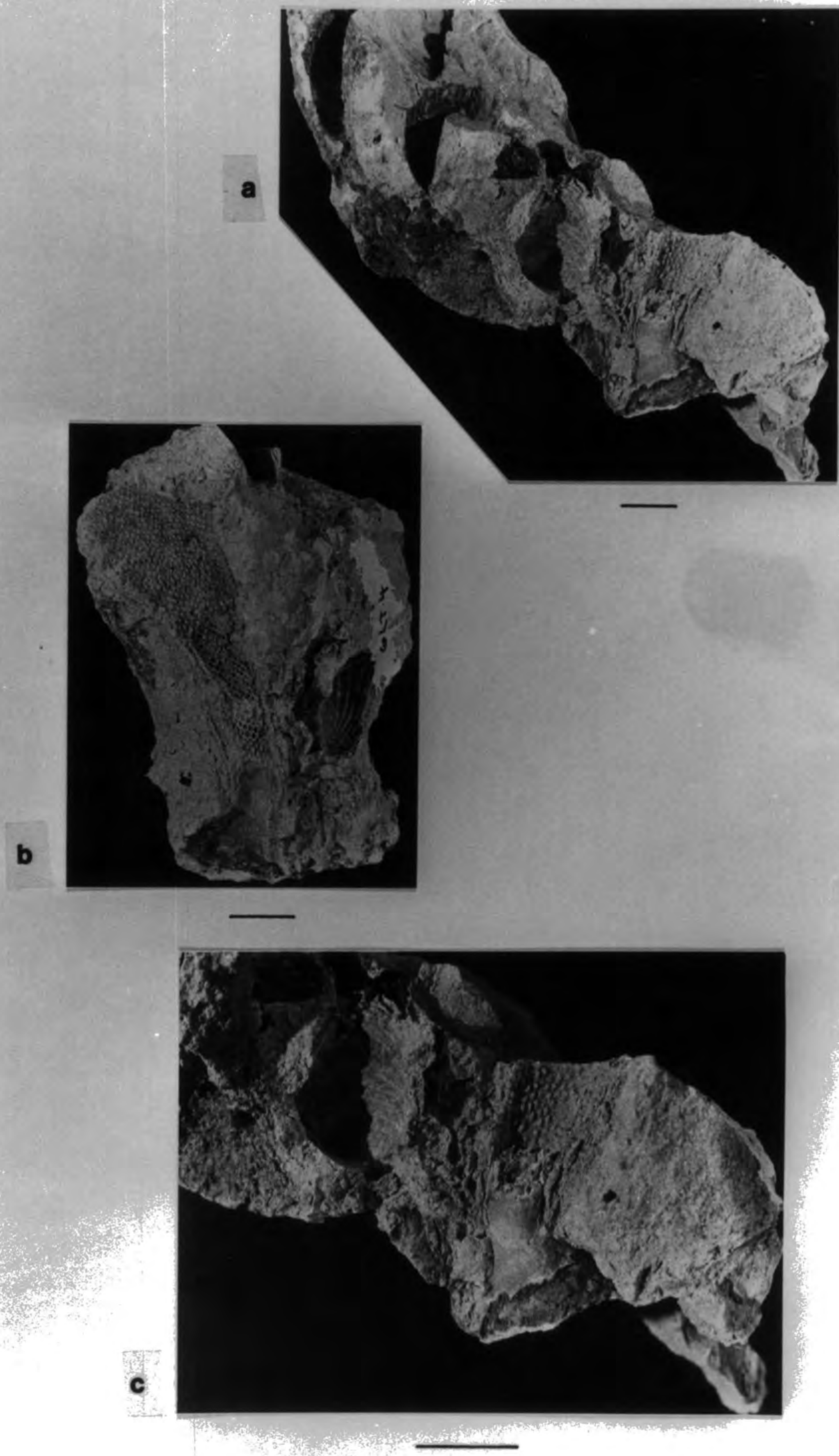

a
b
c

Plate 37. _Kingopora ehrenbergi_ Geinitz

Fig.a Polished section of colony origin,showing vesicular skeleton.Longitudinal section. GLQ2.Bar scale=Imm

Fig.b Zoarial morphology,showing colony origin. MP5.I.Bar scale=IOmm

Fig.c Colony origin with extrazooidal skeleton, seen in transverse section.GLQ3. Bar scale=Imm

Fig.d Colony origin showing spines encrusting the reverse surface(arrowed).GLT5. Bar scale=IOmm

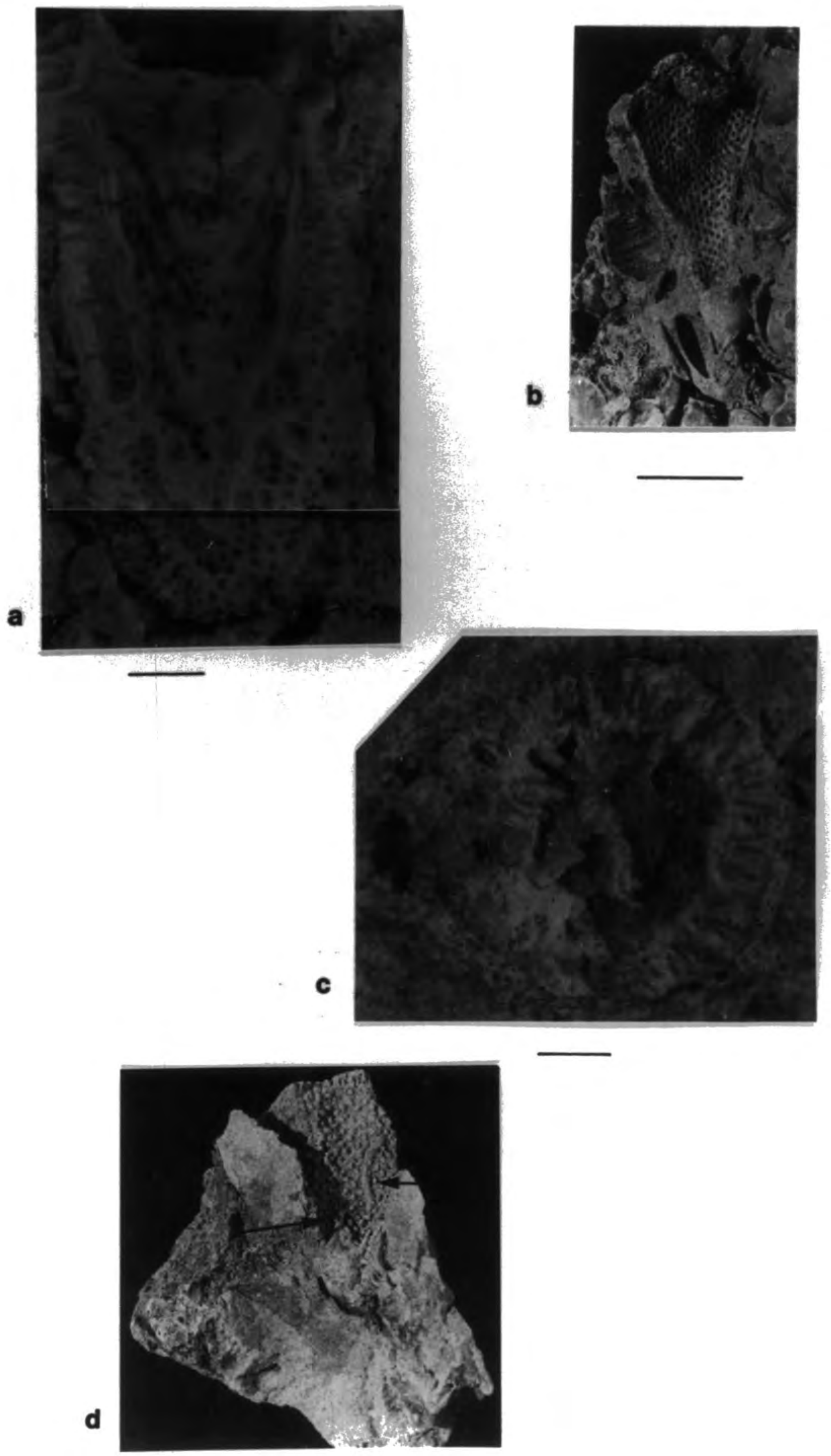
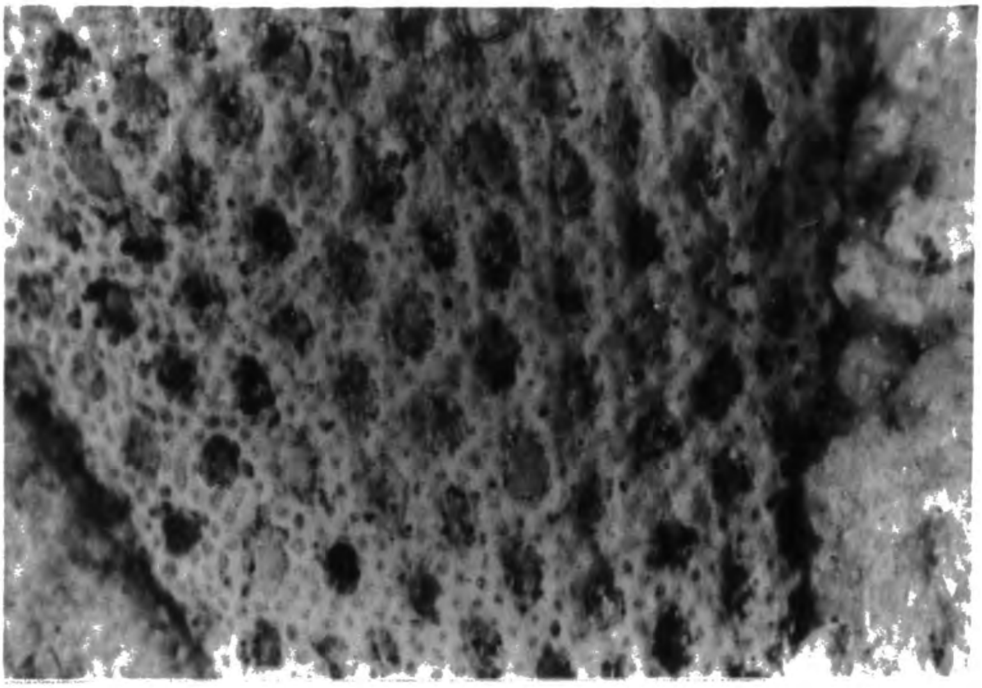

a
b
c
d

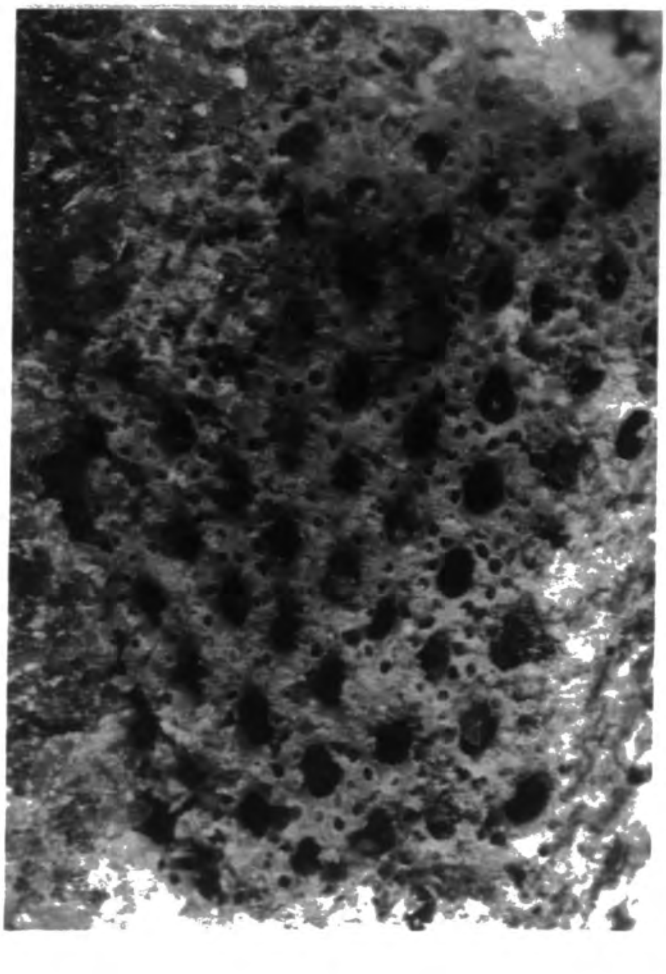
Plate 38. <u>Kingopora</u> <u>ehrenbergi</u> Geinitz

Fig.a Obverse surface detail.NHI.
Bar scale=Imm

Fig.b Obverse surface detail.MP5.I2a.
Bar scale=Imm



a



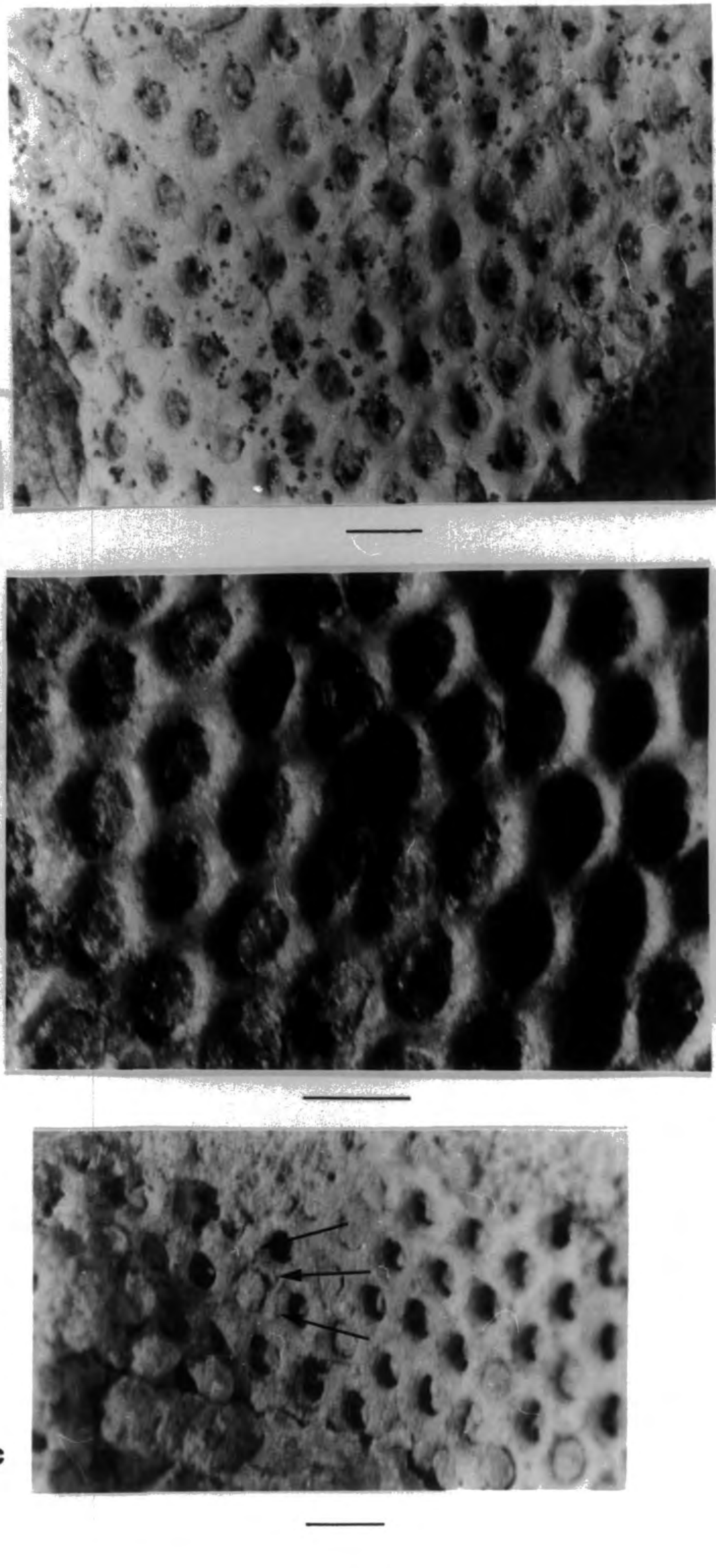
b

Plate 39. Kingopora ehrenbergi Geinitz

Fig.a Reverse surface detail.GLQI8.
Bar scale=Imm

Fig.b Reverse surface detail.BIO8B.
Bar scale=Imm

Fig.c Reverse surface detail,showing reverse surface nodes(arrowed).GLTI4.
Bar scale=Imm



a

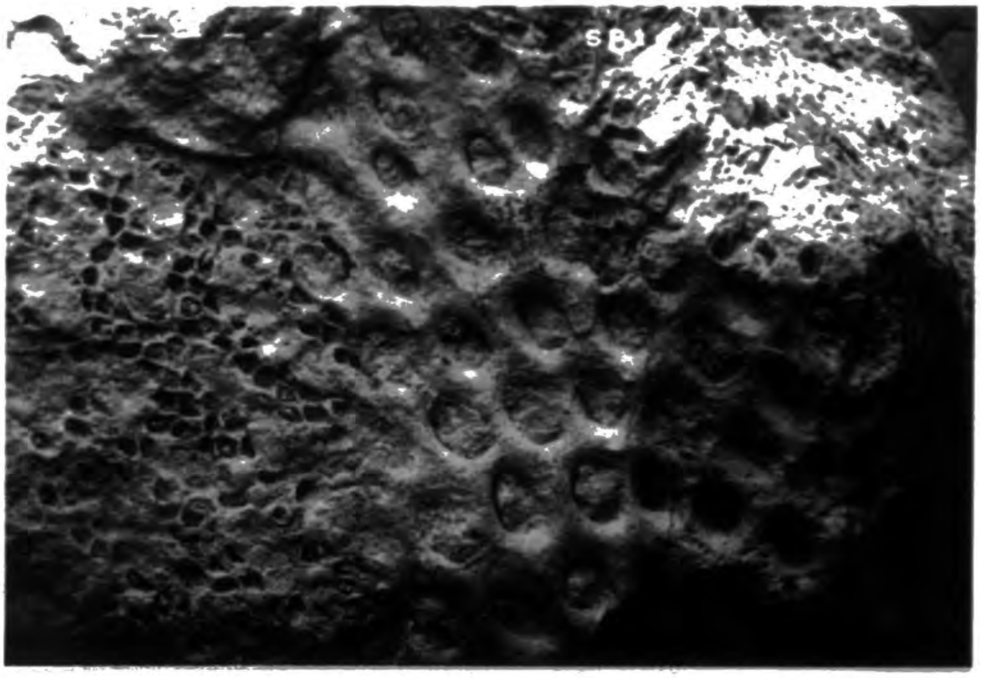
b

c

Plate 40. Kingopora ehrenbergi Geinitz

Fig.a S.E.M. photomicrograph showing the reverse surface and the shapes of zooecial chamber bases.BI08G.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=Imm



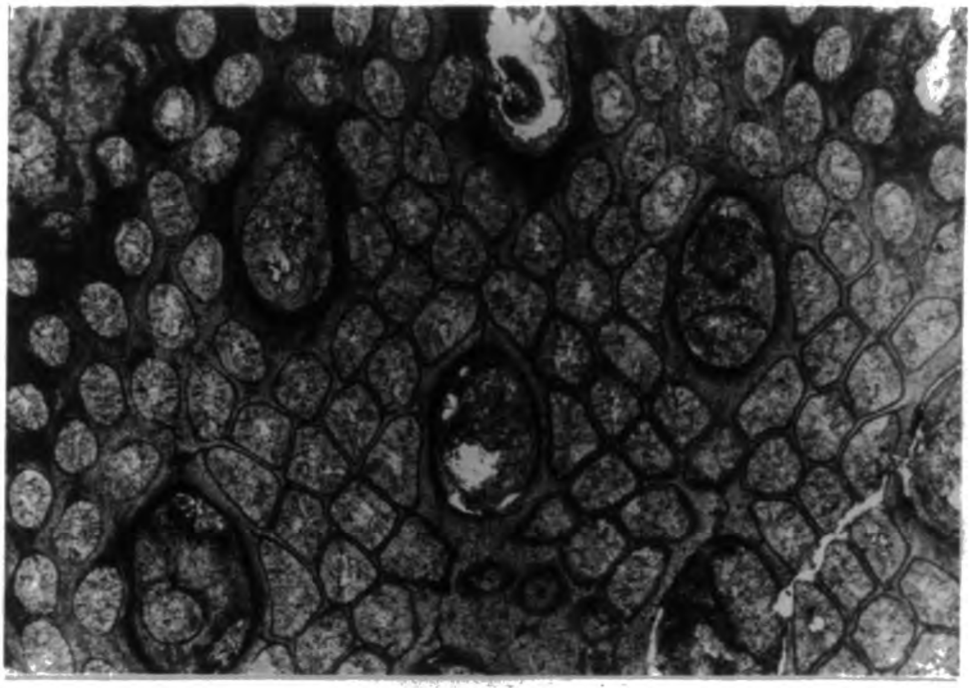
a

b

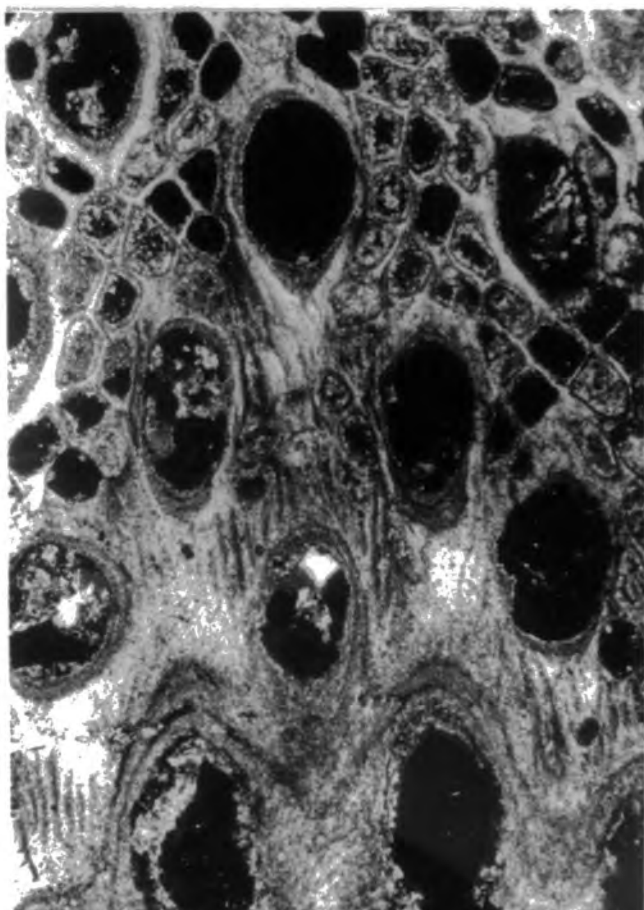
Plate 4I. <u>Kingopora</u> <u>ehrenbergi</u> Geinitz

Fig.a Tangential section.GLQI5.
Bar scale=Imm

Fig.b Tangential section.XPL.MP5-I3.
Bar scale=Imm



a



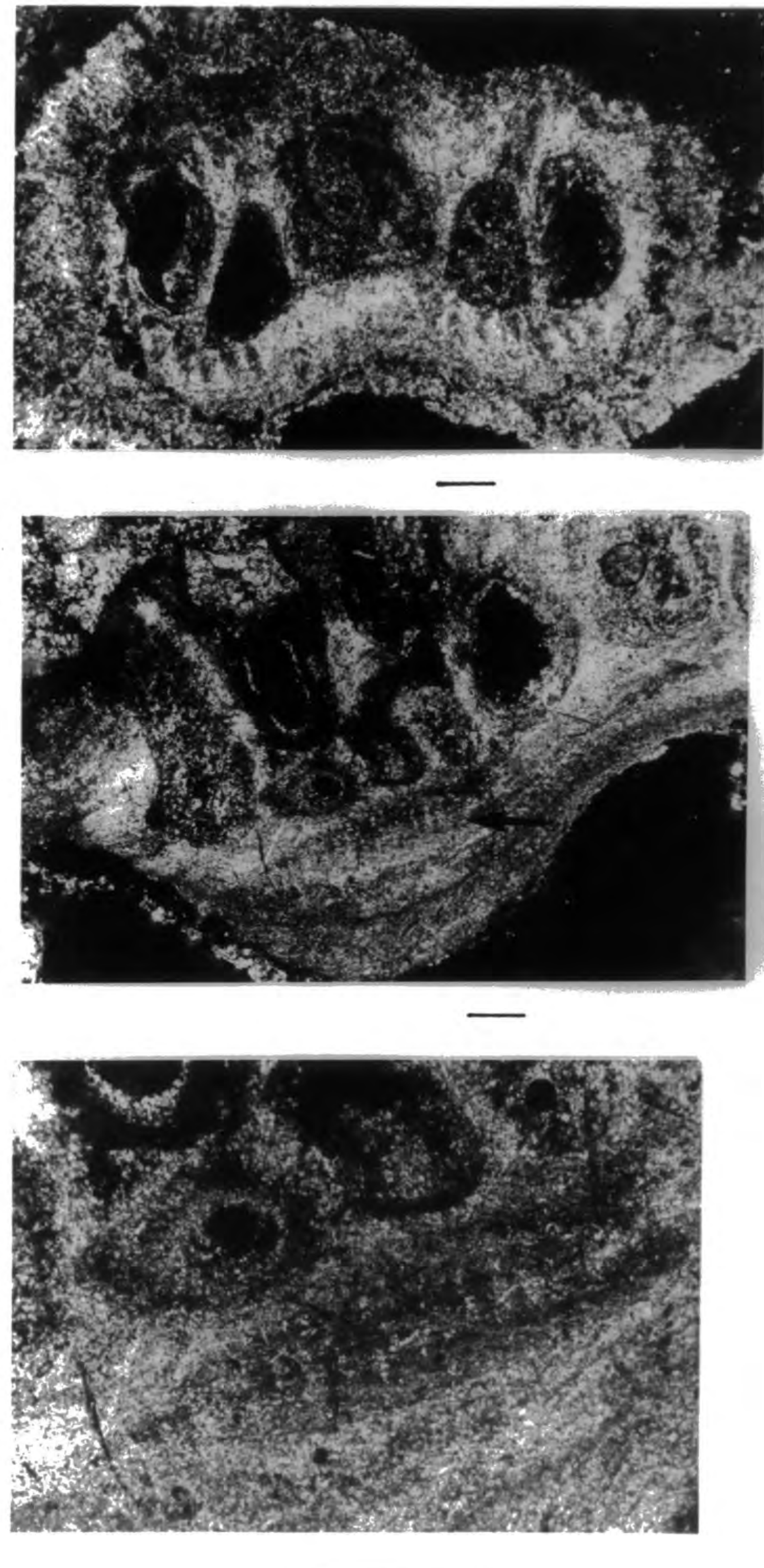
b

Plate 42. _Kingopora_ _ehrenbergi_ Geinitz

Fig.a Transverse section.The 'inner platy core' of the longitudinal striae is in extinction. MP5.2.XPL.Bar scale=O.Imm

Fig.b Transverse section.Skeletal rods arrowed. MP5-I3.XPL.Bar scale=O.Imm

Fig.c As above,fig.b at higher magnification to show skeletal rods.XPL. Bar scale=O.Imm



a

b

c

Plate 43. Kingopora ehrenbergi Geinitz

Fig.a Transverse/Longitudinal section.GLQI8.
Bar scale=Imm

Fig.b Transverse/Longitudinal section.GLQI8.
Bar scale=Imm

Fig.c As above,fig.b at higher magnification.
Inner laminated layer arrowed.Its thickness decreases distally in a zooecial chamber.
Bar scale=O.Imm

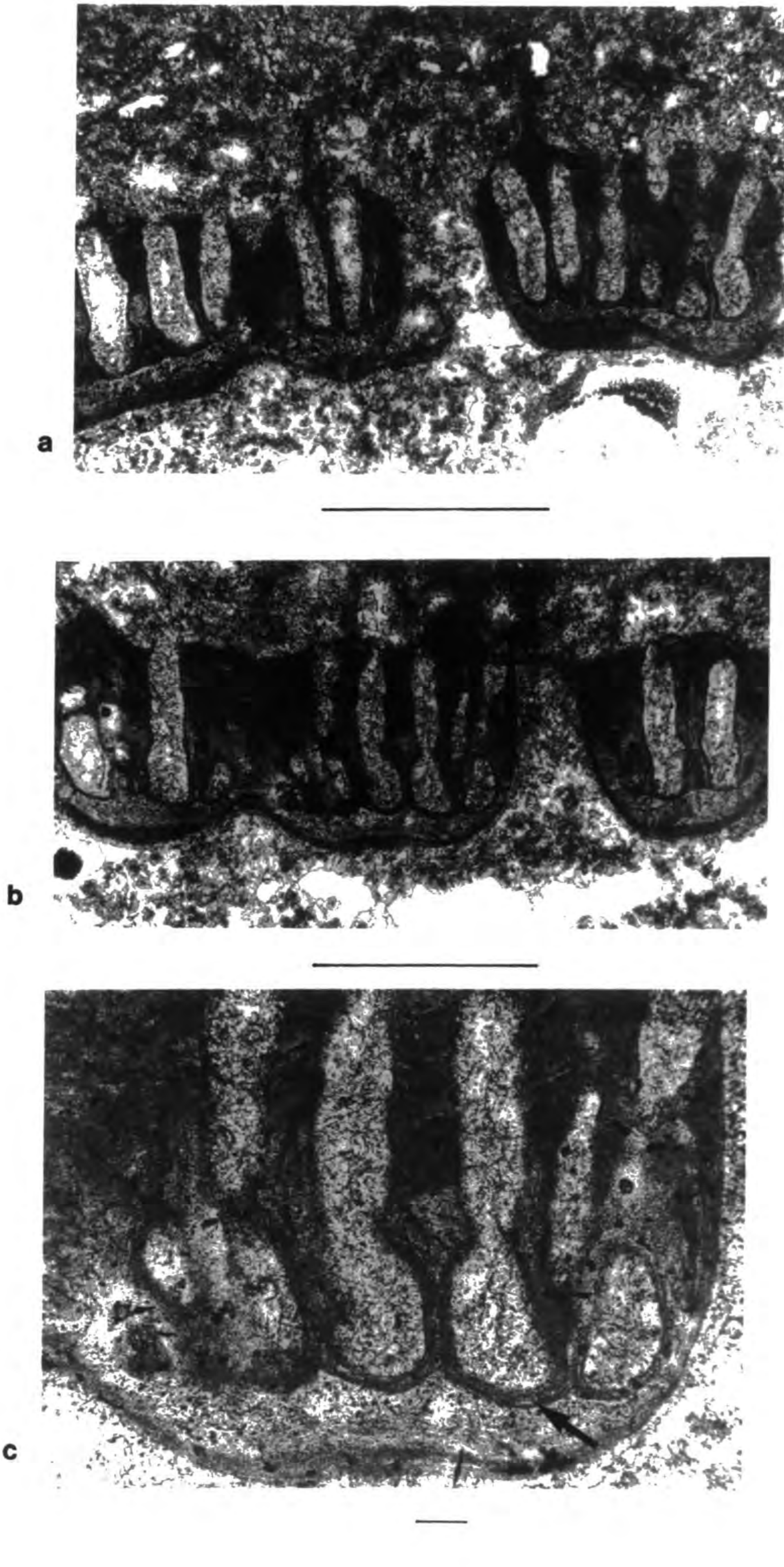


Plate 44. *Kingopora ehrenbergi* Geinitz

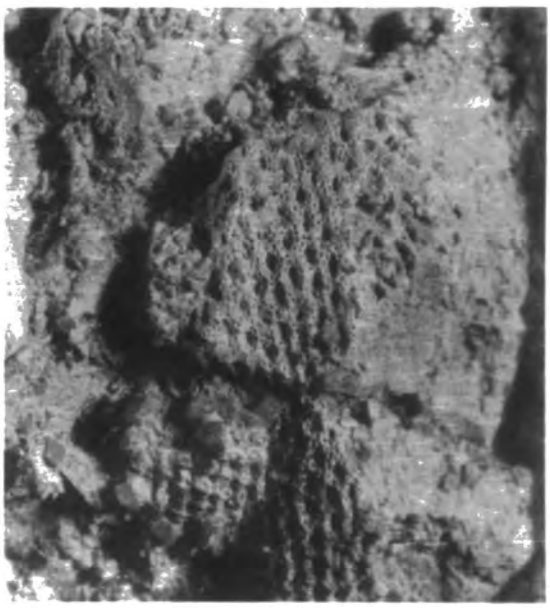
Fig.a Specimen Taf.III fig.7 from the Korn collection.Bar scale=5mm

Fig.b Specimen Taf.III fig.I2 from the Korn collection, assigned to "*Phyllopora solida*" by Korn(I930). Bar scale=5mm (Mould preservation).

Fig.c Specimen Taf.IV fig.I from the Korn collection, assigned to "*Phyllopora solida*" by Korn(I930). Bar scale=5mm

a

b



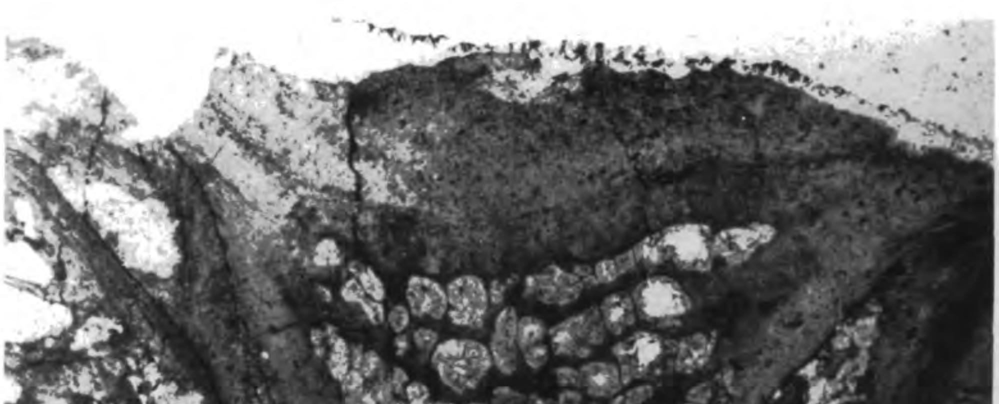
c

Plate 45. Kingopora ehrenbergi Geinitz

Fig.a Longitudinal section through colony origin showing vesicular skeleton.GLQ2.
Bar scale=Imm

Fig.b As above at higher magnification to show vesicular extrazooidal skeleton.
Bar scale=Imm

a



b

Plate 46. Kingopora ehrenbergi Geinitz

Fig.a Colony origin showing robust spine(arrowed), developed from the obverse surface.GLT8. Bar scale=IOmm

Fig.b As above at higher magnification. Bar scale=Imm

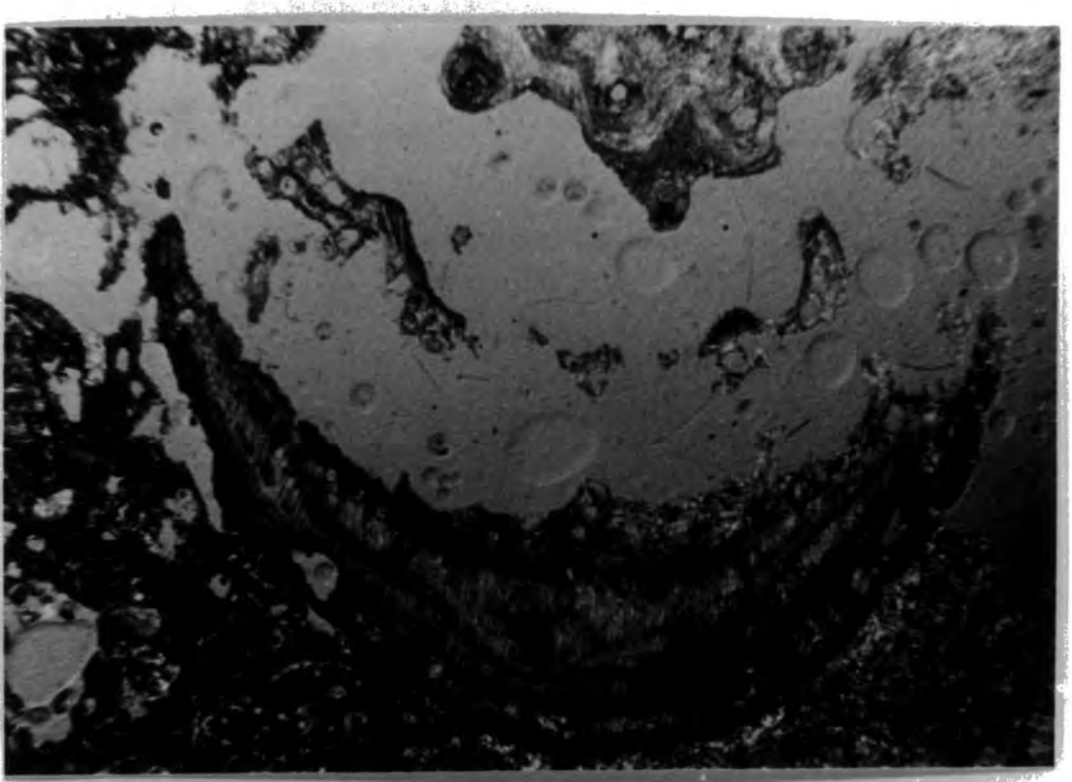
a

b

Plate 47. <u>Kingopora</u> <u>ehrenbergi</u> Geinitz

Fig.a Striated extrazooidal skeleton of a colony origin.MP5-6.
Bar scale=Imm

Fig.b As above at higher magnification showing discontinuities perpendicular to the striae. MP5-6.XPL.
Bar scale=O.Imm



a

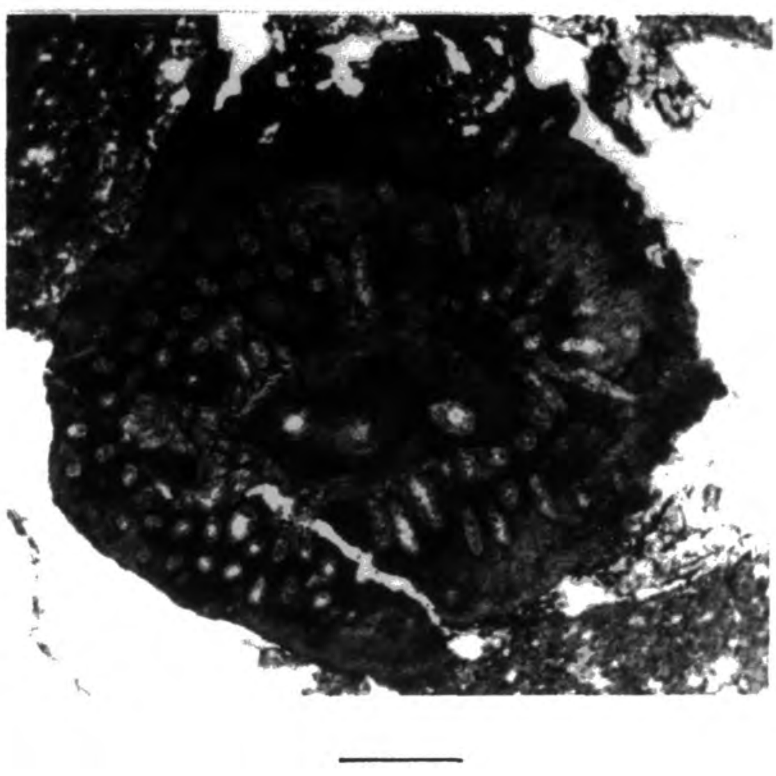
b

Plate 48. _Kingopora_ _ehrenbergi_ Geinitz

Fig.a Transverse section close to colony origin, showing particularly elongate zooecial chamber in bottom right corner.GLQ4. Bar scale=Imm

Fig.b As above at lower magnification. Bar scale=Imm

a



b

Plate 49. Kingopora ehrenbergi Geinitz

Fig.a Supplementary lateral lamina (arrowed). GLQ6. Bar scale=Imm

Fig.b As above at higher magnification. Bar scale=Imm

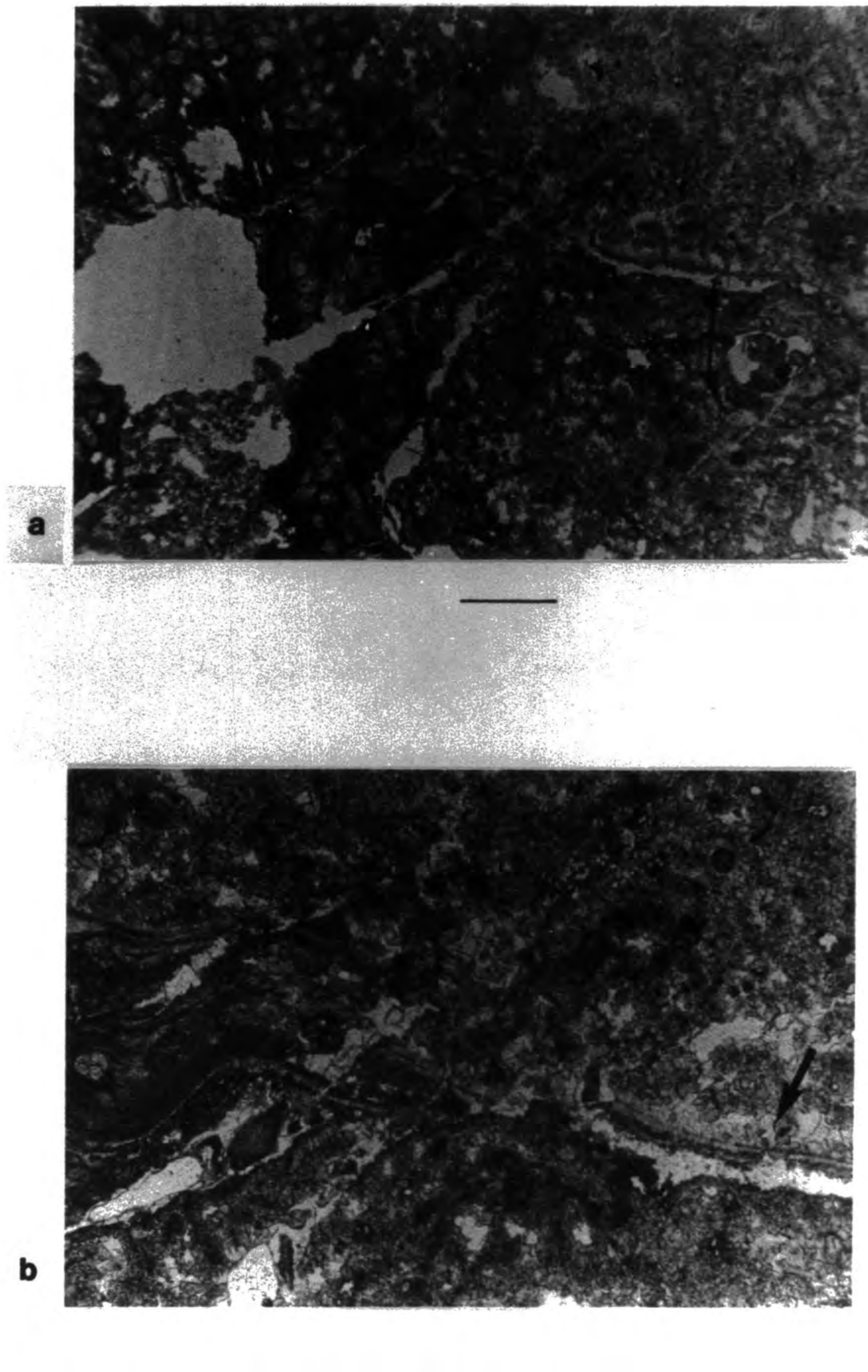


Plate 50.

Fig.a "Dingeria depressa"Geinitz(I86I),interpreted as part of the holdfast of Kingopora ehrenbergi by Korn(I930).Specimen with no number. Bar scale=5mm

Fig.b Trepostome in cast preservation.GLQIO. Bar scale=Imm

a

b

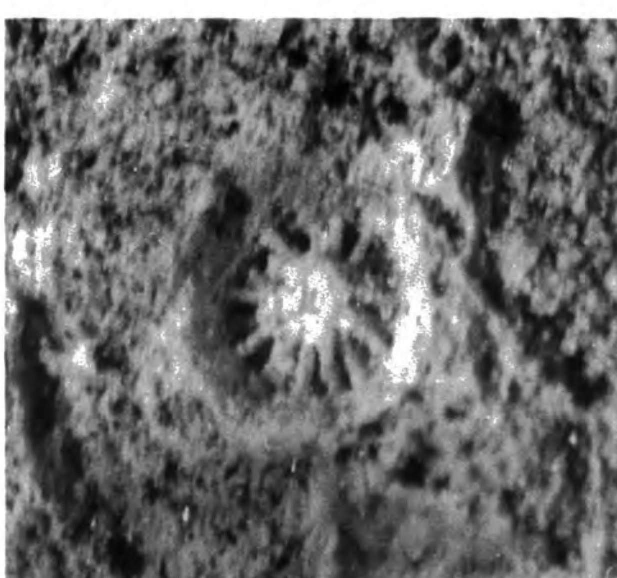


Plate 5I. _Kingopora_ _ehrenbergi_ Geinitz

Fig.a Obverse surface showing structures interpreted as ovicells(arrowed).NHI. Bar scale=IOmm

Fig.b As above at higher magnification,showing ?ovicells.Bar scale=Imm

Fig.c Close-up of ?ovicells.NHI. Bar scale=Imm

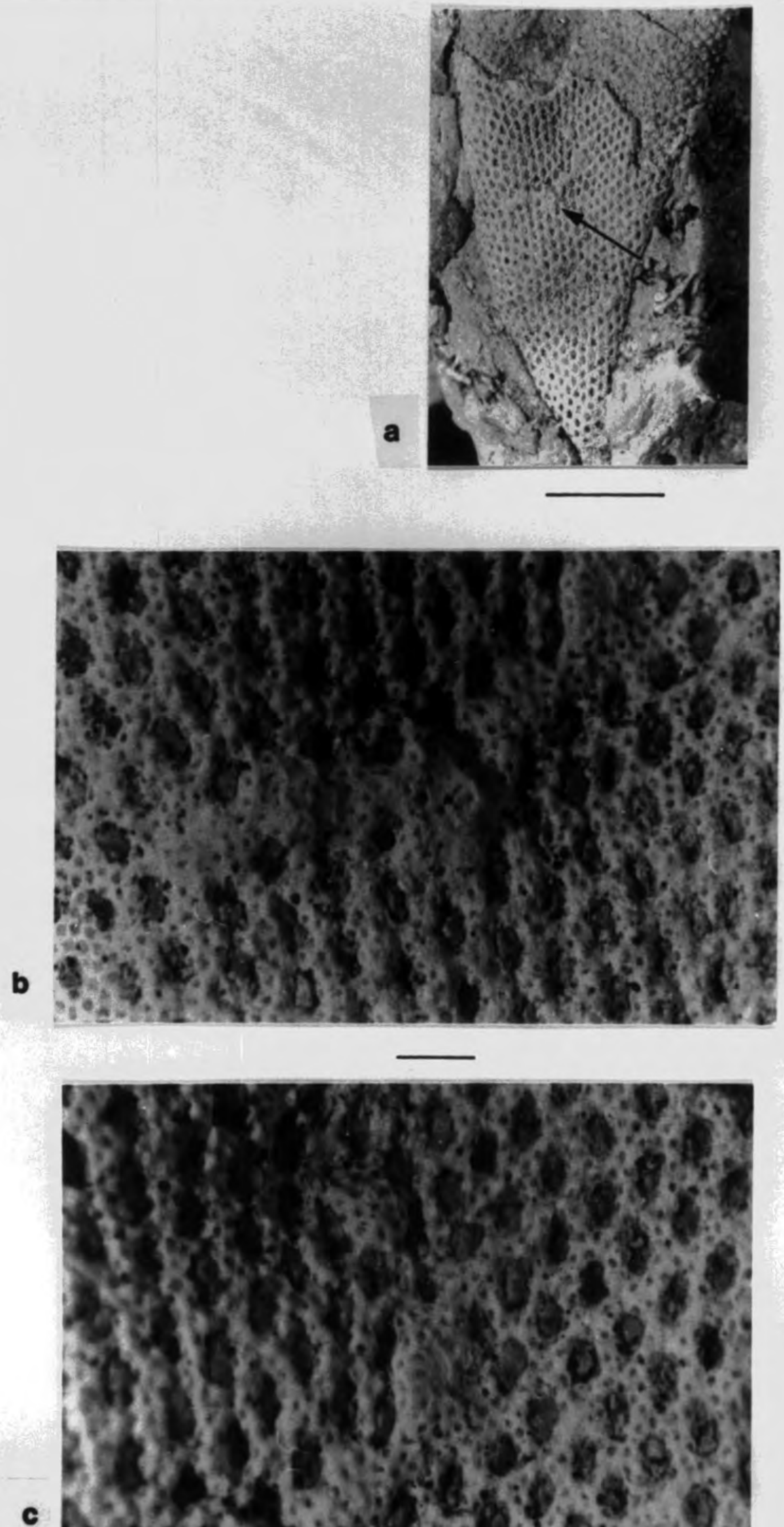
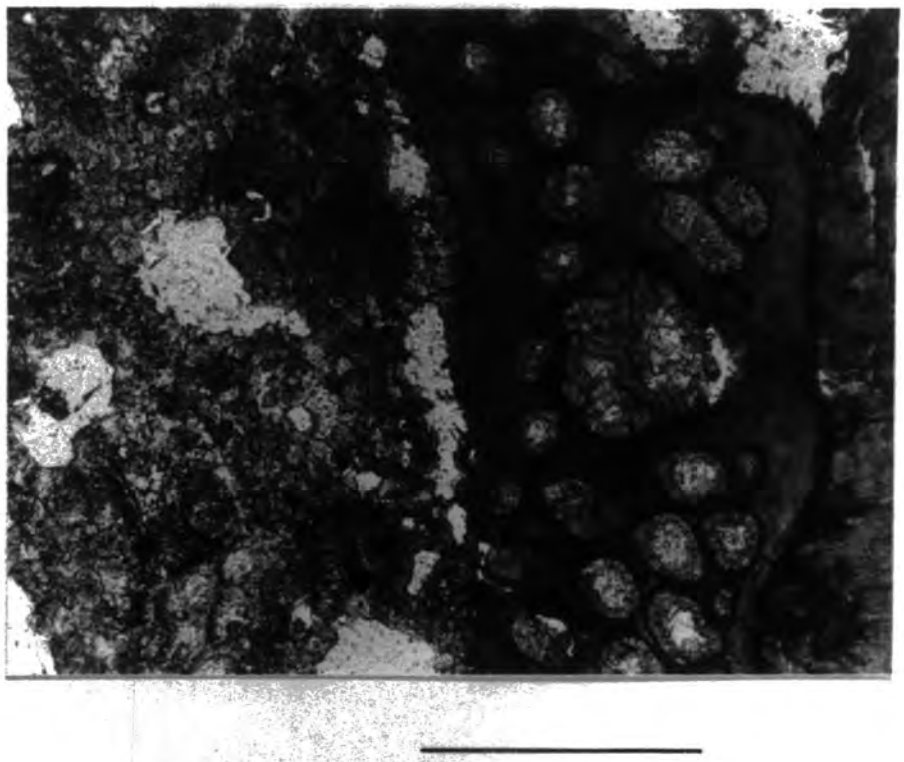

a
b
c

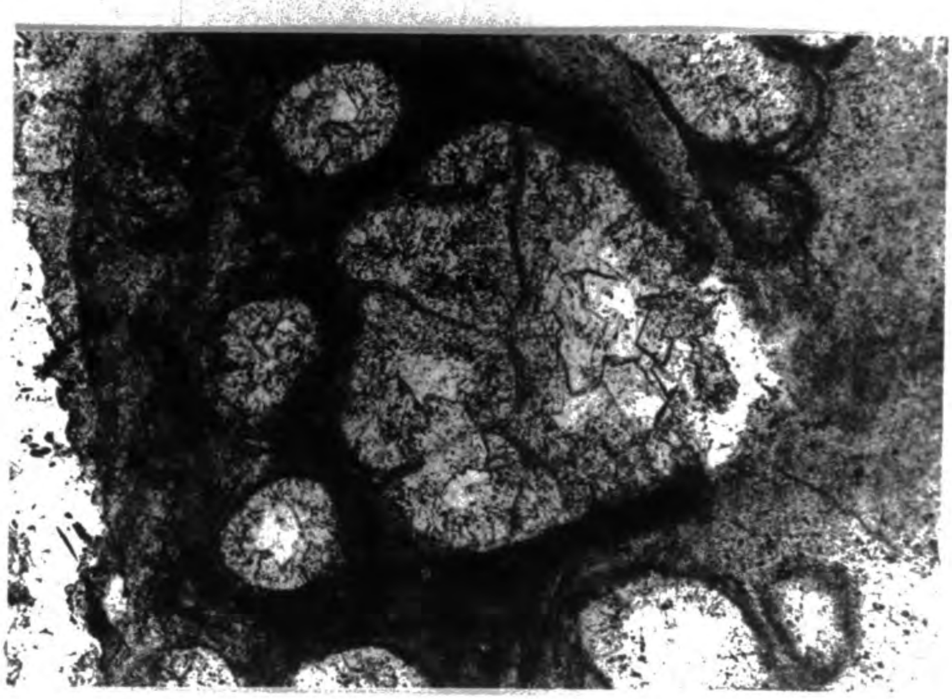
Plate 52. _Kingopora_ _ehrenbergi_ Geinitz

Fig.a Oblique section showing thin skeletal walls developed in a fenestrule - interpreted as ?representing ovicells,or a stage in their development.GLQI5.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=O.Imm



a



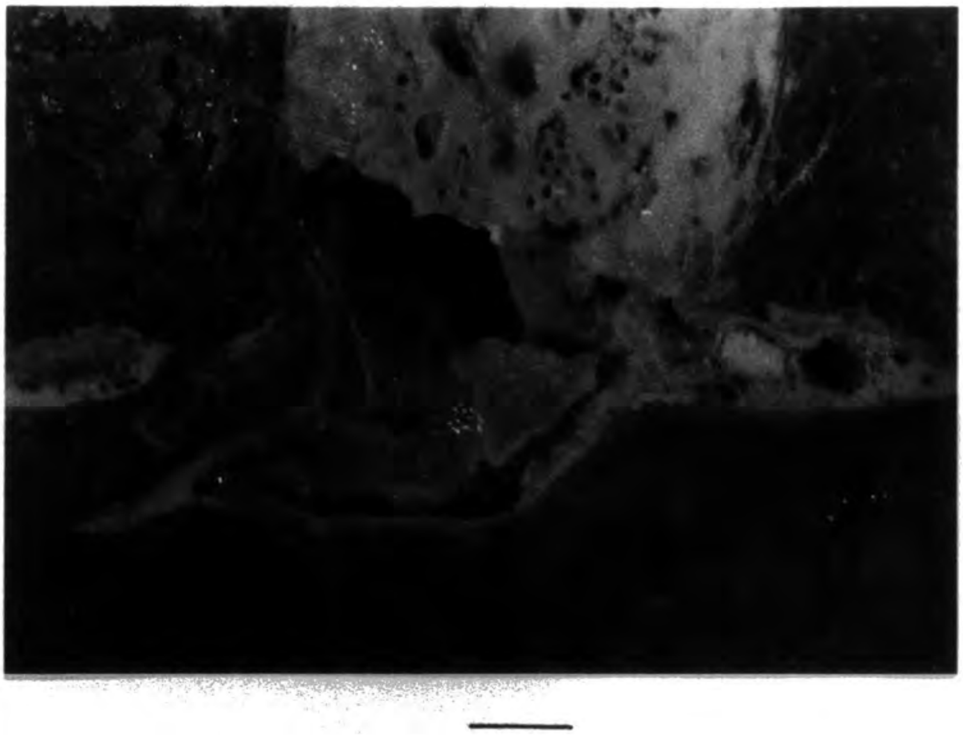
b

Plate 53. <u>Kingopora</u> <u>ehrenbergi</u> Geinitz

Fig.a Polished section showing colony origin, encrusting a hard substratum and overgrowing a colony of <u>Dyscritella</u>.MP5.3/I.Bar scale=Imm

Fig.b As above at lower magnification, showing lithified crust.
Bar scale=IOmm

a



b

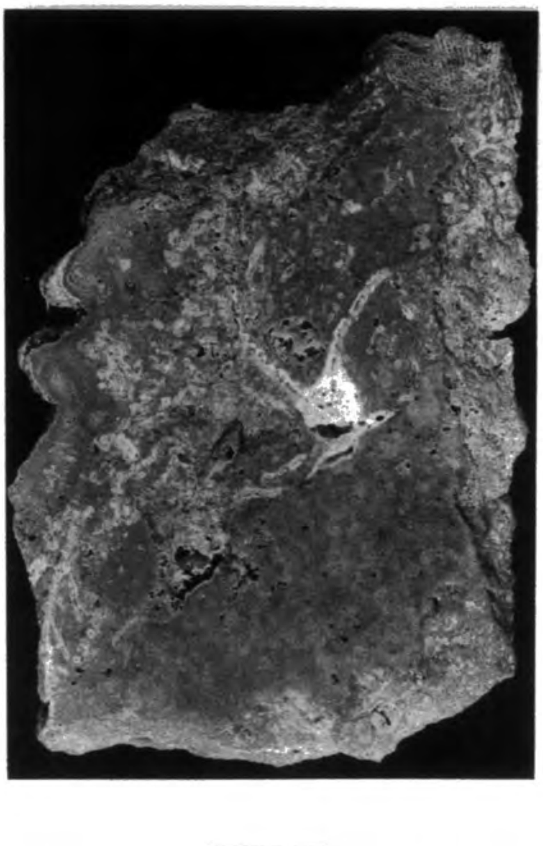
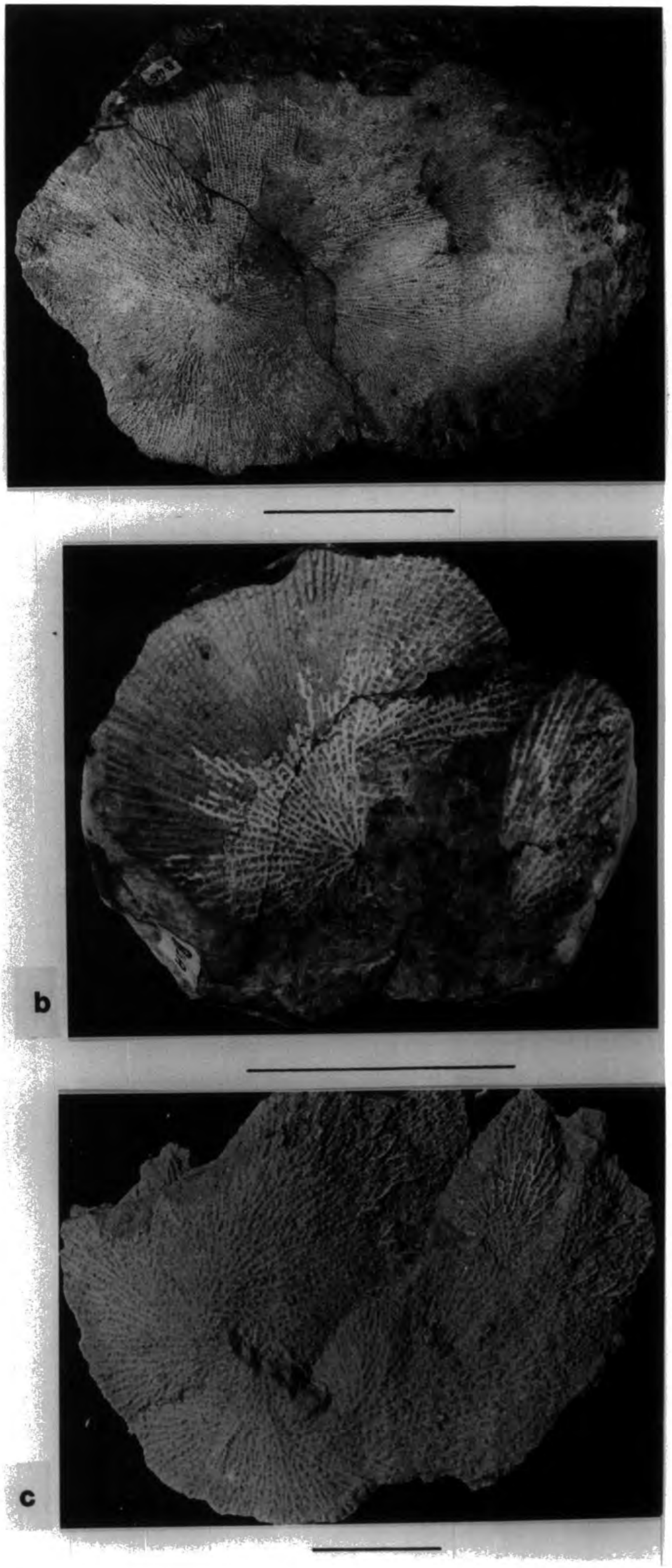


Plate 54. *Synocladia virgulacea* Sedgwick

Fig.a Zoarial morphology.B45.
Bar scale=5cm

Fig.b Zoarial morphology,showing assymetrical development of bifurcations.B43A.
Bar scale=3cm

Fig.c Specimen showing development of spiral zoarial morphology.HYQII.
Bar scale=2cm



b

c

Plate 55. Synocladia virgulacea Sedgwick

Fig.a Reverse surface, showing crowding of branches at distal edge of zoarium.BIOO.
Bar scale=Icm

Fig.b Mould of zoarium showing the positions of reverse surface spines.B3O.
Bar scale=Icm

Fig.c Reverse surface detail.RH2.I.
Bar scale=Imm

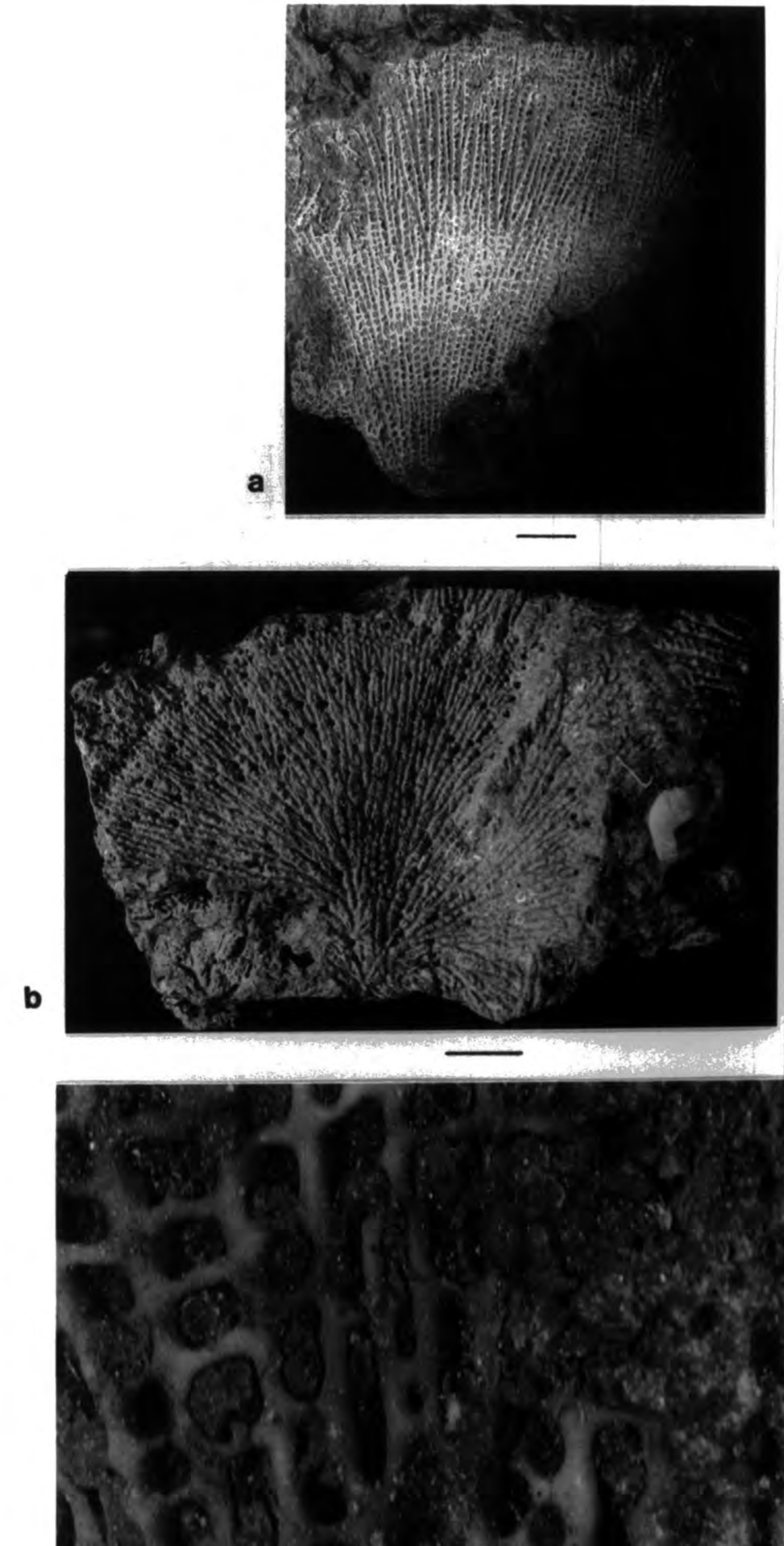

a
b
c

Plate 56. <u>Synocladia virgulacea</u> Sedgwick

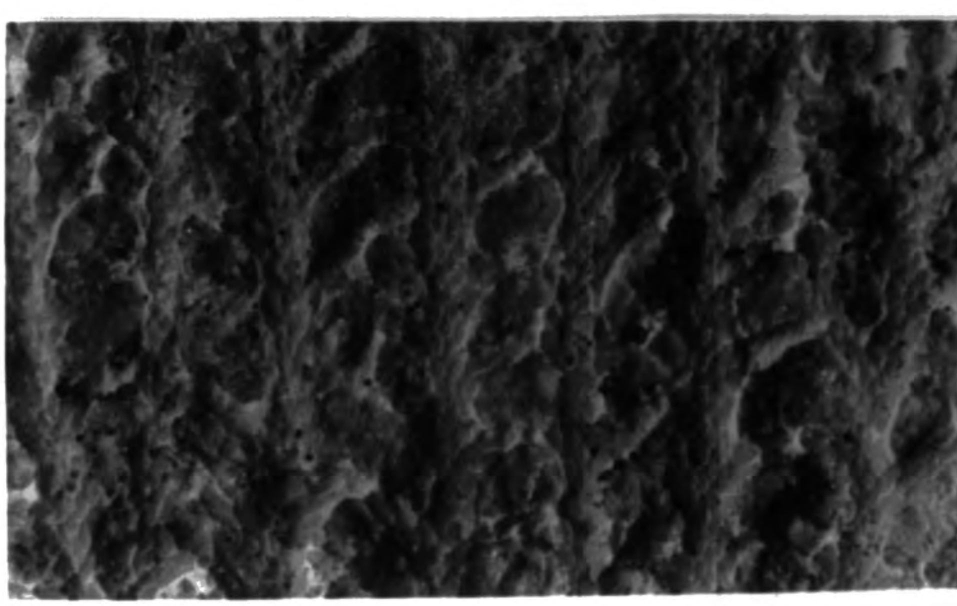
Fig.a Latex cast of specimen B29B, showing uncharacteristically wide fenestrules.
Bar scale=Icm

Fig.b As above at higher magnification, showing minor secondary branches developed from dissepiments where fenestrules are especially wide(arrowed).
Bar scale=Imm

Fig.c Reverse surface detail, skeleton removed revealing zooecial chambers in cast preservation. BIOO.
Bar scale=Imm

a

b

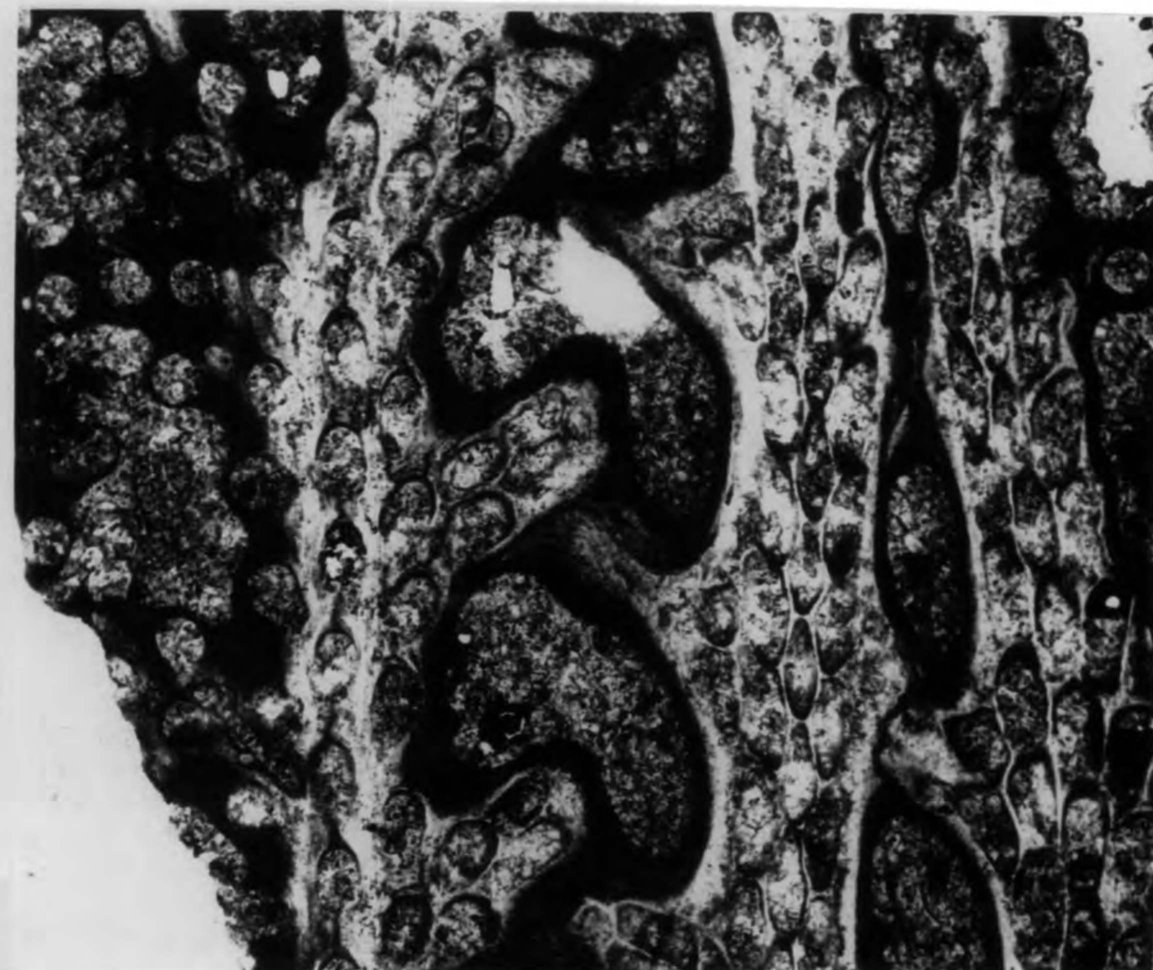


c

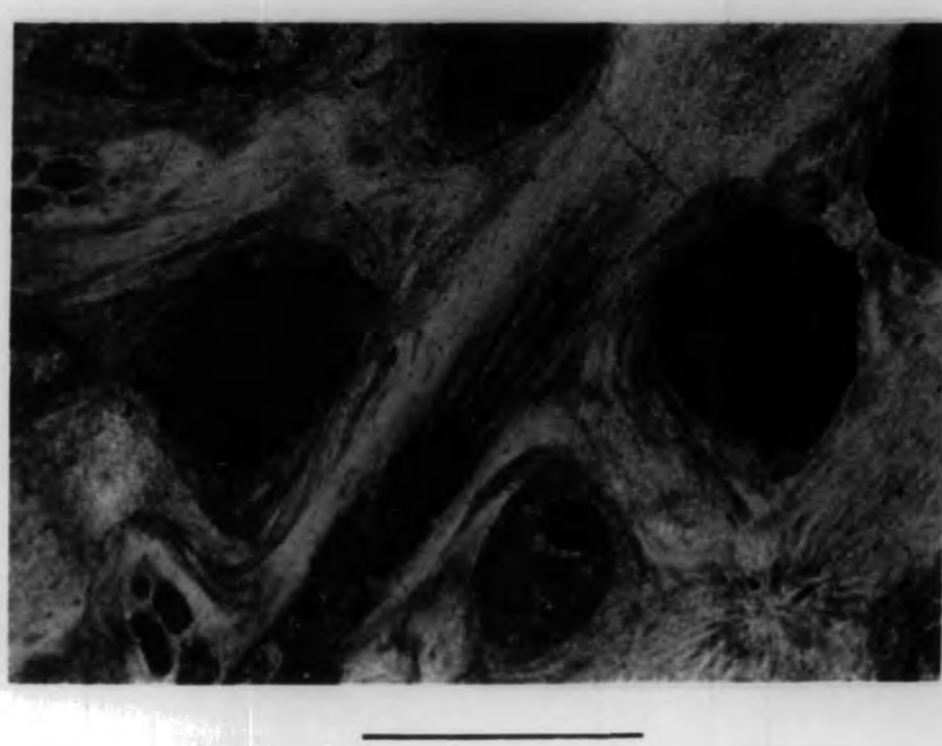
Plate 57. Synocladia virgulacea Sedgwick

Fig.a Tangential section.HM5.5tang.
Bar scale=Imm

Fig.b Tangential section,showing longitudinal striae and origin of a reverse surface spine.
MP5.23.XPL.
Bar scale=Imm



a



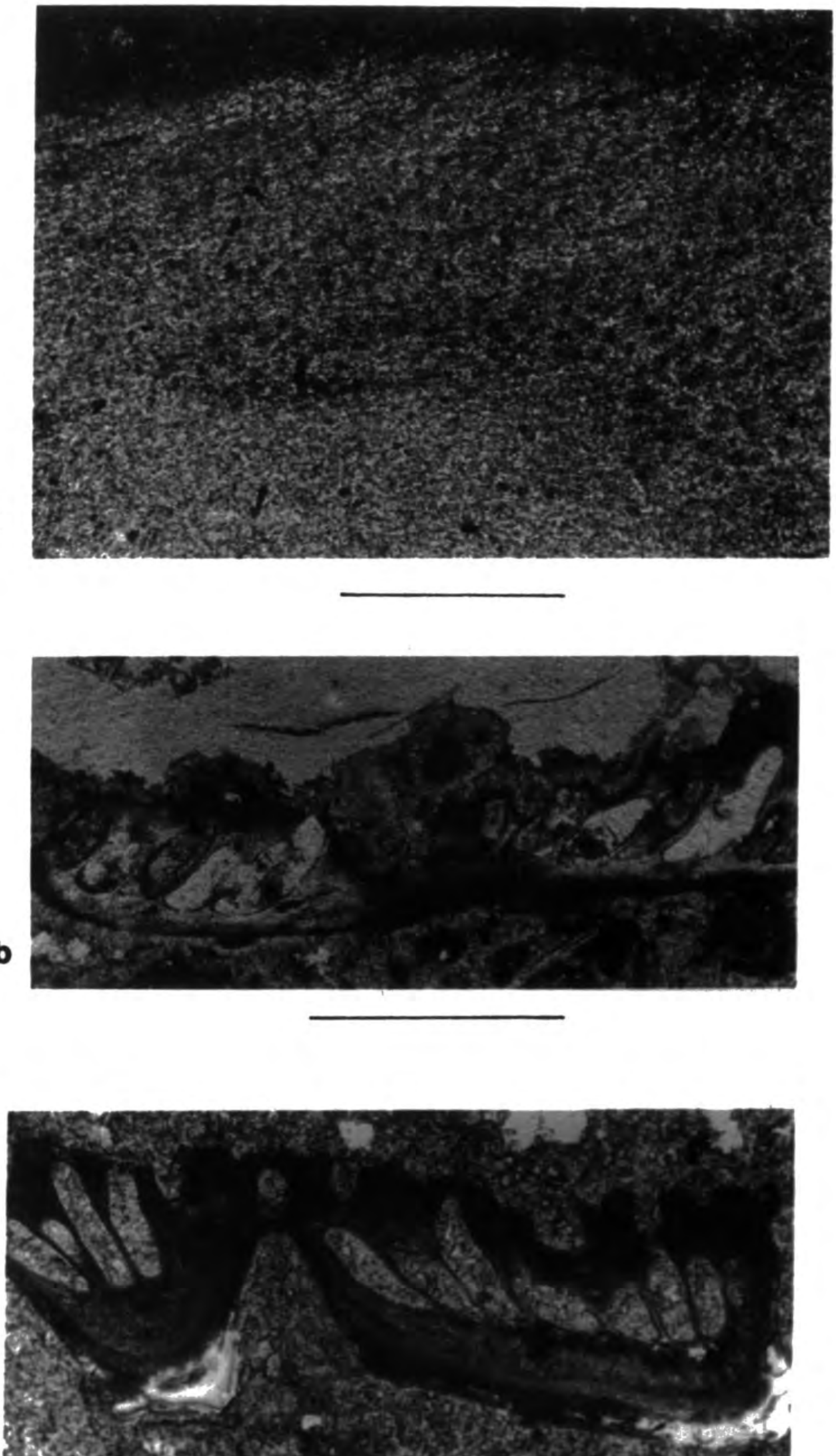
b

Plate 58. <u>Synocladia</u> <u>virgulacea</u> Sedgwick

Fig.a Tangential section,showing skeletal rods. MP5.23.Bar scale=O.Imm

Fig.b Longitudinal section.MP5.25. Bar scale=Imm

Fig.c Oblique longitudinal section.SBC4a. Bar scale=Imm



a

b

c

Plate 59. <u>Synocladia</u> <u>virgulacea</u> Sedgwick

Fig.a Specimen showing a clear dichotomy of fenestrule dimensions between proximal and distal parts of the zoarium.HN9. Bar scale=2cm

Fig.b Zoarium(preserved as a mould) with a 'sub-colony' developed at its distal margin.Specimen from Sunderland museum with no number.Bar scale=6cm

Fig.c As above,fig.b,at higher magnification. Bar scale=5cm

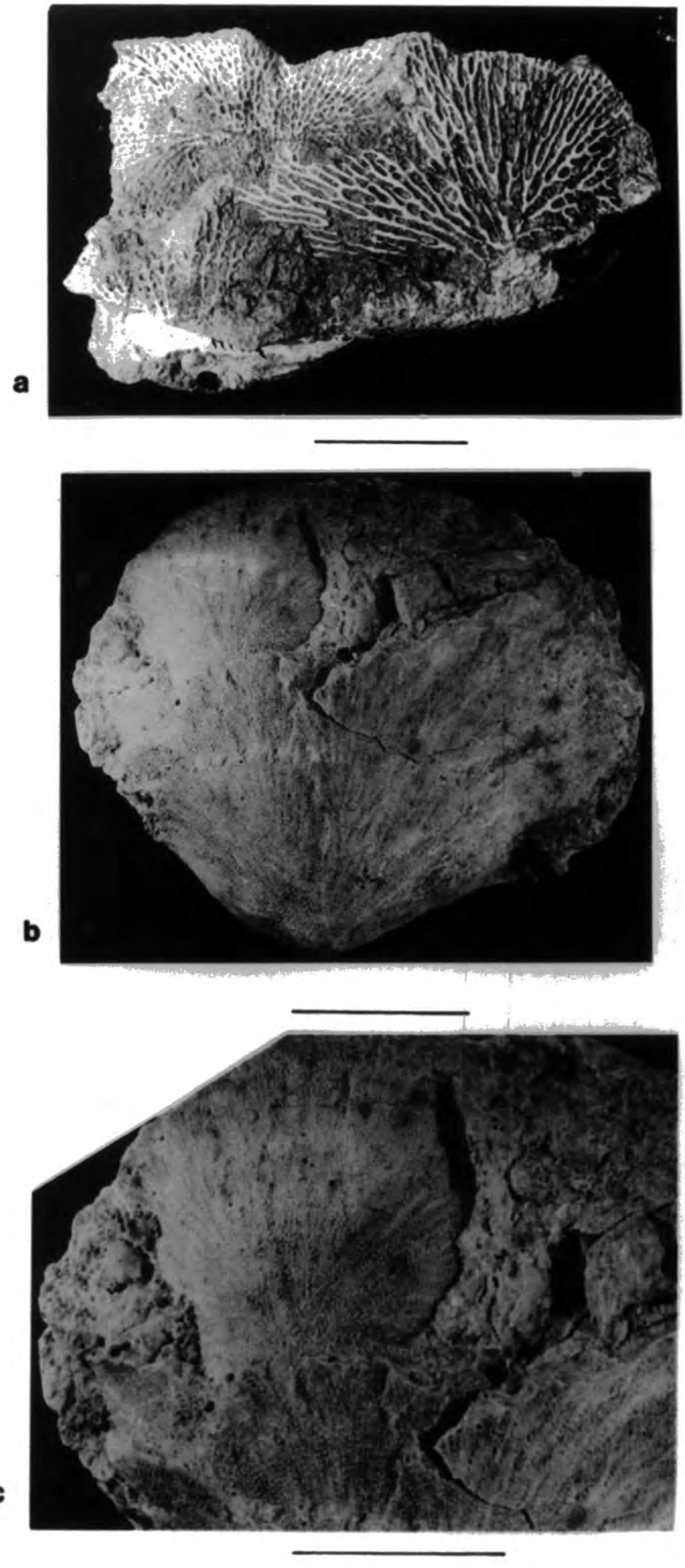
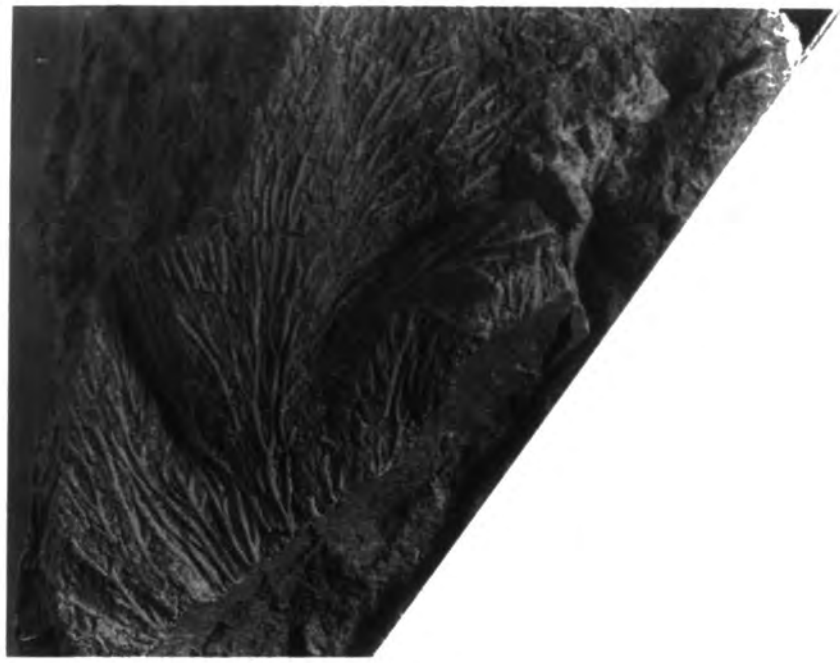

a
b
c

Plate 60. *Synocladia virgulacea* Sedgwick

Fig.a Specimen Taf.I fig.IO,Taf.II fig.I from the Korn collection,assigned to *Synocladia weigelti* by Korn(I930).
Bar scale=IOmm

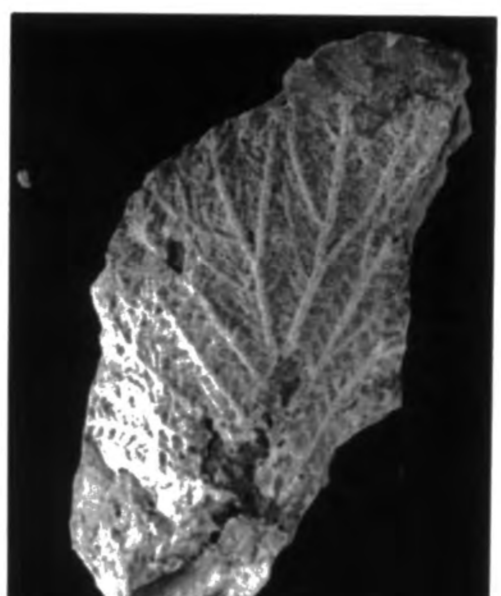
Fig.b Specimen Taf.II fig.5,6 from the Korn collection,assigned to *Synocladia dux* by Korn(I930).
Bar scale=IOmm

Fig.c Reverse surface of specimen with unusually wide fenestrules.MPI.IOO.
Bar scale=IOmm



a

b



c

Plate 6I. <u>Synocladia</u> <u>virgulacea</u> Sedgwick

Fig.a Obverse surface,mineralogically overgrown. MPI.49.Bar scale=IOmm

Fig.b Reverse surface of a particularly delicate zoarium.MPI.23. Bar scale=IOmm

Fig.c Reverse surface of a particularly delicate zoarium.MPI.83. Bar scale=IOmm

a

b

c

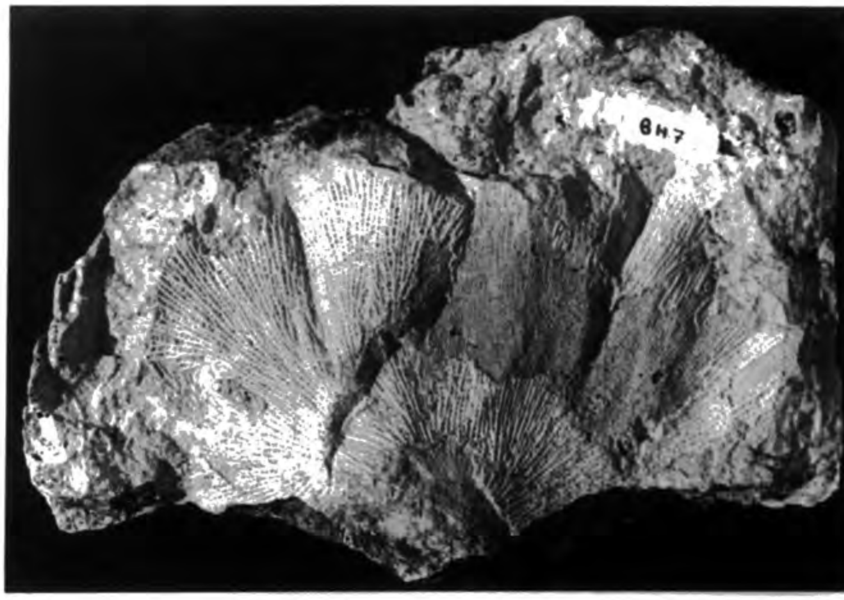
Plate 62. Synocladia virgulacea Sedgwick

Fig.a Zoarial morphology.BH7.
Bar scale=20mm

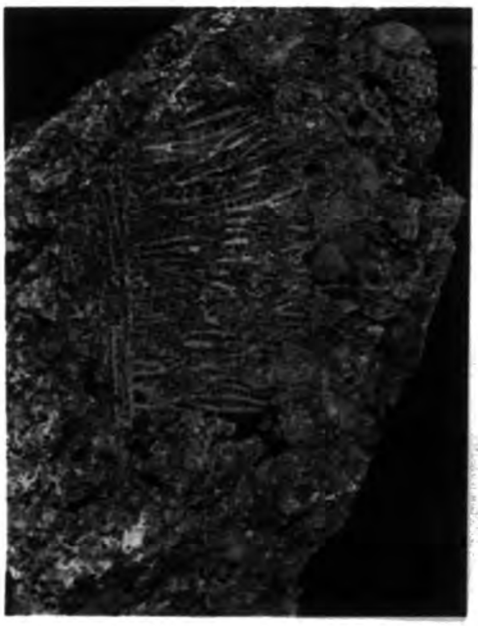
Fig.b Zoarial morphology,showing branches developed at right angles to the growth direction of the parent branch.RH2.6.
Bar scale=IOmm

Fig.c Zoarial morphology,showing sudden expansion from one level.B43B.
Bar scale=IOmm

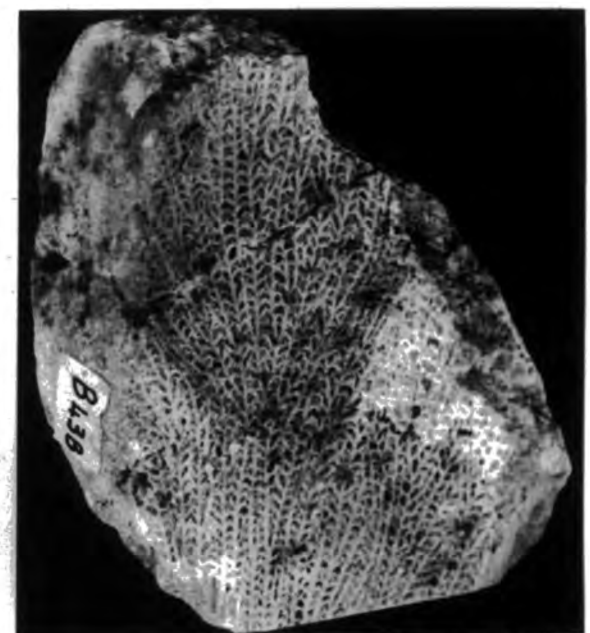
Fig.d Zoarial morphology,showing branches developed at right angles to the growth direction of the parent branch.B29A.
Bar scale=IOmm



a



b



c

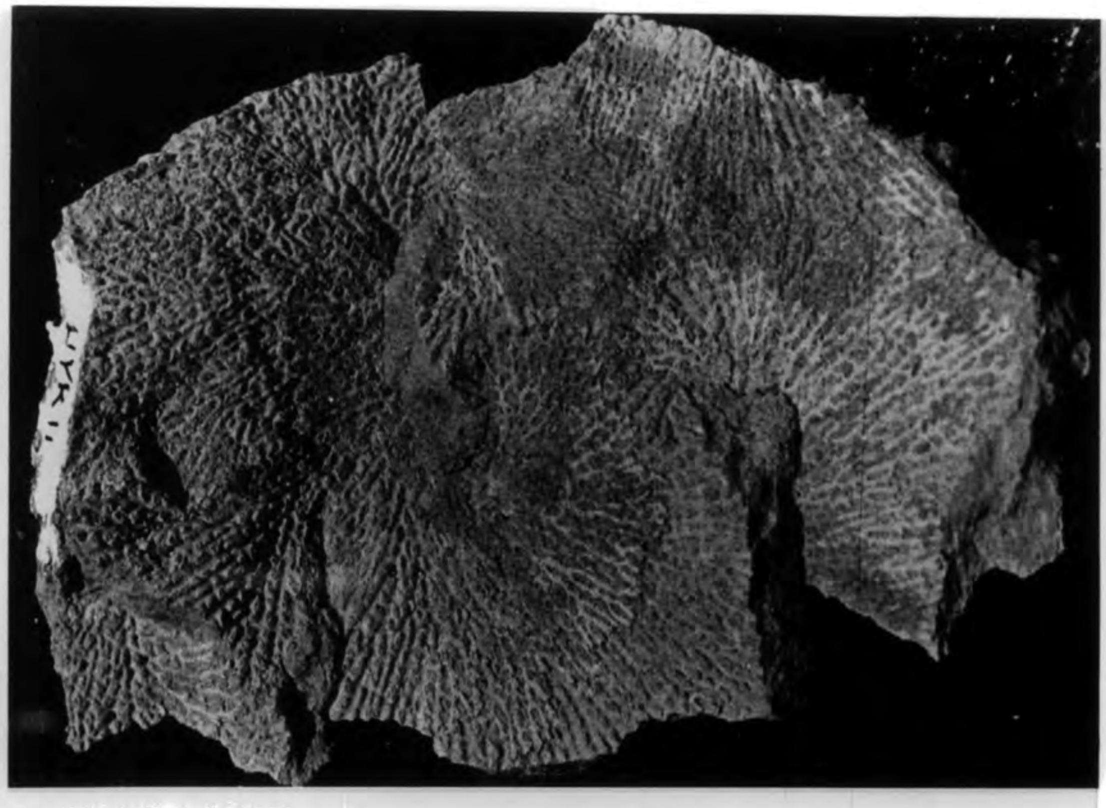
d

Plate 63. *Synocladia virgulacea* Sedgwick

Fig.a Zoarium with a spiral, multi-laminar morphology. HYQII.
Bar scale=IOmm

Fig.b Zoarium with a spiral, multi-laminar morphology. HYQI2.
Bar scale=2Omm

a



b

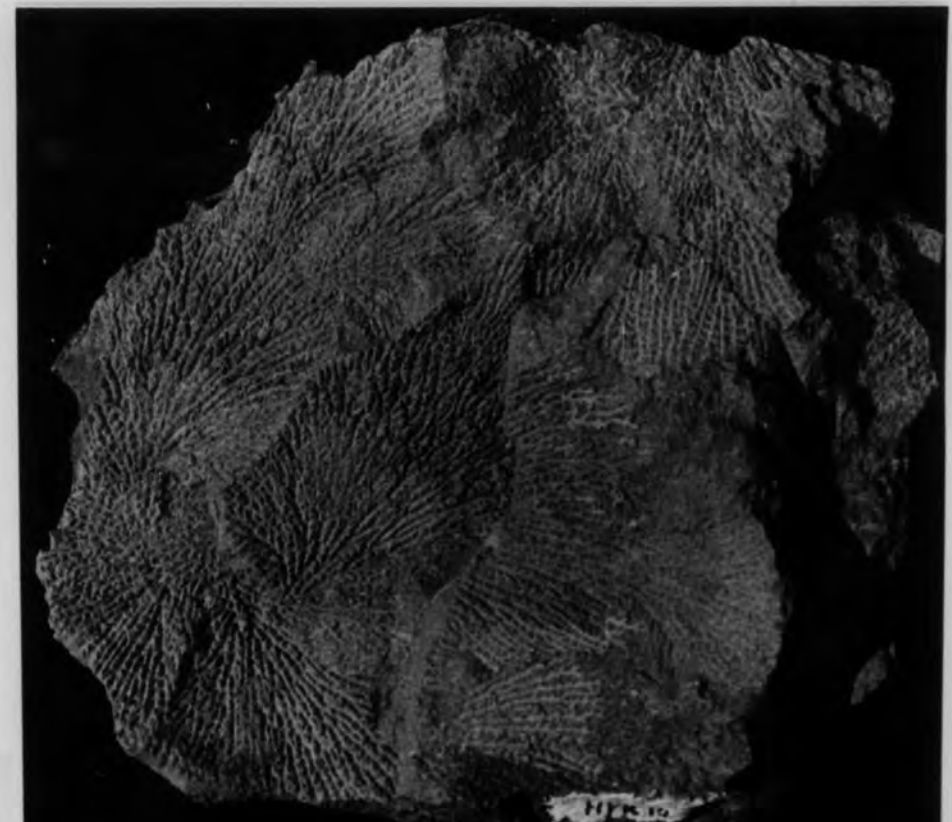


Plate 64. <u>Synocladia</u> <u>virgulacea</u> Sedgwick

Fig.a S.E.M. photomicrograph showing the obverse surface and abundant nanate zooecia.HNI. Bar scale=Imm

Fig.b As above at higher magnification. Bar scale=Imm

Fig.c As above at higher magnification,showing nanate zooecia in cast preservation. Bar scale=O.Imm

a

b

c

Plate 65. <u>Synocladia</u> <u>virgulacea</u> Sedgwick

Section (XPL) showing origin of zoarium. Ancestrula and earliest zooecial chambers are not visible.Colony attached to a fragment of <u>Acanthocladia</u>.MP5.23.
Bar scale=Imm

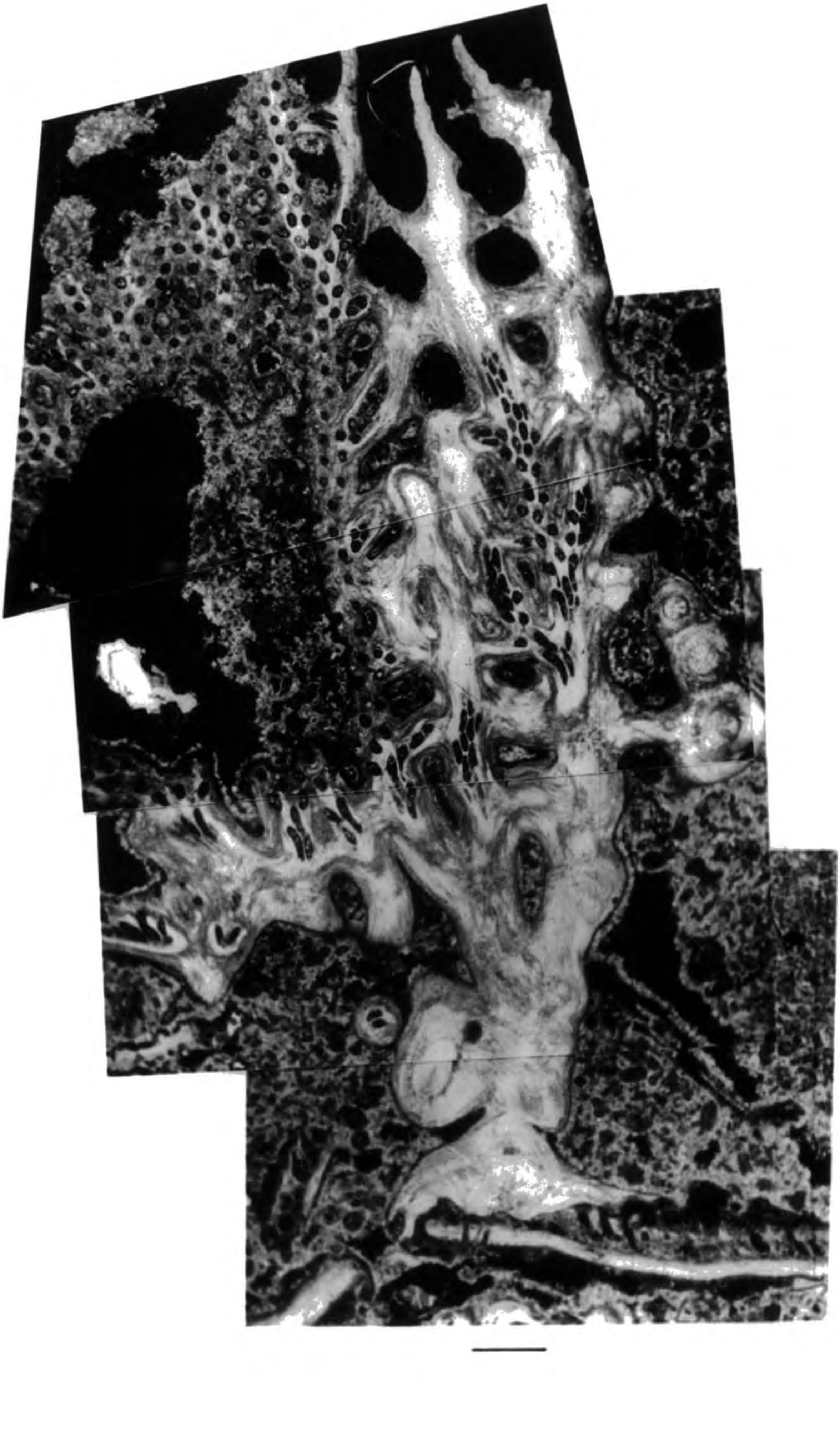
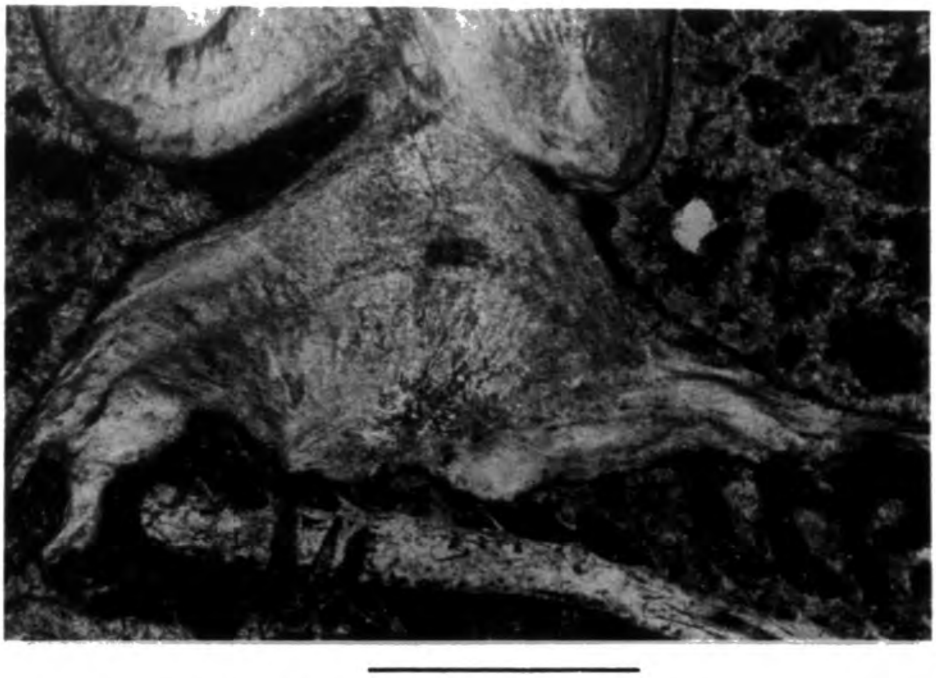


Plate 66. _Synocladia_ _virgulacea_ Sedgwick

Fig.a Close-up of colony origin(see Pl.65), showing irregularity of interface between _S.virgulacea_ and substratum(_Acanthocladia_). MP5.23.Bar scale=Imm

Fig.b As above at higher magnification,showing chevron-like folds in the primary granular layer.Bar scale=O.Imm XPL

Fig.c As above,fig.b,at higher magnification. XPL.Bar scale=O.Imm



a

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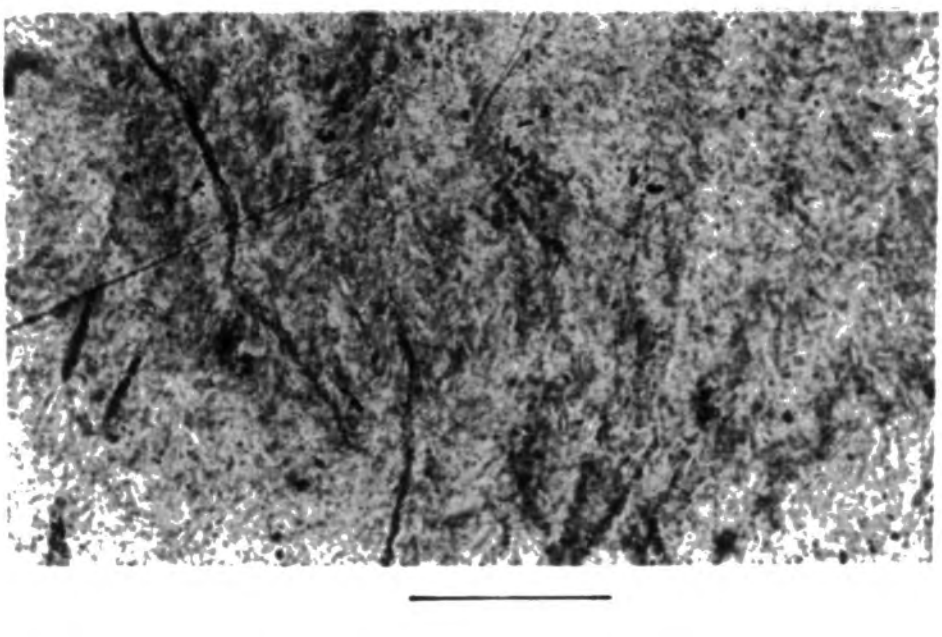


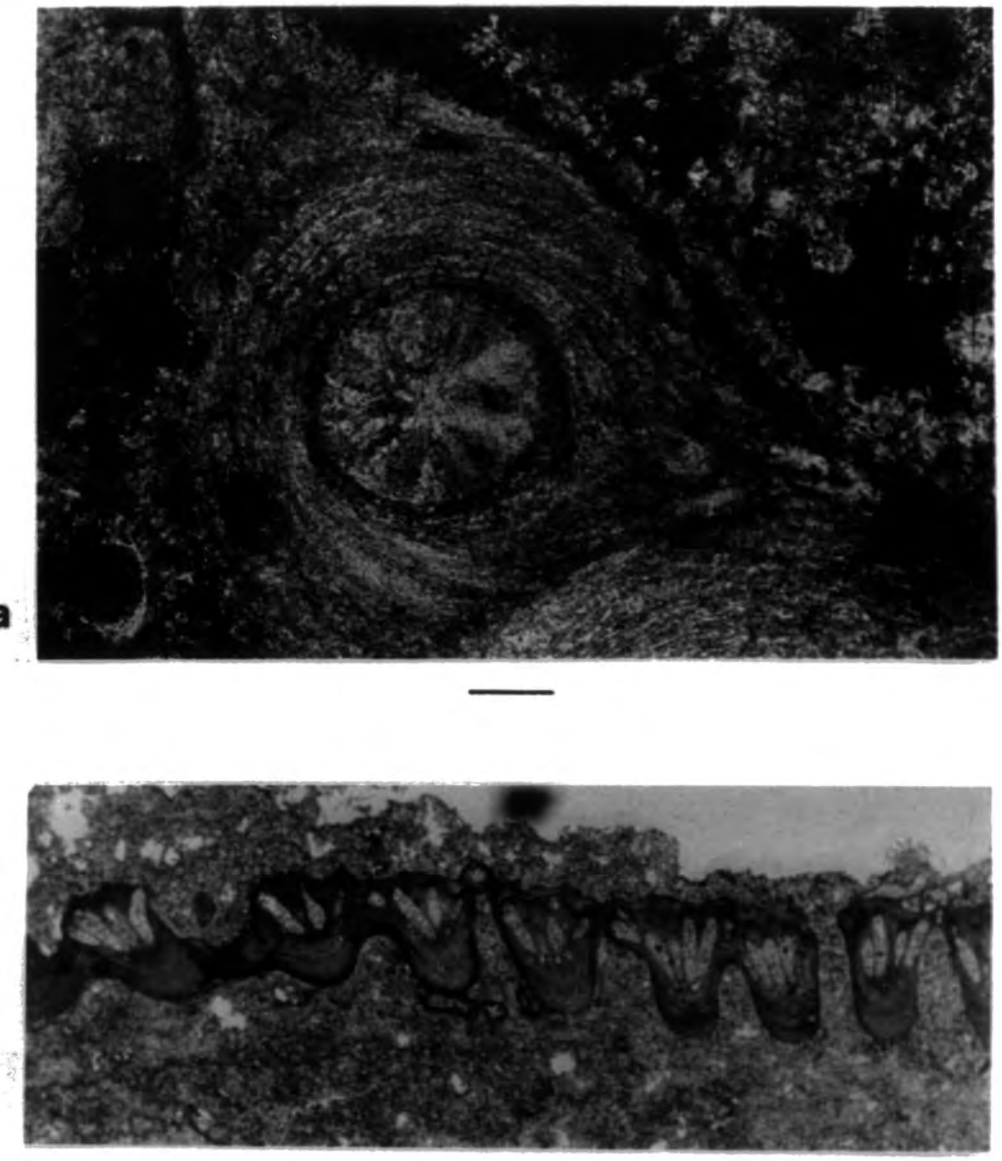
c

Plate 67. <u>Synocladia</u> <u>virgulacea</u> Sedgwick

Fig.a Transverse section through a spine,showing granular core surrounded by outer laminated skeleton.MP5.23.XPL
Bar scale=O.Imm

Fig.b Transverse Section.SBC4a.
Bar scale=Imm

Fig.c As above at higher magnification.The cylindrical object in the top centre of the figure may be a worm tube which has suffered bioimmuration.
Bar scale=Imm



a

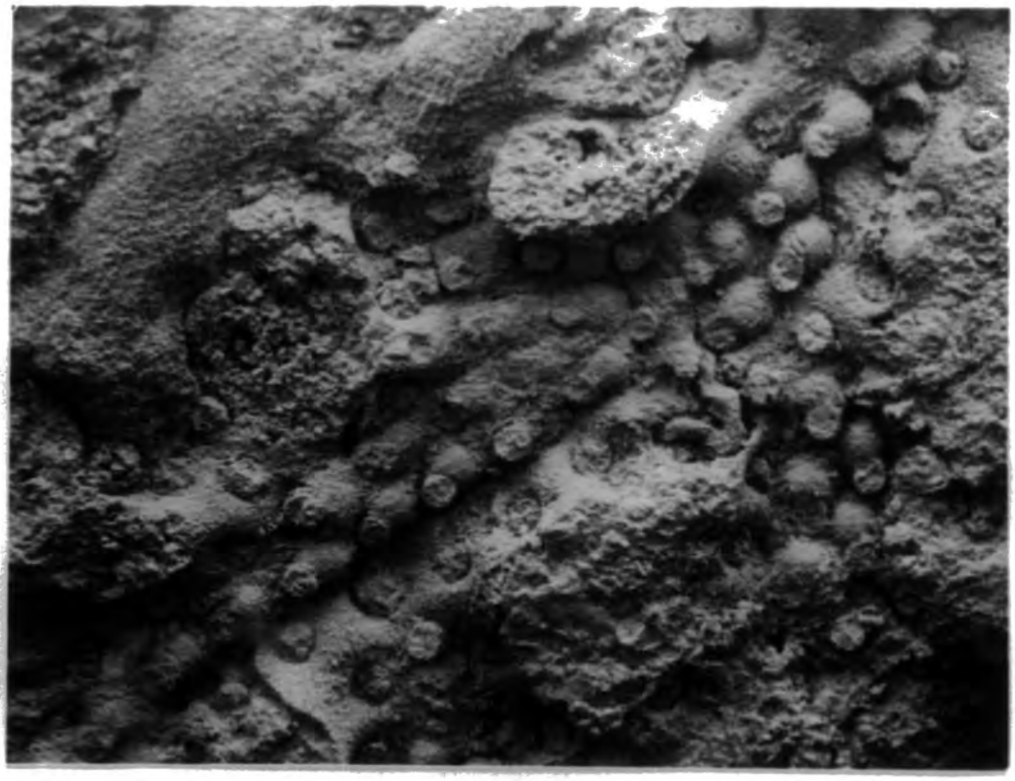
b

c

Plate 68. *Synocladia virgulacea* Sedgwick

Fig.a S.E.M. photomicrograph showing ovicells in cast preservation where part of the branch has been removed.Branch growth direction is towards the bottom left corner of the figure.MPI.I8.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=O.Imm



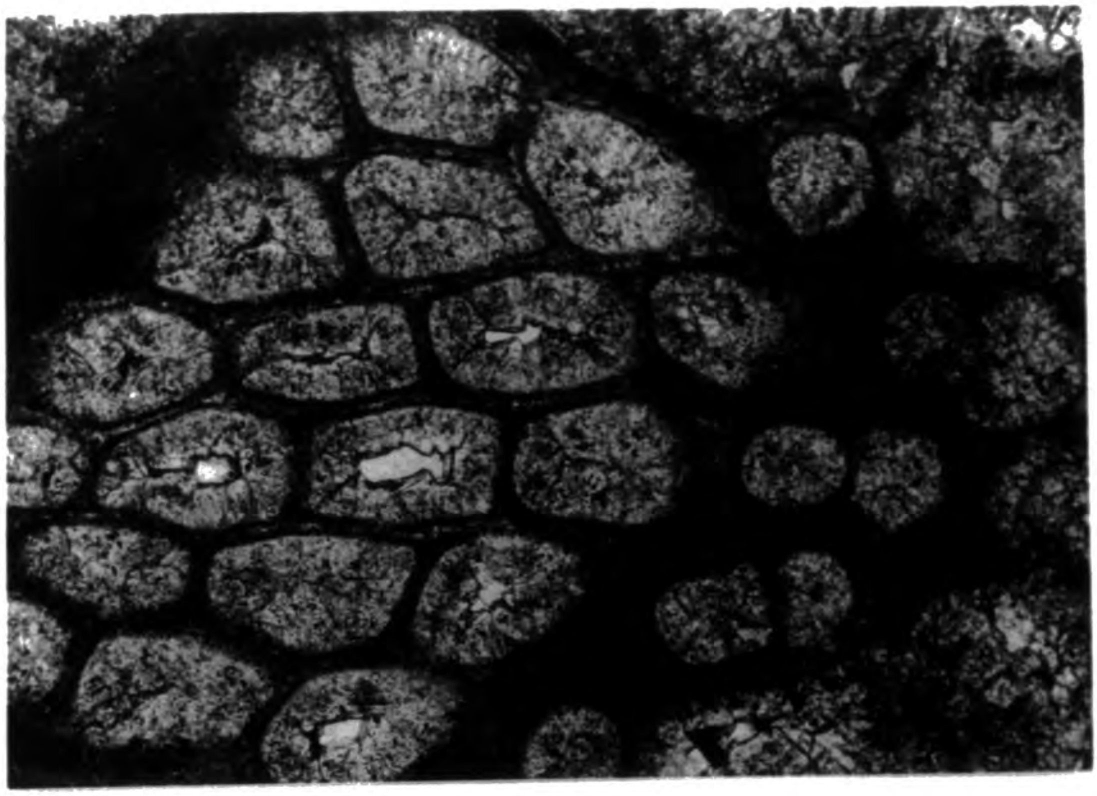
a

b

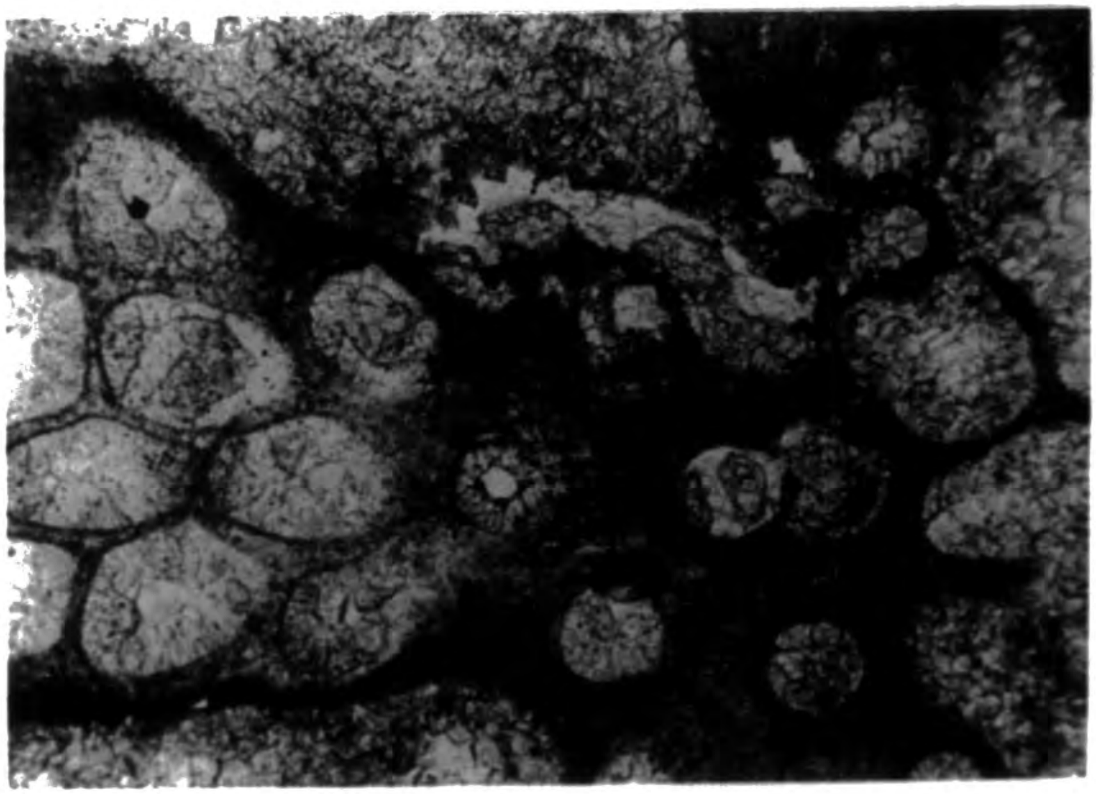
Plate 69. Synocladia virgulacea Sedgwick

Fig.a Oblique tangential section, showing ovicells proximal to zooecial apertures. MPI.b. Bar scale=O.Imm

Fig.b Oblique tangential section, showing ovicells proximal to zooecial apertures. MPI.b. Bar scale=O.Imm



a



b

Plate 70. *Synocladia virgulacea* Sedgwick

Fig.a Specimen K40 from the Schlotheim collection, labelled as "*Keratophytes dubius*". Bar scale=IOmm

Fig.b Specimen K45.I from the Schlotheim collection, labelled as "*Keratophytes dubius*". Bar scale=IOmm

Fig.c Specimen K40, Schlotheim collection, labelled as "*Keratophytes dubius*". Close-up of zooecial chambers in cast preservation. Bar scale=Imm

Fig.d Specimen C20 from the Schlotheim collection, labelled as "*Keratophytes dubius*". Preserved as a mould. Bar scale=IOmm

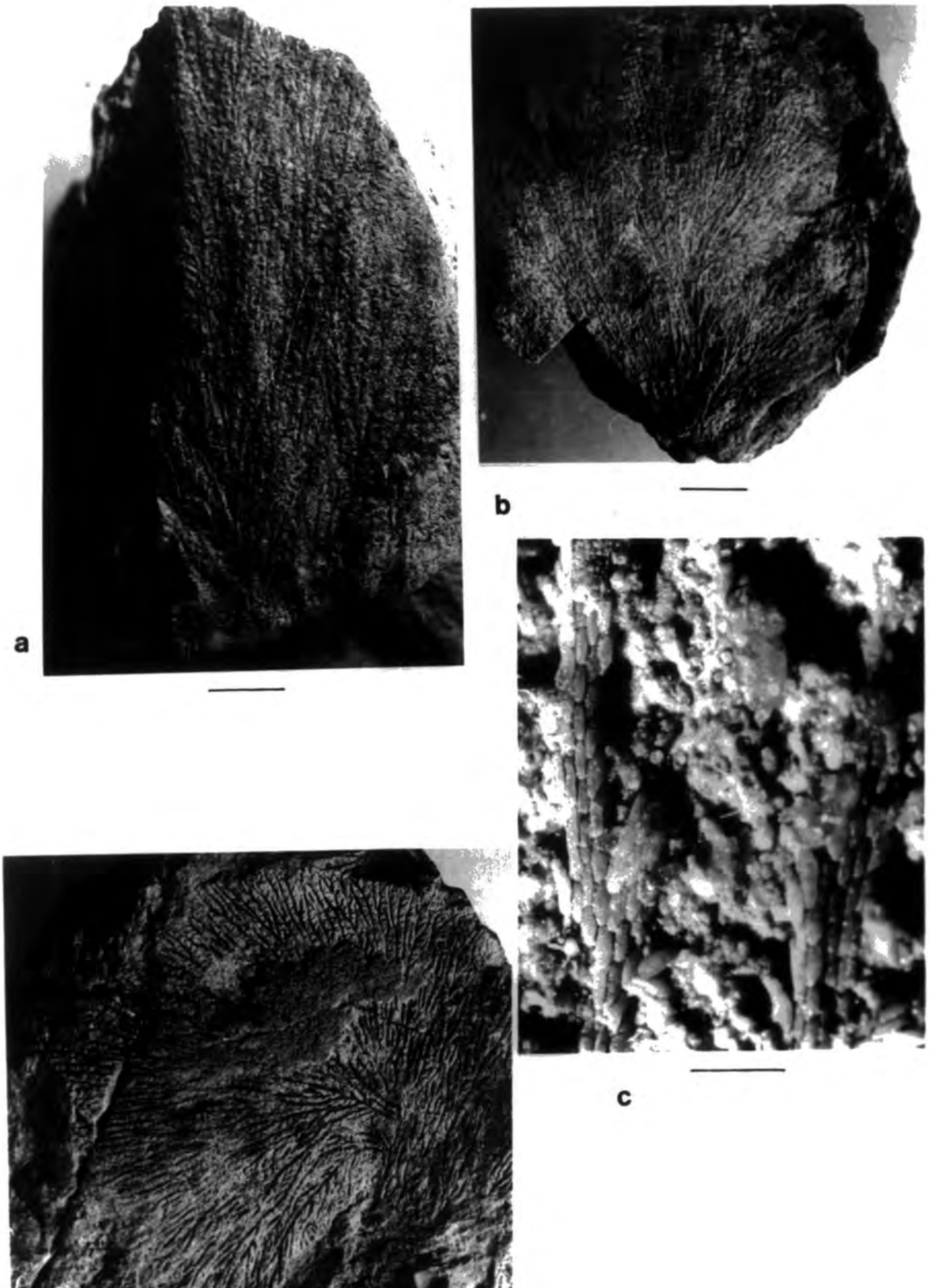

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Plate 7I. Thamniscus dubius Schlotheim

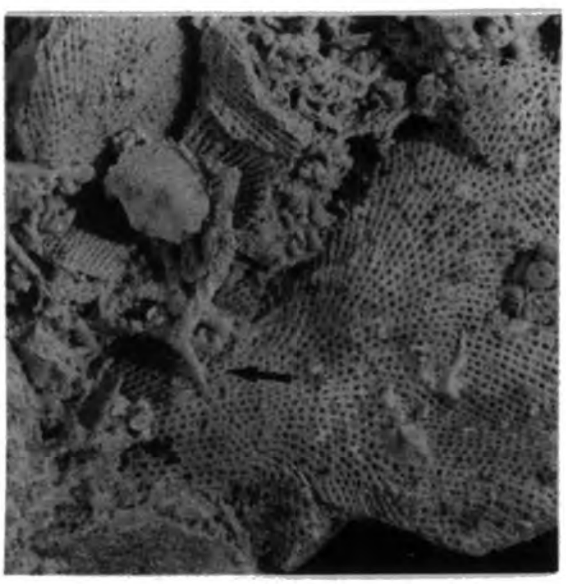
Fig.a Reverse surface, mineralogically overgrown. Original position of reverse surface spine arrowed. 7I2F. Bar scale=IOmm

Fig.b As above at higher magnification. Bar scale=Imm

Fig.c Zoarium supported above a substrate of Fenestella by reverse surface spines (arrowed). RH4.36. Bar scale=IOmm

a

b



c

Plate 72. <u>Thamniscus</u> <u>dubius</u> Schlotheim

Fig.a Obverse surface,showing colony form.
B9OA.Bar scale=IOmm

Fig.b Reverse surface.B92D.
Bar scale=IOmm

Fig.c Reverse surface.B92A.
Bar scale=IOmm

Fig.d Reverse surface and cast preservation.B92C.
Bar scale=IOmm

Fig.e Reverse surface,mineralogically overgrown.
B92B.Bar scale=IOmm

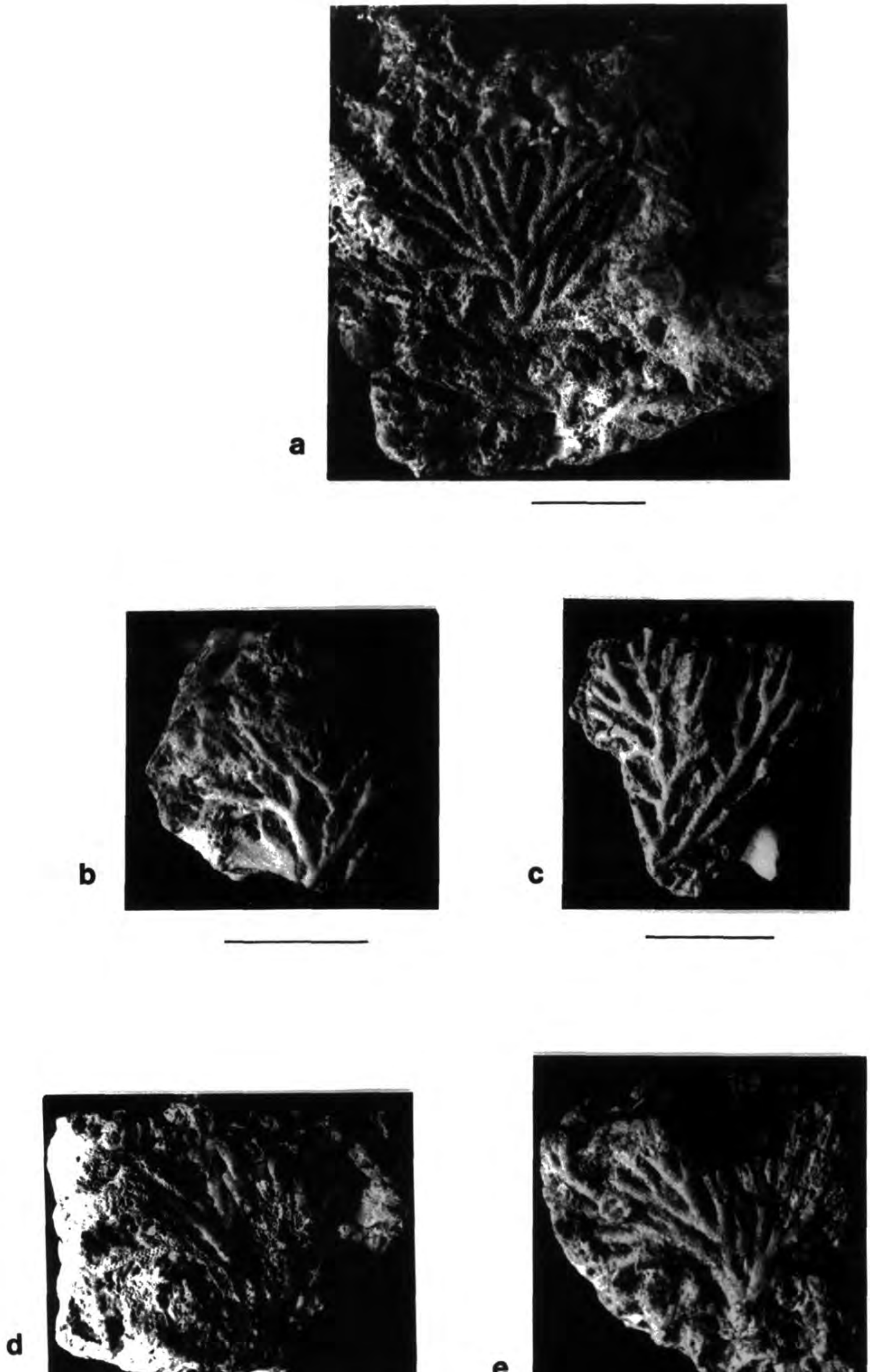

a
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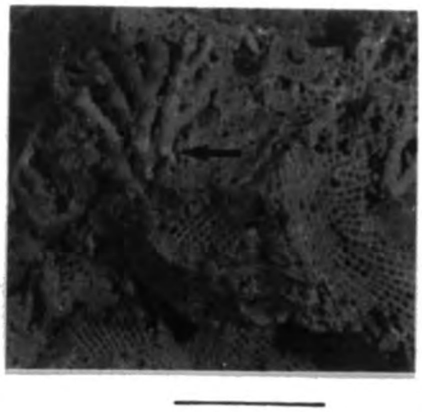
Plate 73. Thamniscus dubius Schlotheim

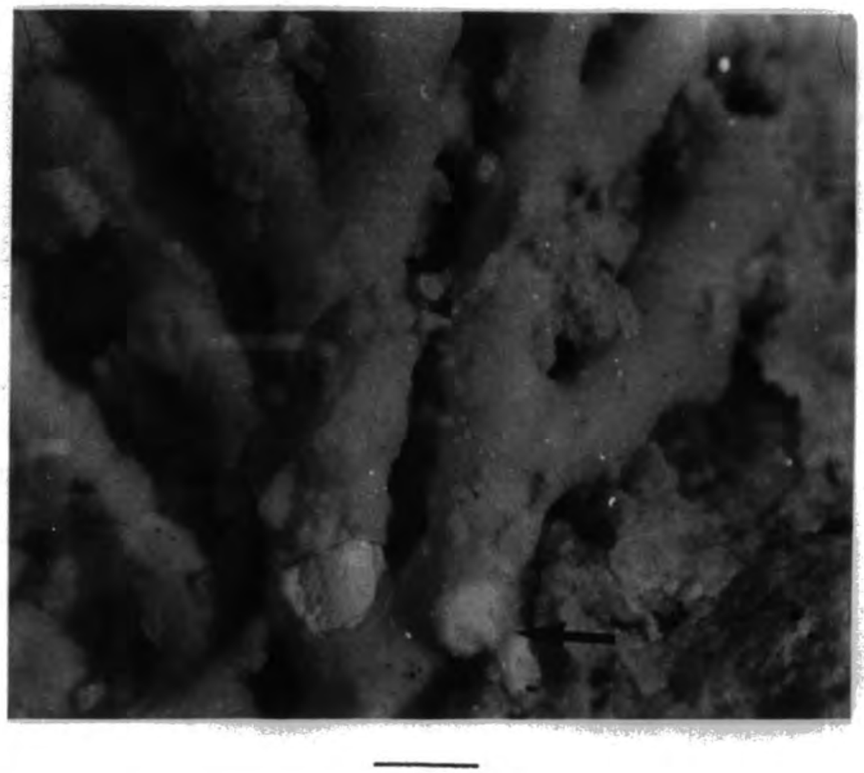
Fig.a Reverse surface,mineralogically overgrown. Origin of reverse surface spine arrowed. RH4.33.Bar scale=IOmm

Fig.b As above at higher magnification. Bar scale=Imm

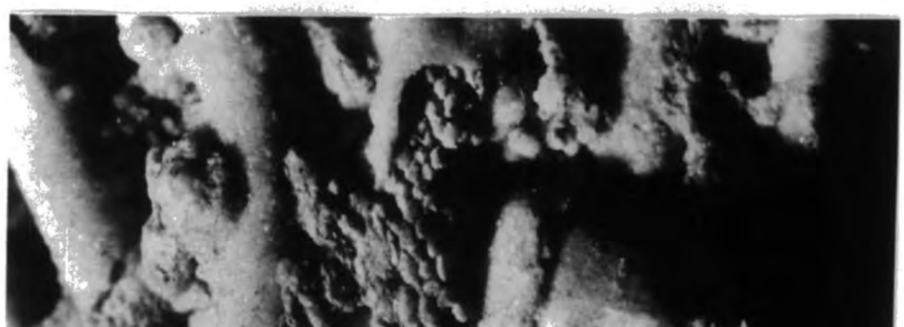
Fig.c Reverse surface revealing zooecial chambers in cast preservation.7IOF. Bar scale=Imm



a



b



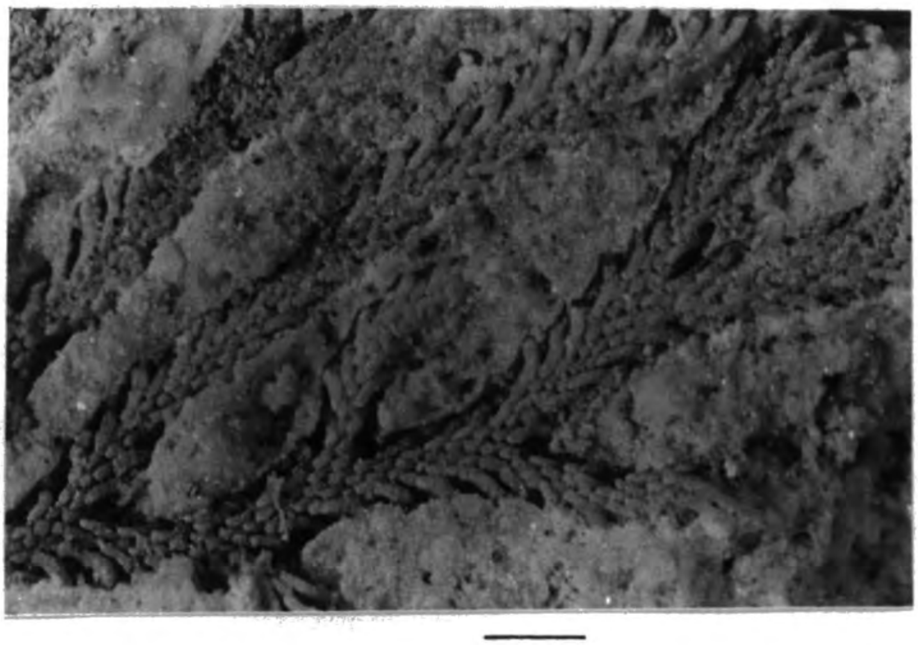
c

Plate 74. Thamniscus dubius Schlotheim

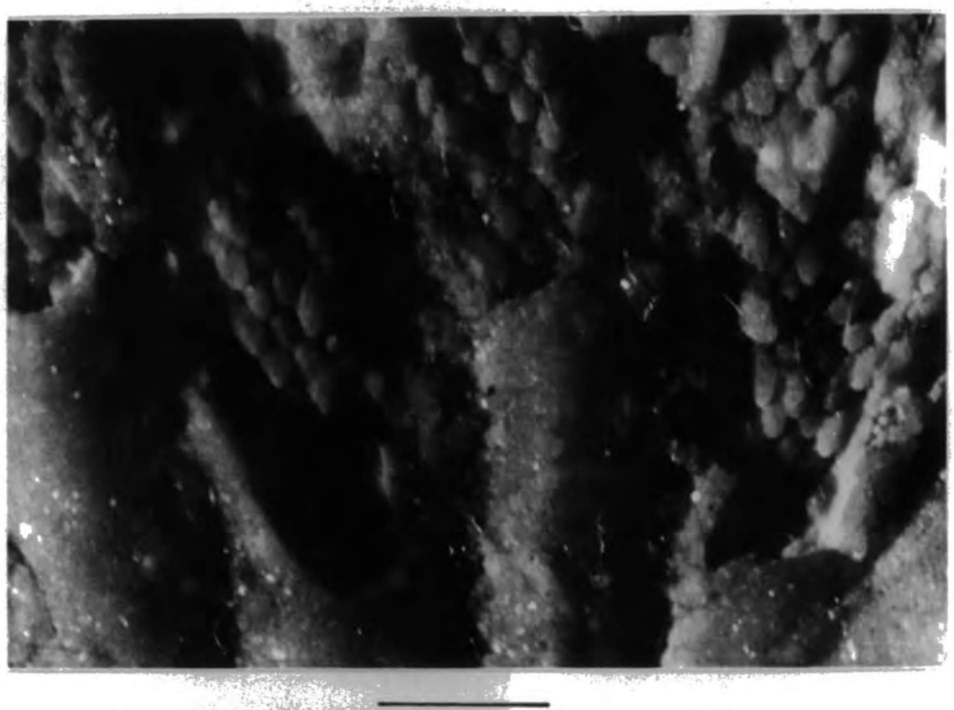
Fig.a Zooecial chambers in cast preservation, seen from the reverse side.HM5.Ia.
Bar scale=Imm

Fig.b Reverse surface revealing zooecial chambers in cast preservation.B92B.
Bar scale=Imm

Fig.c Reverse surface.Irregularly distributed circular holes resemble accessory pores but are probably the work of some boring organism.B92A.
Bar scale=Imm



a



b

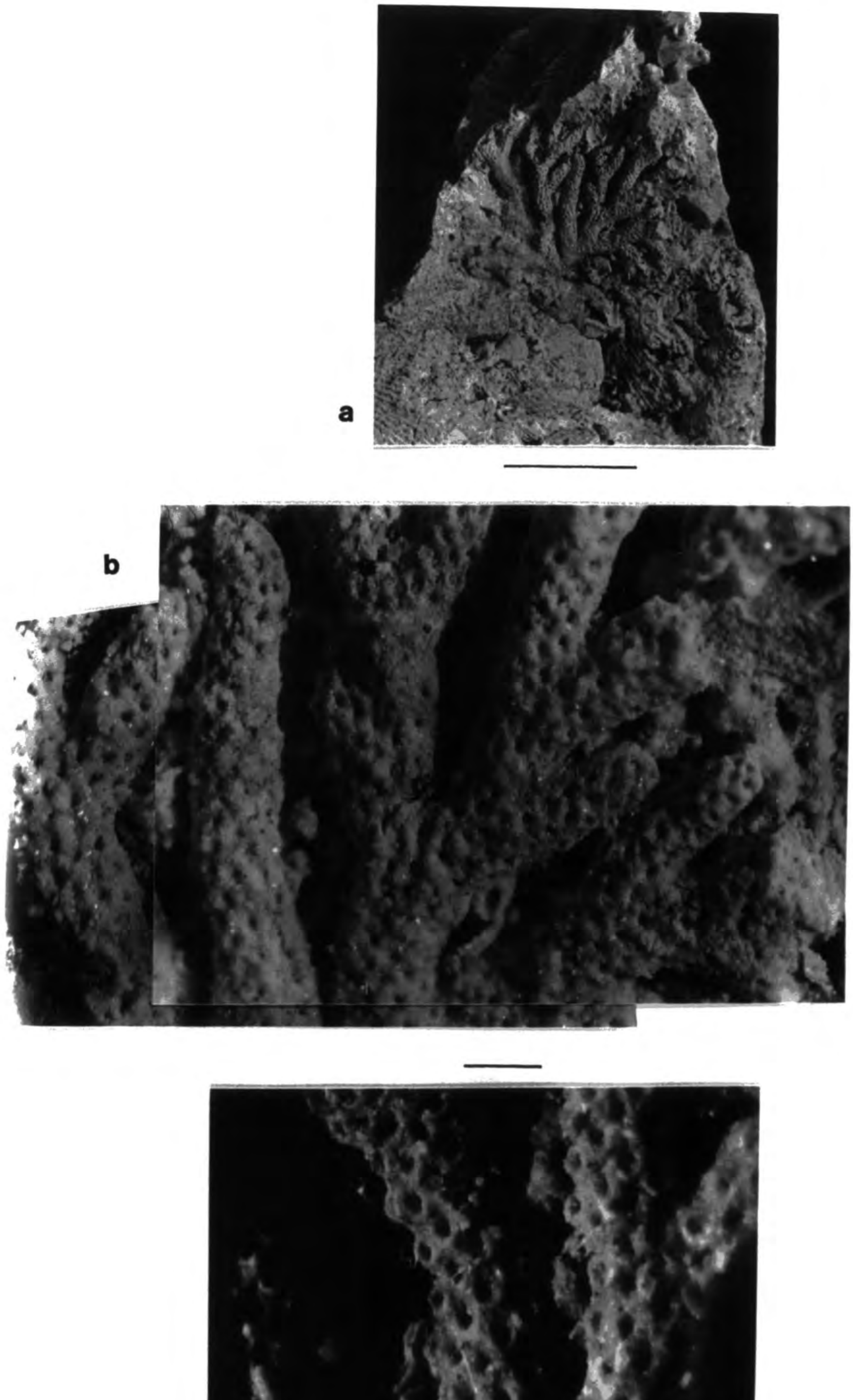
c

Plate 75. Thamniscus dubius Schlotheim

Fig.a Obverse surface,mineralogically overgrown.
RH4.30.Bar scale=IOmm

Fig.b As above at higher magnification.
Bar scale=Imm

Fig.c Obverse surface detail,mineralogically overgrown.B9OA.
Bar scale=Imm


a
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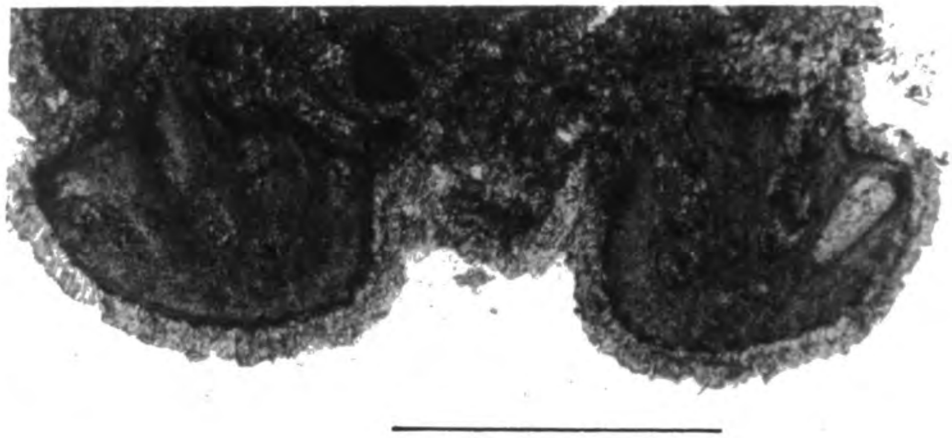
c

Plate 76. <u>Thamniscus</u> <u>dubius</u> Schlotheim

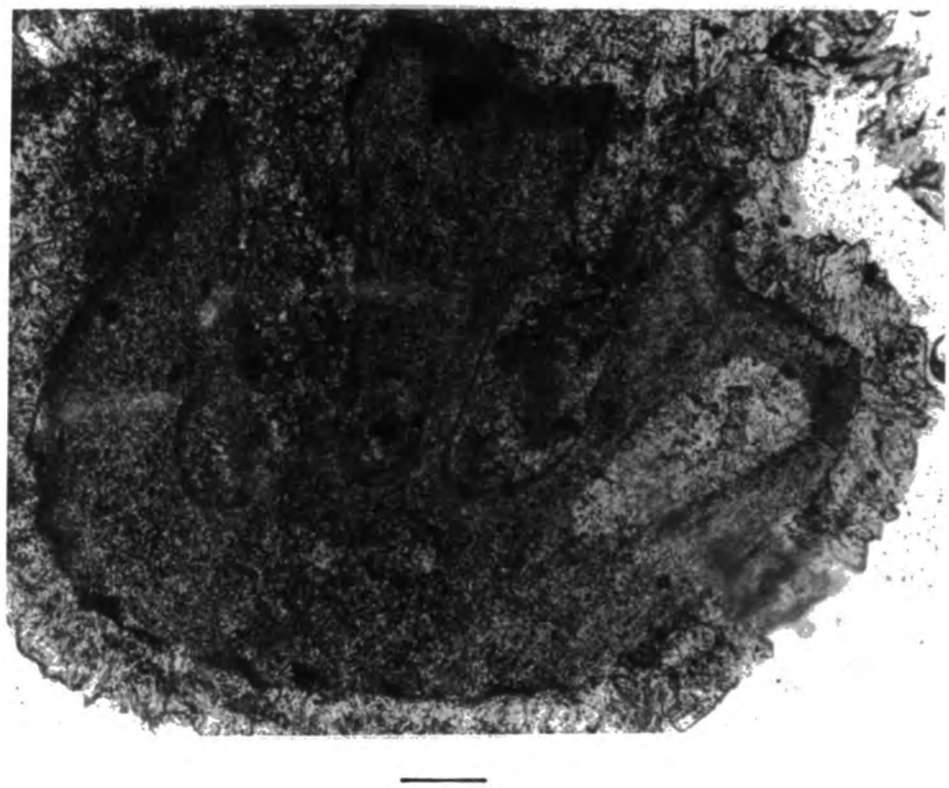
Fig.a Transverse section.RH4.3.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=O.Imm

Fig.c Oblique longitudinal section.Reverse surface spine developed in bottom left corner of figure.RH4.39a.
Bar scale=Imm



a



b

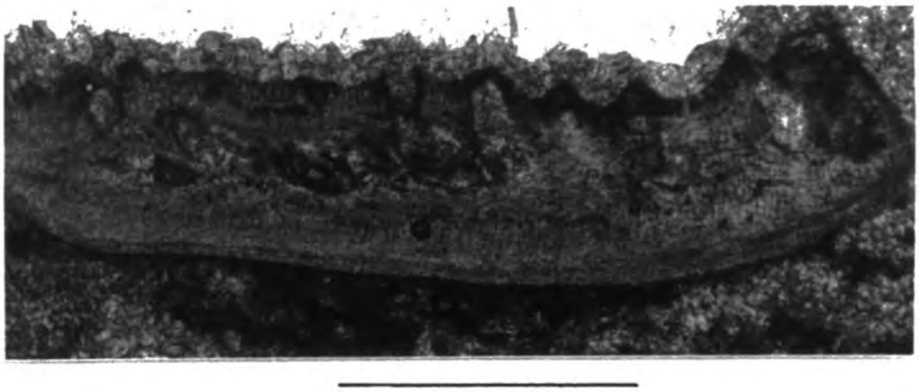
c

Plate 77. Thamniscus dubius Schlotheim

Fig.a Slightly oblique longitudinal section.
RH4.IO.Bar scale=Imm

Fig.b Tangential section,showing bifurcation.
RH4.IO.Bar scale=Imm

a



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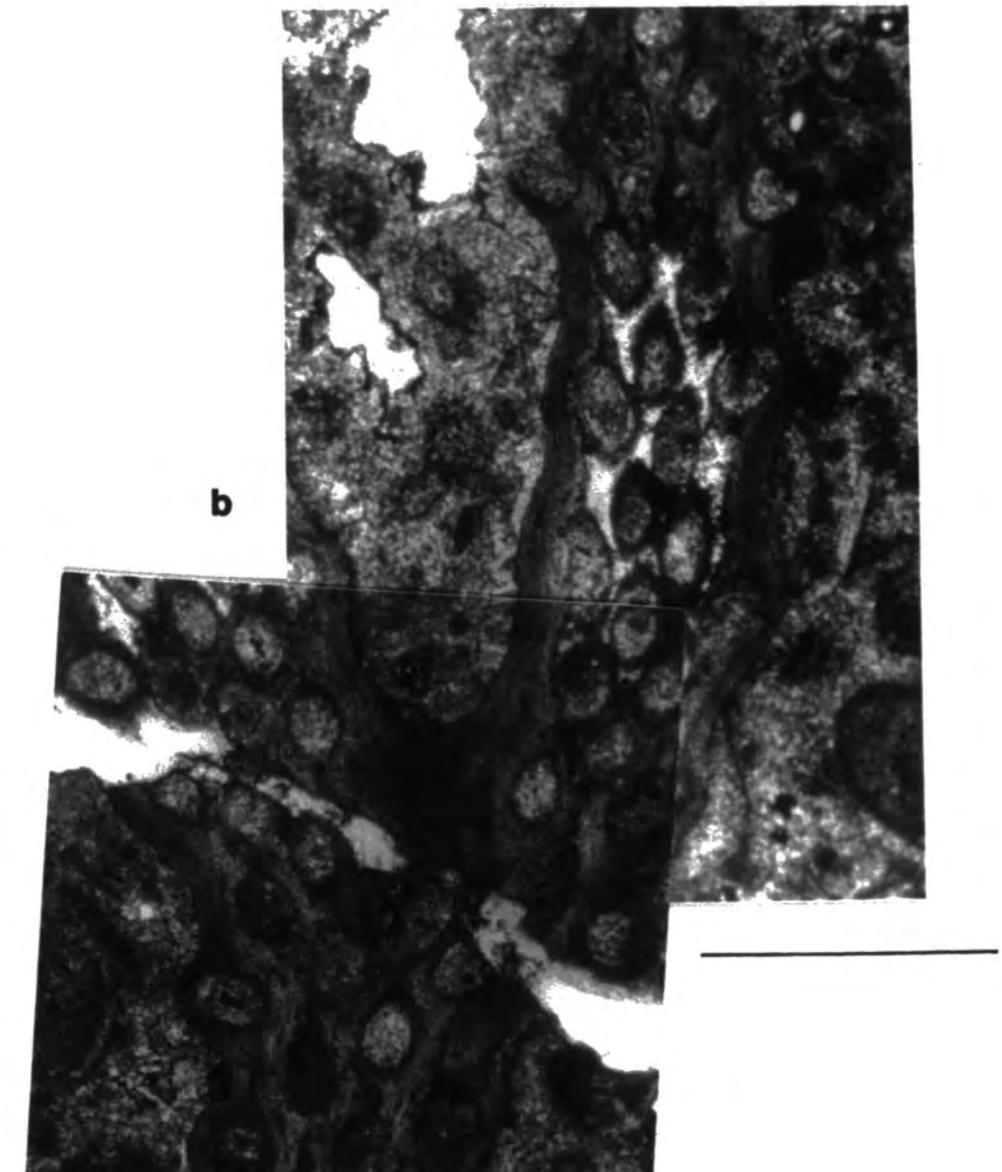
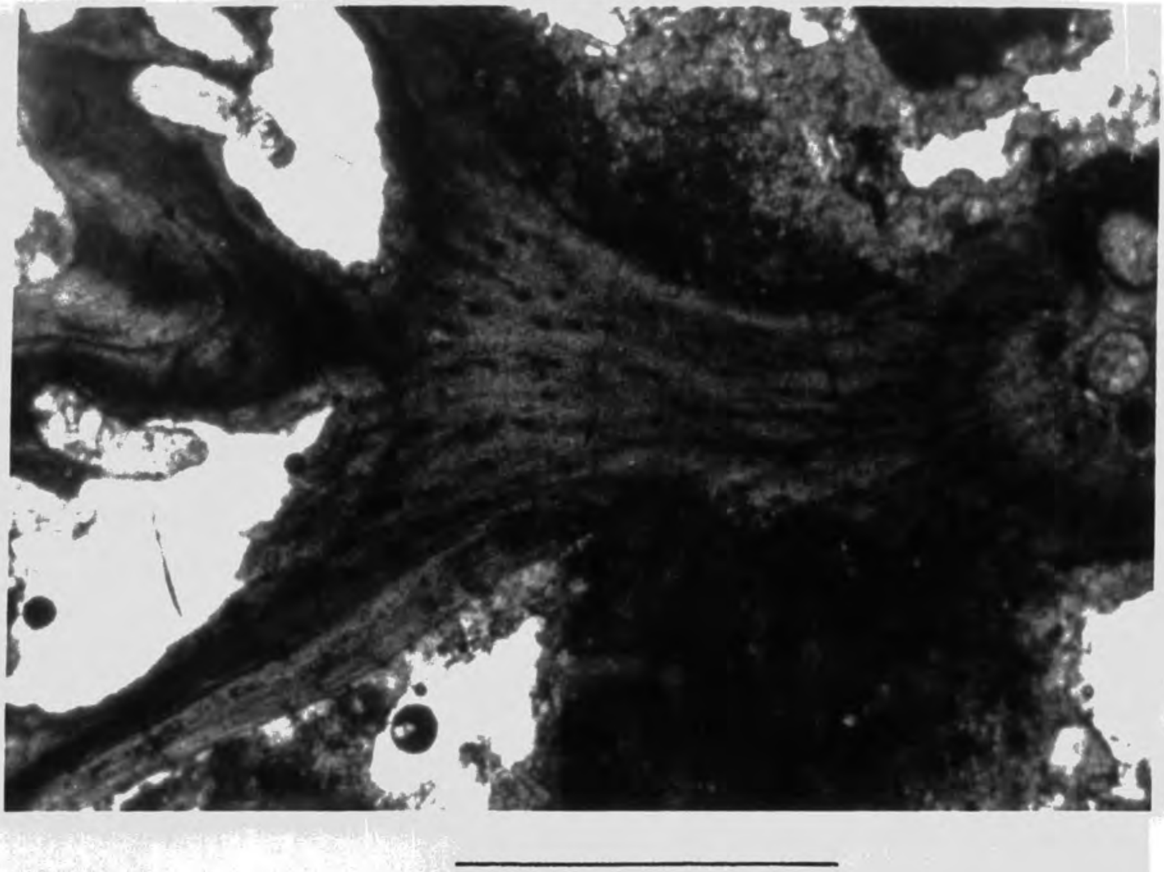


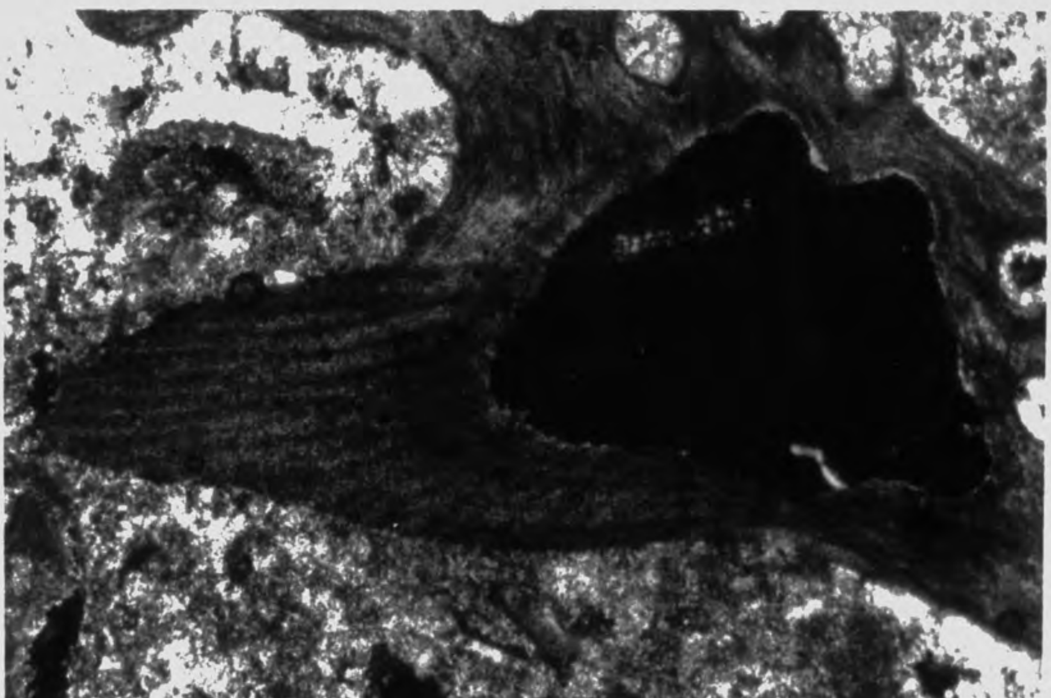
Plate 78. Thamniscus dubius Schlotheim

Fig.a Oblique section,showing ?skeletal rods.RH4.39.
Bar scale=Imm

Fig.b Oblique section showing longitudinal striae.
RH4.39.XPL.
Bar scale=Imm



a



b

Plate 79. Thamniscus dubius Schlotheim

Fig.a Specimen Taf.III fig.I,Taf.II fig.8, from the Korn collection.
Bar scale=IOmm

Fig.b Specimen Taf.III fig.2,from the Korn collection,assigned to Thamniscus geometricus by Korn(I930).
Bar scale=IOmm


a

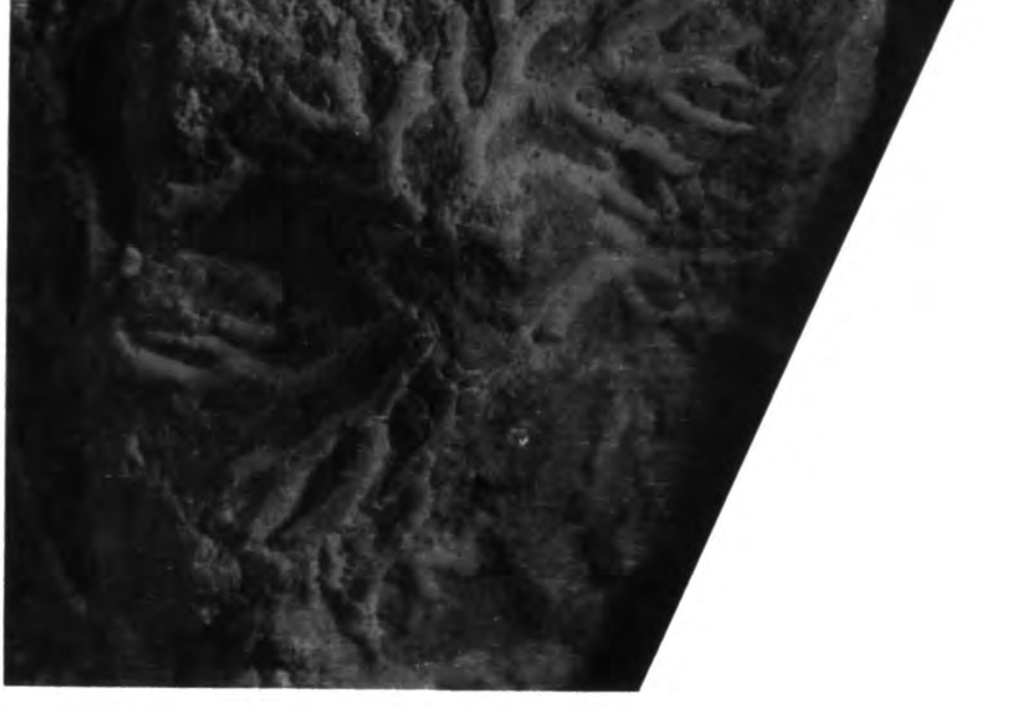

b

Plate 80. Thamniscus geometricus Korn

Fig.a Specimen Taf.III fig.4 from the Korn collection. Obverse surface,dissepiment arrowed. Bar scale=I·Omm

Fig.b Obverse surface detail.MP5.59. Bar scale=Imm

Fig.c Specimen Taf.III fig.5 from the Korn collection. Bar scale=IOmm

Fig.d Reverse surface detail.RH2.73a. Bar scale=Imm

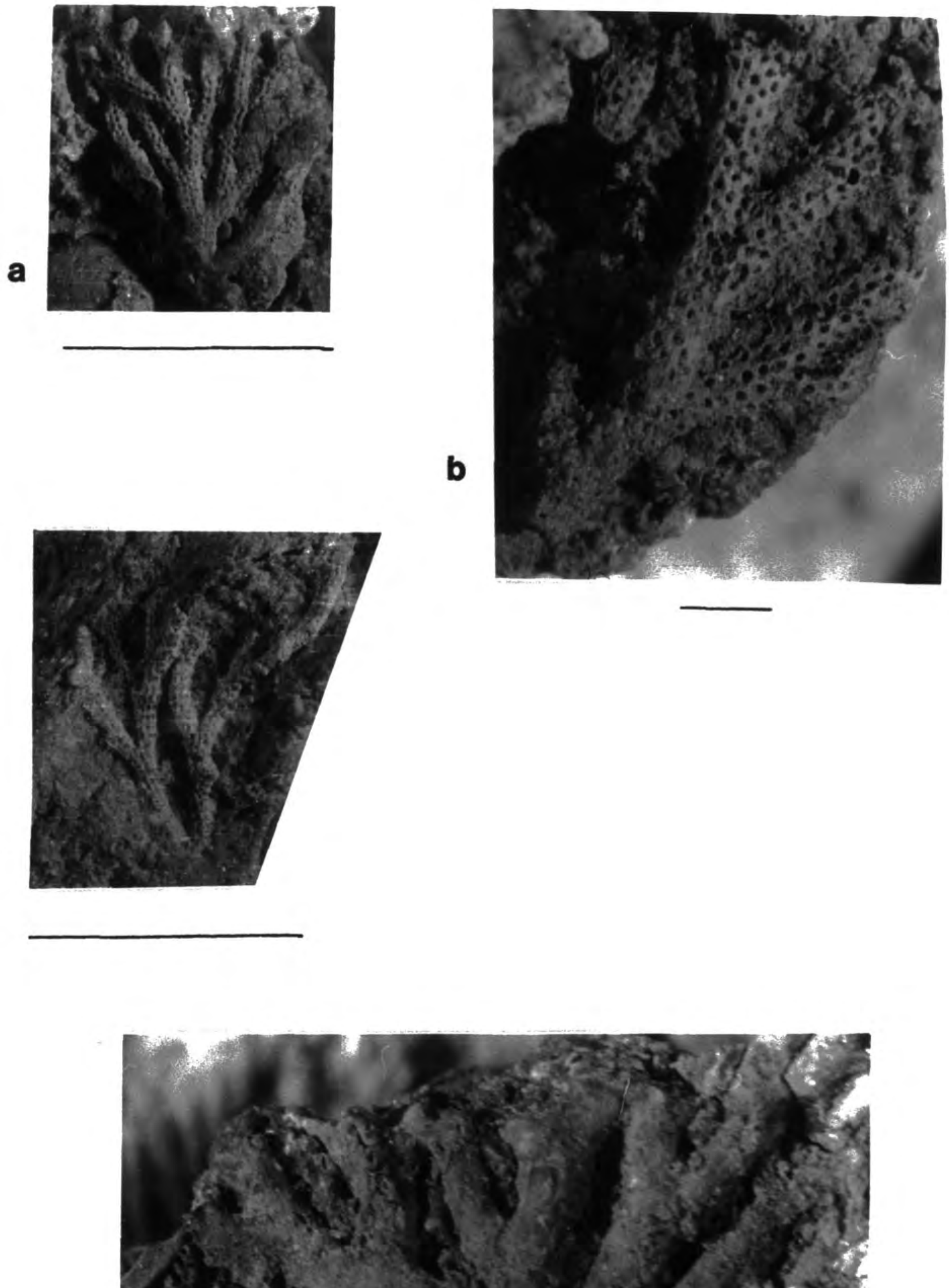
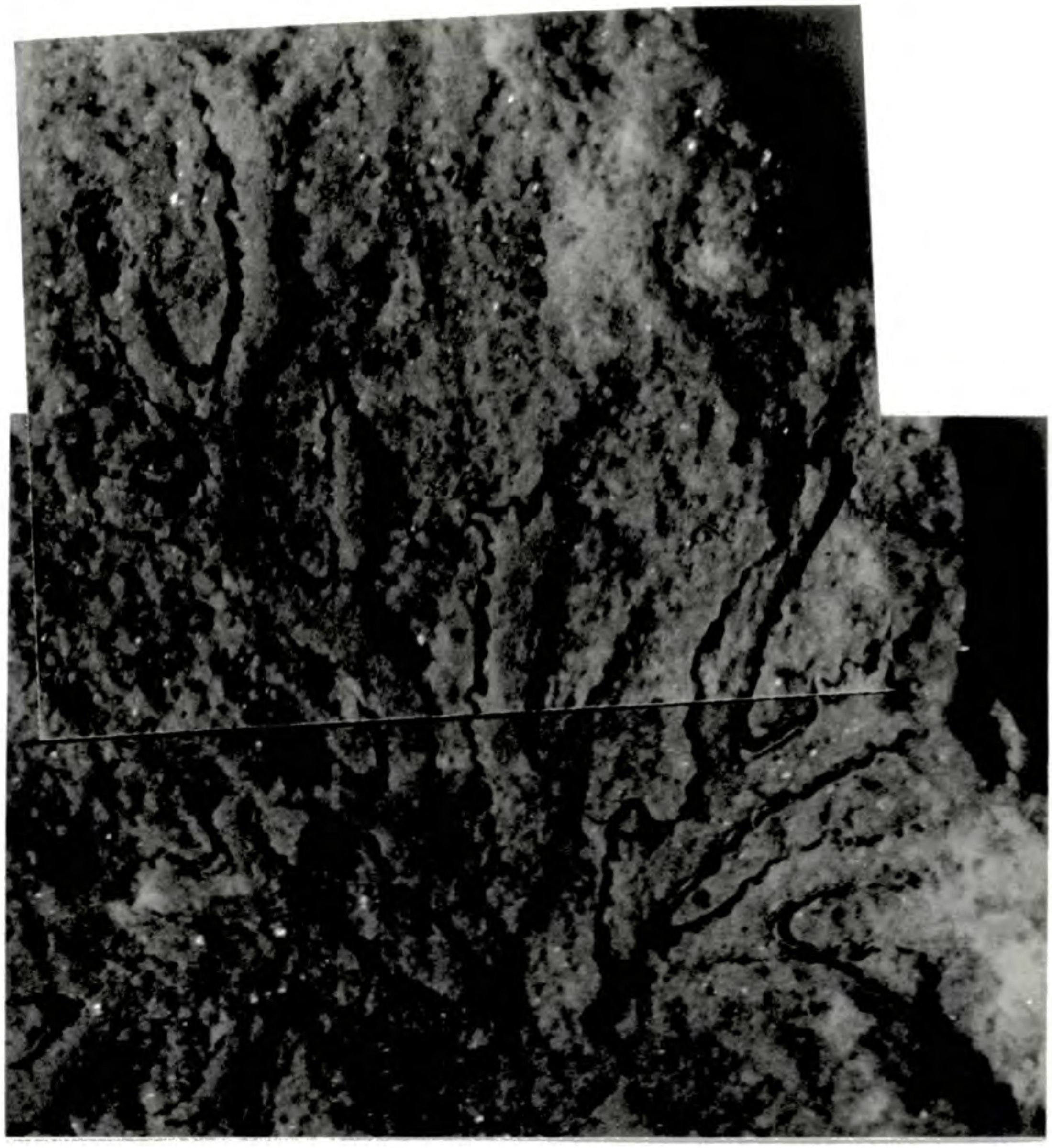

a
b
d

Plate 8I. Thamniscus geometricus Korn

Fig.a Reverse surface,cast preservation.HAW63.
Bar scale=Imm

Fig.b Specimen Taf.III fig.3 from the Korn collection.
Bar scale=IOmm

Fig.c Specimen Taf.II fig.I7 from the Korn collection.
Bar scale=IOmm



a

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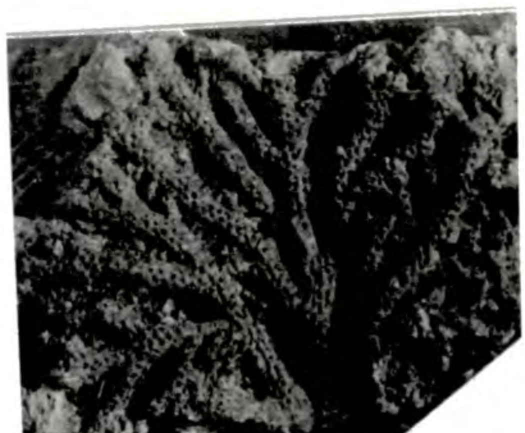


c

Plate 82. <u>Thamniscus</u> <u>siccus</u> Dreyer

Fig.a Taf.VIII fig.4 from Dreyer(I96I).
Bar scale=IOmm

Fig.b Reverse surface detail.RHI.I8.
Bar scale=Imm

Fig.c Taf.VIII fig.2 and fig.3 from Dreyer(I96I).
Bar scale=Imm

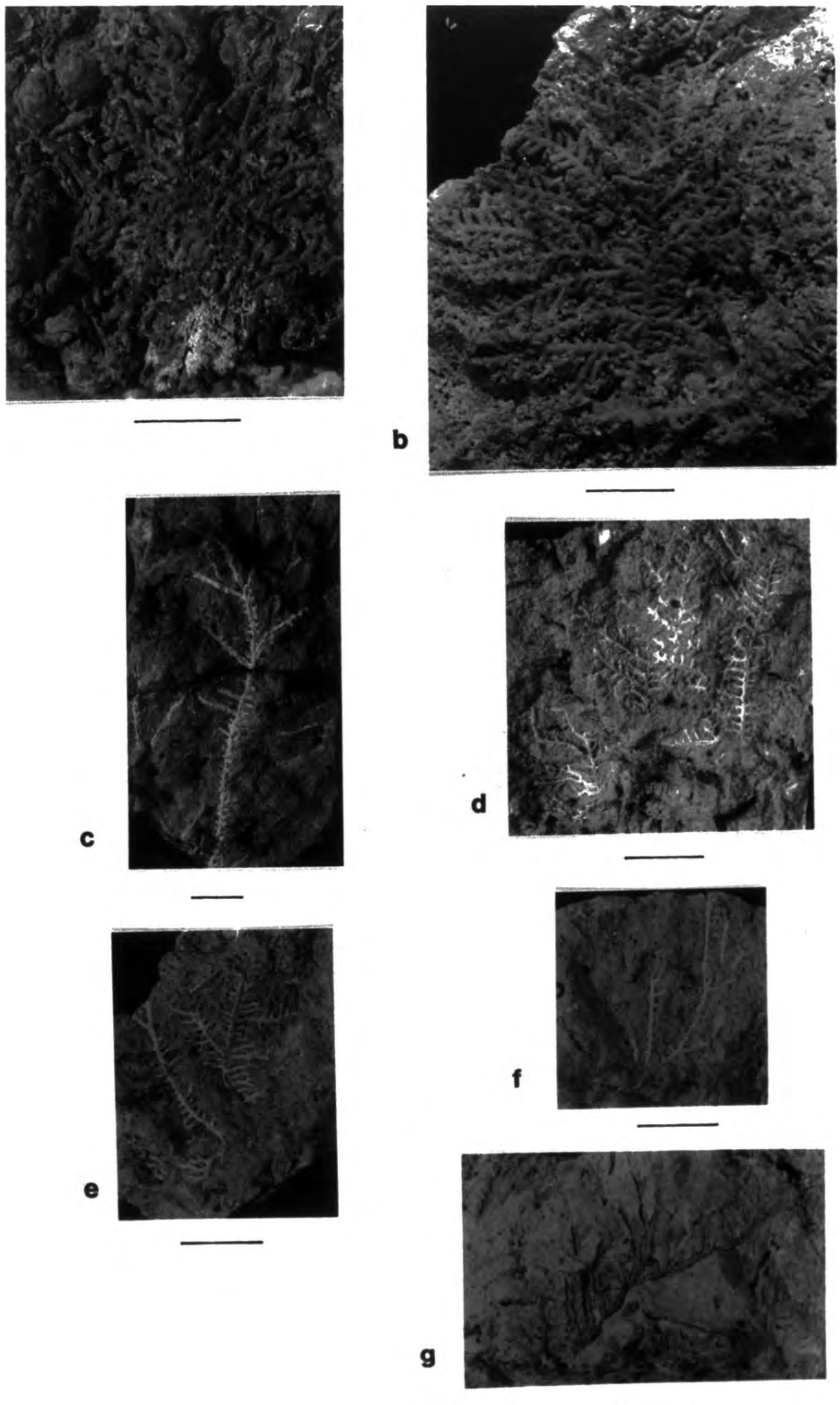
Fig.d Taf.VIII fig.I from Dreyer(I96I).
Bar scale=Imm

Fig.e Obverse surface detail.BHIOc.
Bar scale=Imm


a
Fig. 4
b
Fig. 2
Fig. 3
c
d
Fig. 1
e

Plate 83. <u>Acanthocladia</u> <u>anceps</u> Schlotheim

Fig.a	Zoarial morphology.Specimen mineralogically overgrown.MP5.34. Bar scale=IOmm
Fig.b	Zoarial morphology.Specimen mineralogically overgrown.RH4.45. Bar scale=IOmm
Fig.c	Zoarial morphology.B94. Bar scale=IOmm
Fig.d	Zoarial morphology.B78A. Bar scale=IOmm
Fig.e	Zoarial morphology.HYRI9. Bar scale=IOmm
Fig.f	Zoarial morphology.BH4a. Bar scale=IOmm
Fig.g	Zoarial morphology,cast preservation.GLQ33. Bar scale=IOmm


b
c
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g

Plate 84. <u>Acanthocladia</u> <u>anceps</u> Schlotheim

Fig.a Zoarial morphology.?Growth of colony in an original cavity within the reef framework. MP5.30a.Bar scale=IOmm

Fig.b As above at higher magnification.Supportive spines arrowed.
Bar scale=Imm

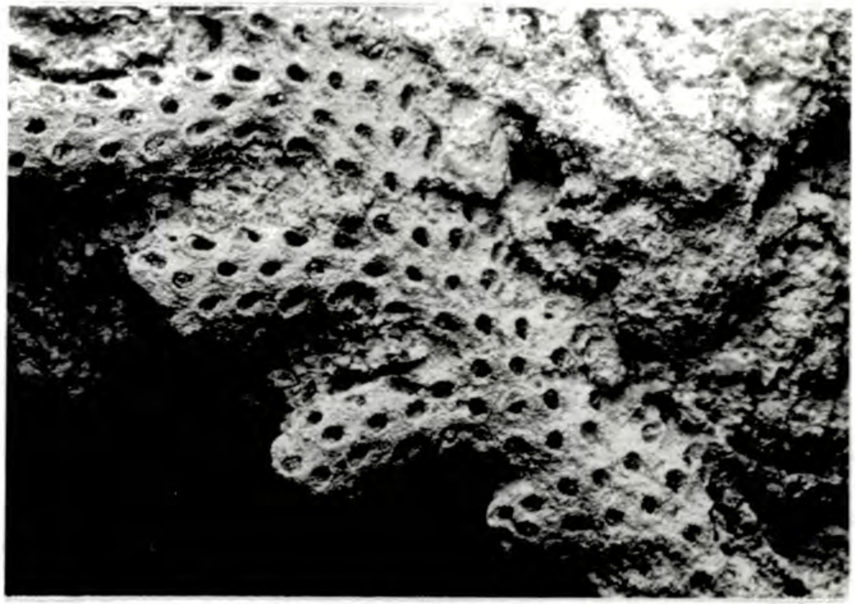
Plate 85. Acanthocladia anceps Schlotheim

Fig.a Obverse surface detail.HAWIO.
Bar scale=Imm

Fig.b S.E.M. photomicrograph of obverse surface.
Small proximal notch (?fossula) is visible in some apertures.RH2.66.
Bar scale=Imm

Fig.c S.E.M. photomicrograph of obverse surface.
B83B.Bar scale=IOmm

a



b

c

Plate 86. Acanthocladia anceps Schlotheim

Fig.a S.E.M. photomicrograph showing obverse surface detail.Several apertures show a small proximal notch(?fossula).B83B.
Bar scale=Imm

Fig.b Reverse surface detail.RH2.5I.
Bar scale=Imm

Fig.c Obverse surface detail.The proximal part of the main branch has three rows of apertures but the distal part prior to bifurcation has only two rows separated by a median keel.
HAW26a.Bar scale=Imm

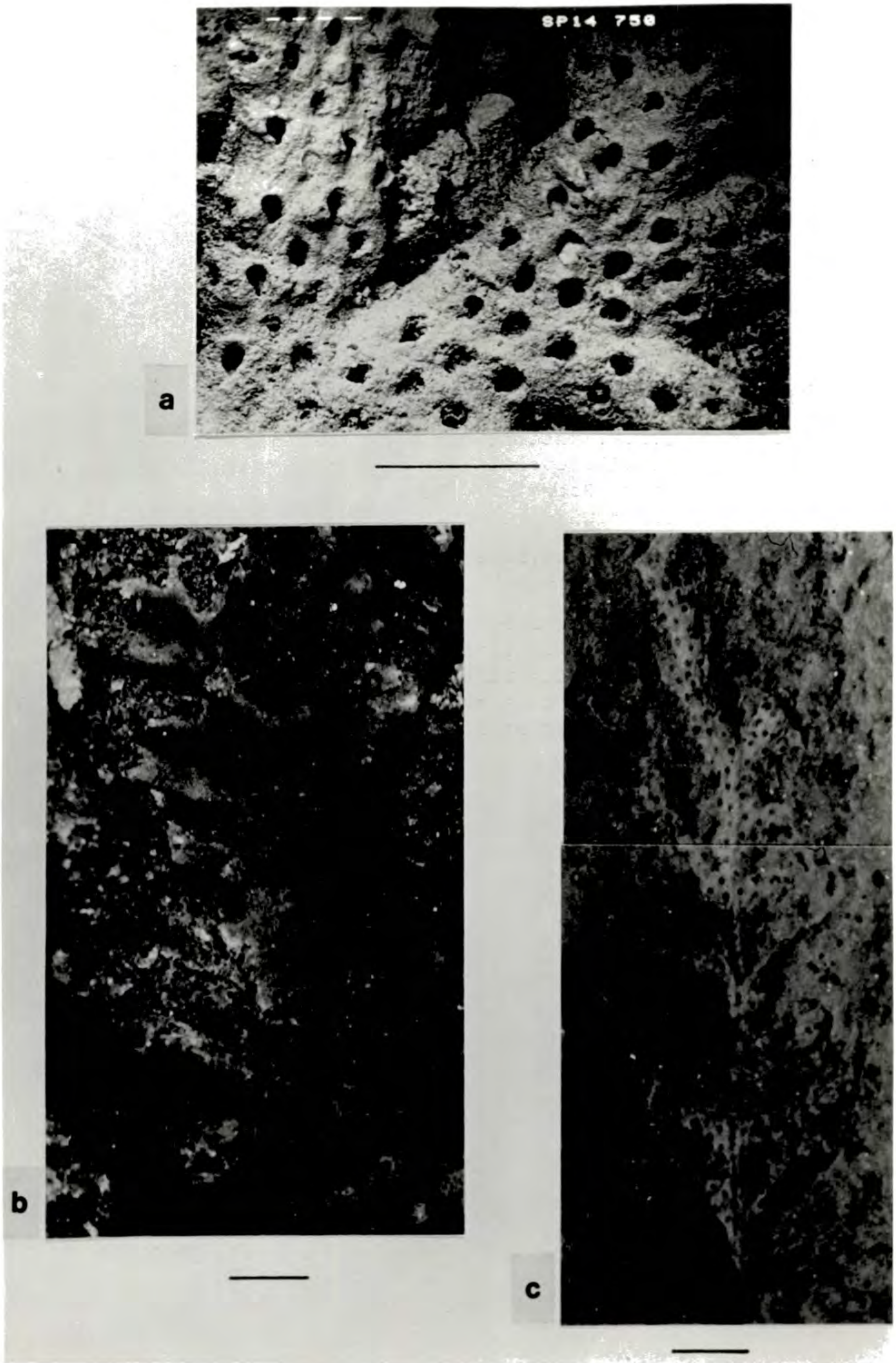

SP14 750
a
b
c

Plate 87. <u>Acanthocladia</u> <u>anceps</u> Schlotheim

Fig.a S.E.M. photomicrograph showing zooecial chambers in cast preservation.B94.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=Imm

Fig.c As above at higher magnification,demonstrating the variability of zooecial chamber shape which may occur within a single zoarium.
Bar scale=Imm

a

b

c

Plate 88. Acanthocladia anceps Schlotheim

Fig.a Tangential section,showing zooecial chamber base shape and longitudinal striae.MP5.46. Bar scale=Imm

Fig.b Tangential section.MP5.8I. Bar scale=Imm

Fig.c As above,fig.a,at higher magnification. Bar scale=O.Imm

Fig.d Shallow tangential section,showing the distal parts of vestibules and ovicells.MP5.46. Bar scale=O.Imm

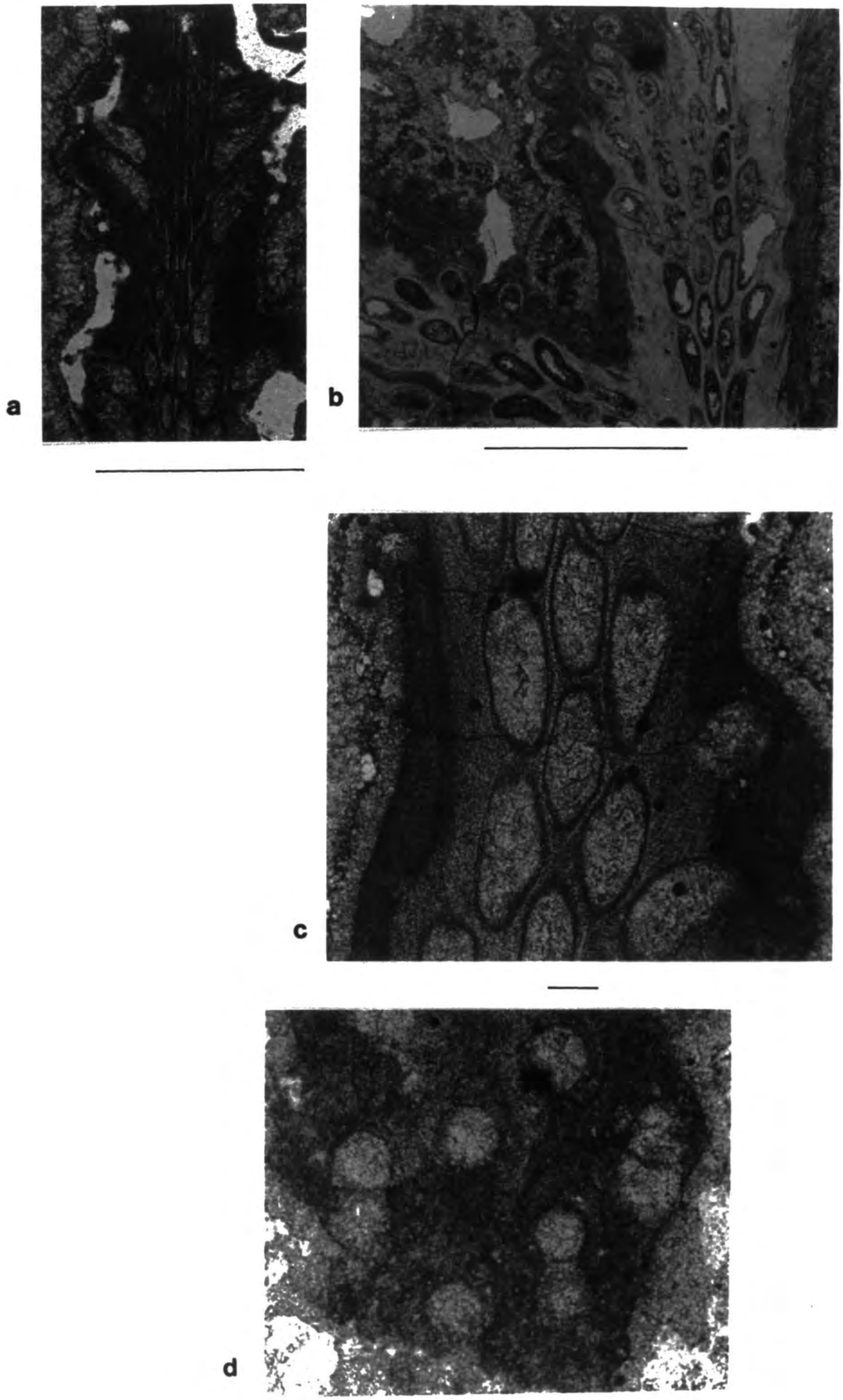

a
b
c
d

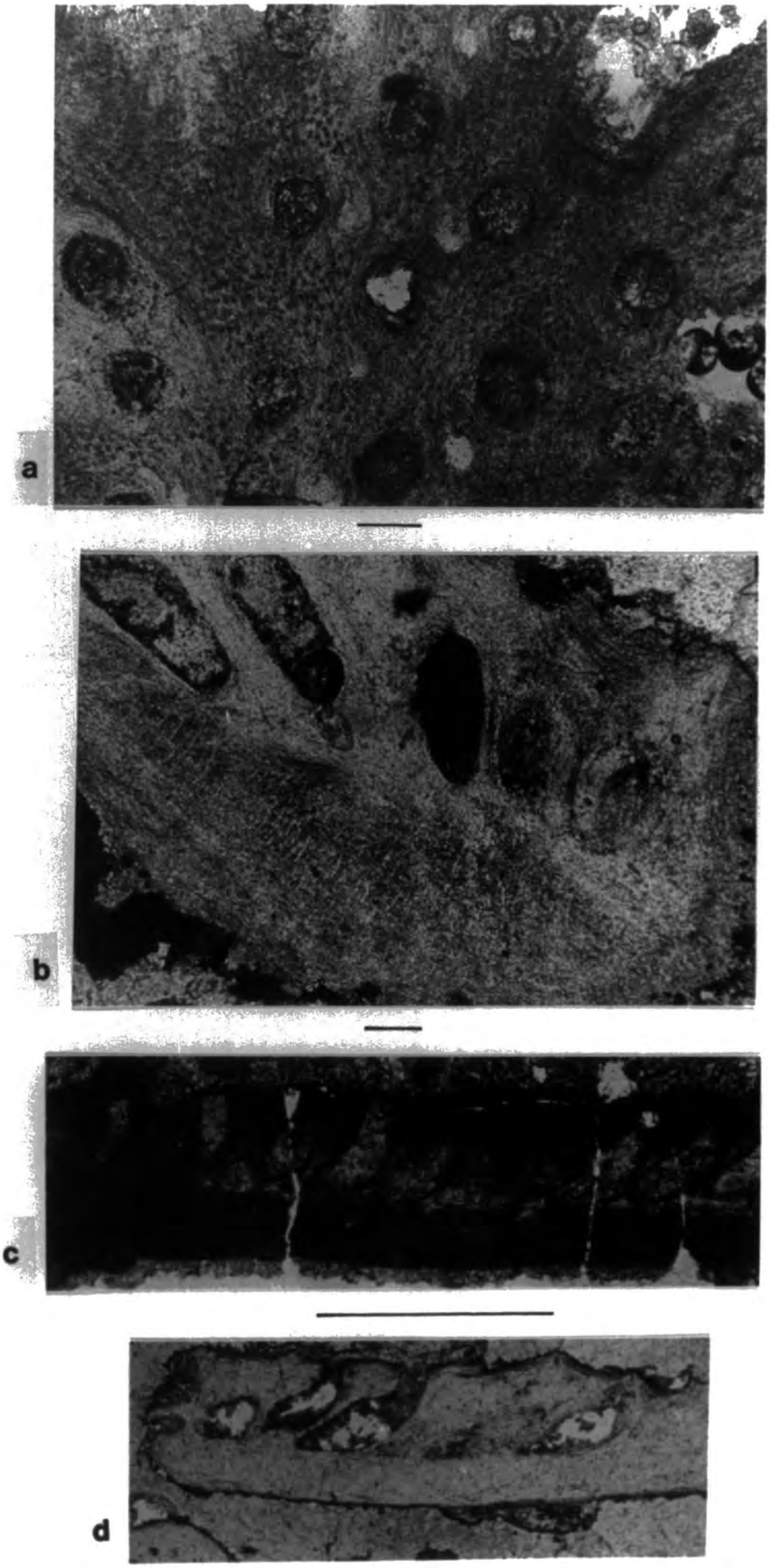
Plate 89. <u>Acanthocladia</u> <u>anceps</u> Schlotheim

Fig.a Shallow tangential section,showing skeletal rods and apertures.MP5.80.
Bar scale=0.Imm

Fig.b Oblique longitudinal section,showing zooecial chambers and skeletal rods.MP5.I50.XPL.
Bar scale=0.Imm

Fig.c Longitudinal section.RH4.5I.
Bar scale=Imm

Fig.d Longitudinal section.MP5.65.
Bar scale=Imm


a
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d

Plate 90. Acanthocladia anceps Schlotheim

Fig.a Specimen K57.3 from the Schlotheim collection. Mould preservation.Bar scale=IOmm

Fig.b Specimen K57.2 from the Schlotheim collection. Mould preservation.Bar scale=IOmm

Fig.c Specimen K57.2 from the Schlotheim collection. Mould and cast preservation.Bar scale=IOmm

Fig.d Specimen K57.3 from the Schlotheim collection. Mould and cast preservation.Bar scale=IOmm

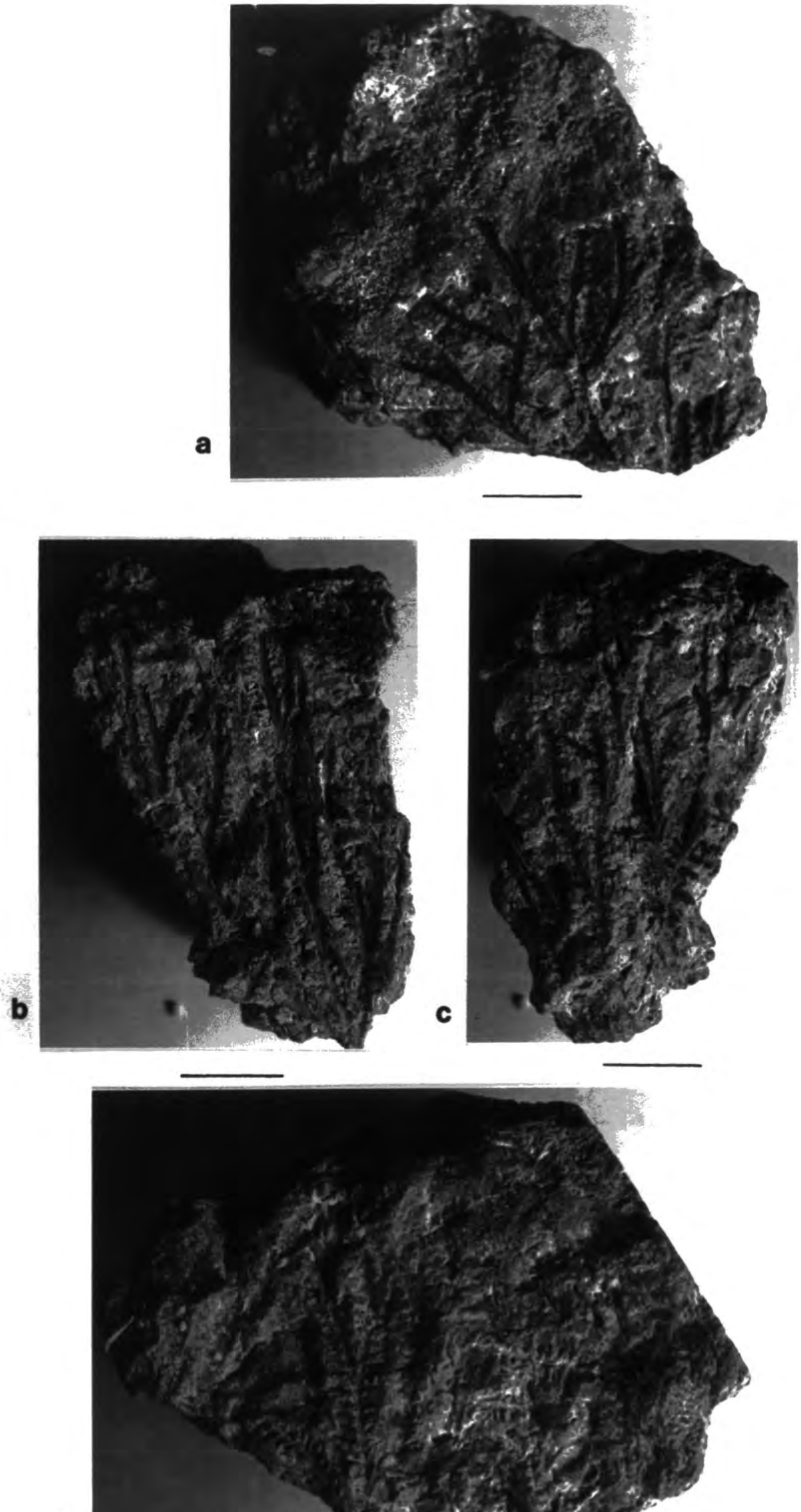

a
b
c
d

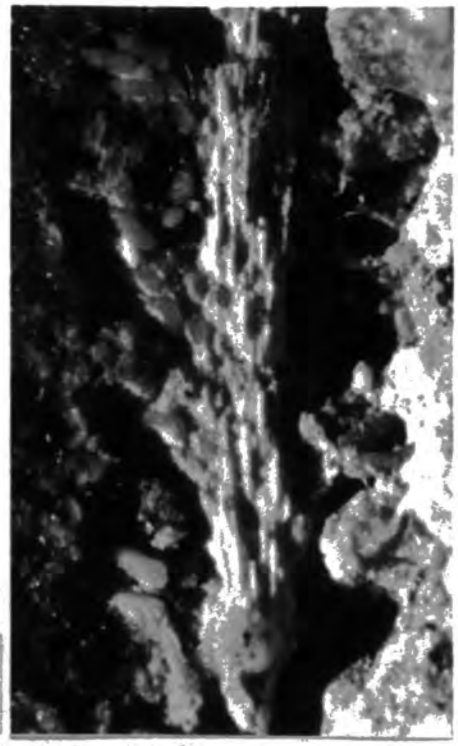
Plate 9I. <u>Acanthocladia anceps</u> Schlotheim

Fig.a Specimen K57.I from the Schlotheim collection, close-up showing longitudinal striae where the outermost skeleton has been removed. Bar scale=Imm

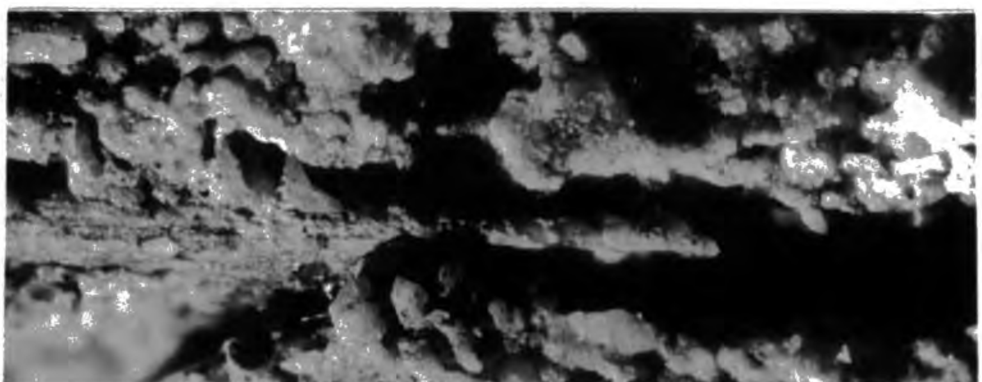
Fig.b Specimen K57.2 from the Schlotheim collection showing zooecial chambers in cast preservation where original skeleton has been removed. Bar scale=Imm

Fig.c S.E.M. photomicrograph of K57.2 showing ovicells and distal part of vestibules in cast preservation. Bar scale=Imm

a



b



c

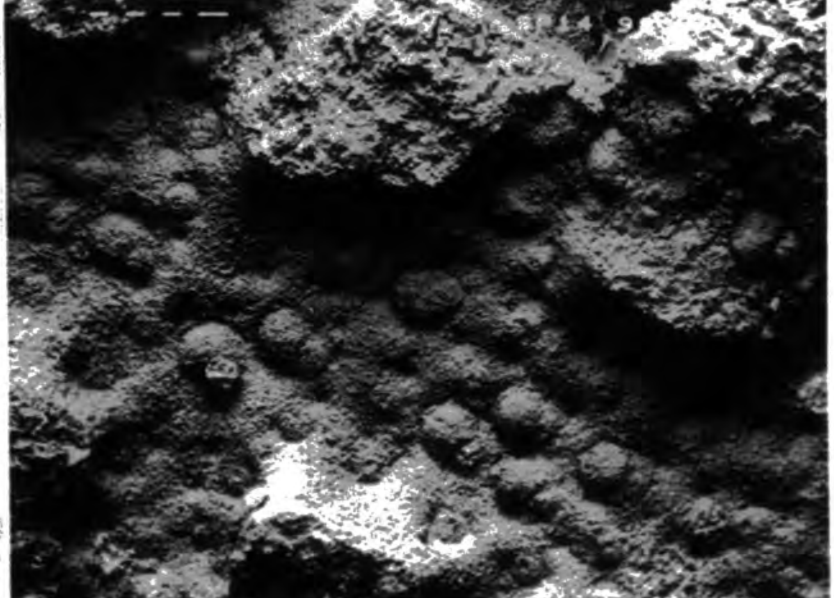


Plate 92. Acanthocladia laxa Korn

Fig.a Zoarial morphology.HDNI2.
Bar scale=IOmm

Fig.b Zoarial morphology.HDN7.
Bar scale=IOmm

Fig.c Reverse surface detail,longitudinal striae visible where outermost skeleton has been removed.HDN7.
Bar scale=Imm

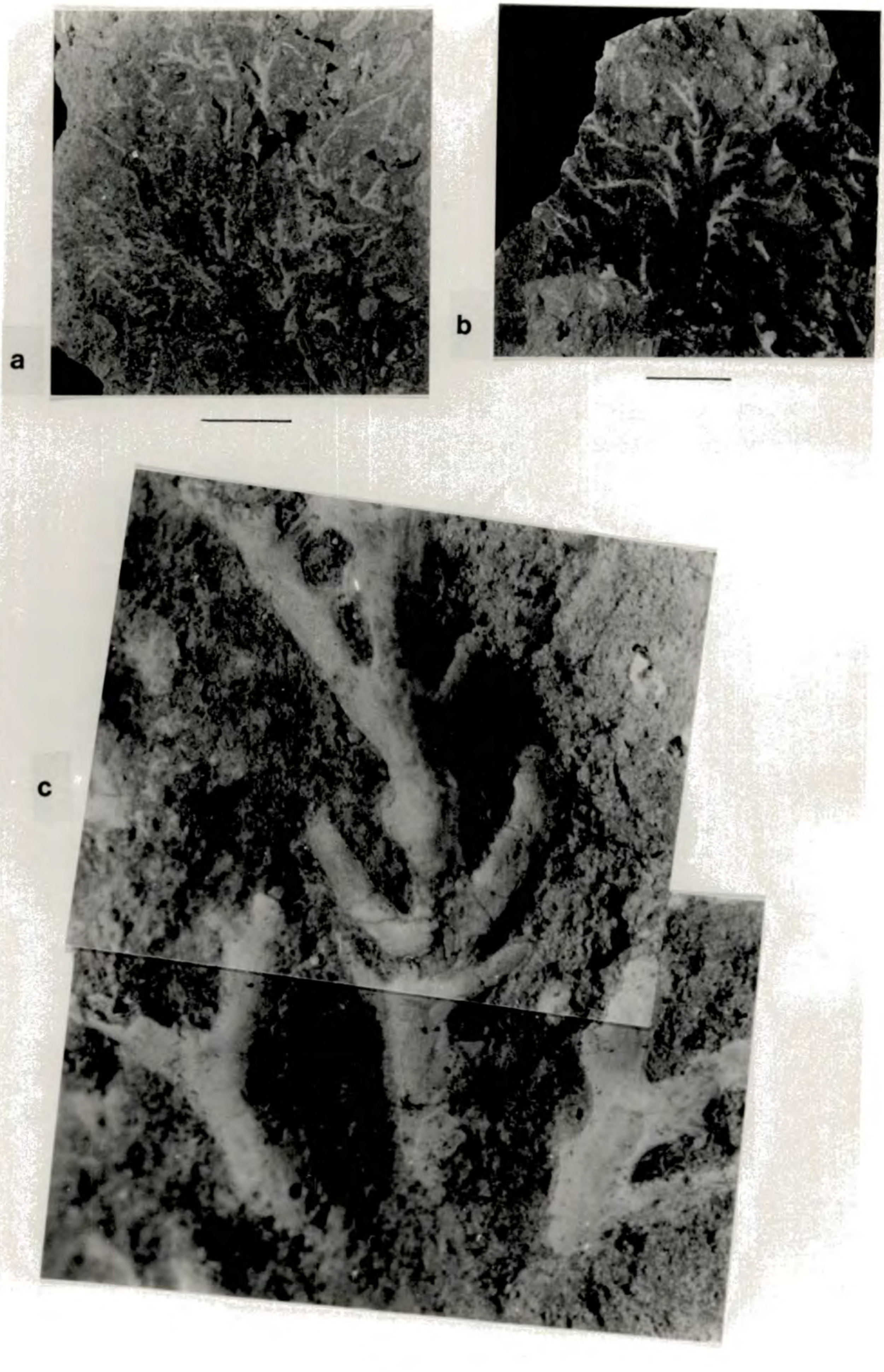
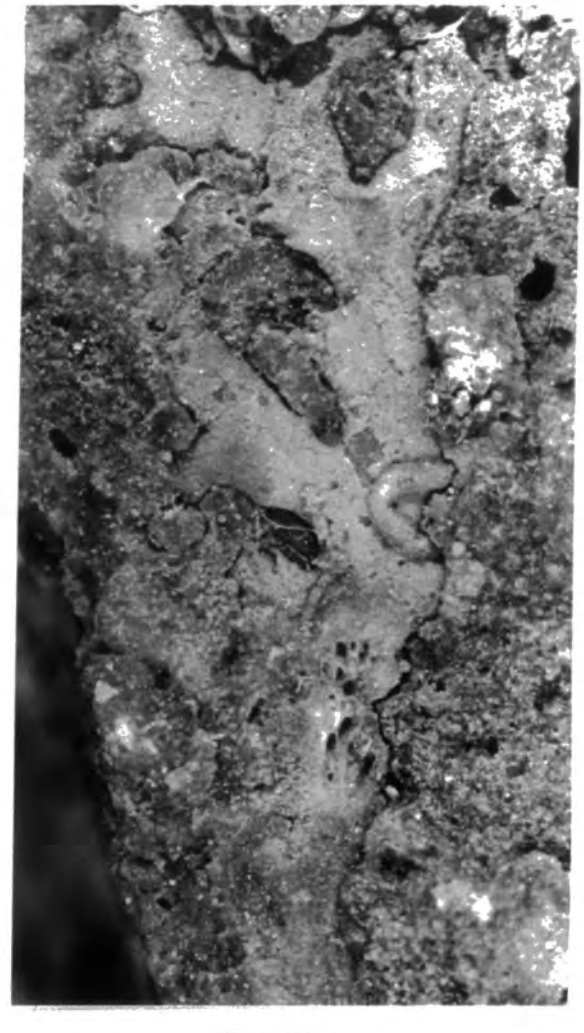

a
b
c

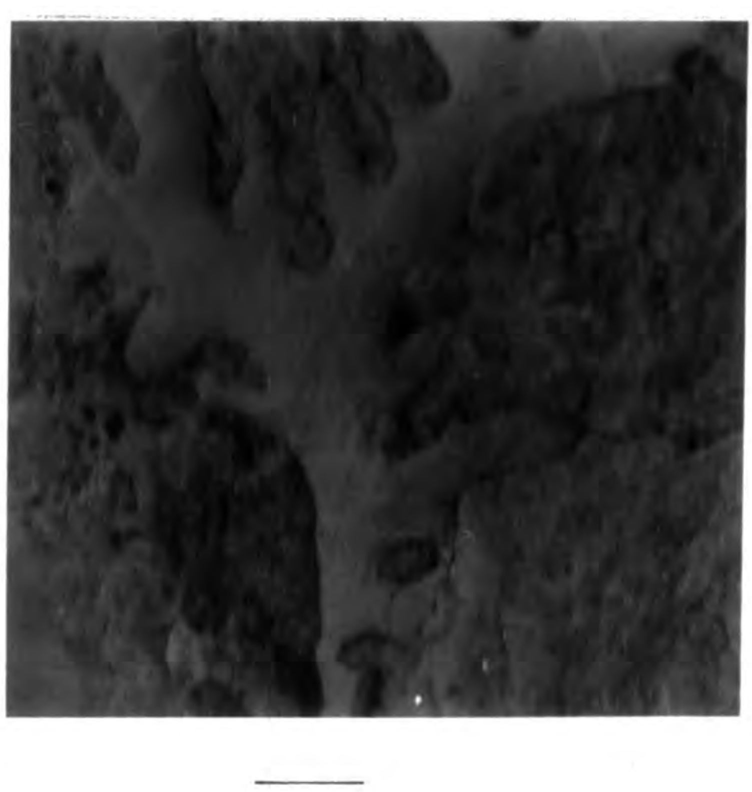
Plate 93. _Acanthocladia_ _laxa_ Korn

Fig.a Reverse surface detail.Encrusted by ?worm tube.RH2.59.
Bar scale=Imm

Fig.b Reverse surface detail.HM7.I3.
Bar scale=Imm



a



b

Plate 94. Acanthocladia laxa Korn

Fig.a Reverse surface detail.Outermost skeleton removed in parts revealing zooecial chamber bases.RHI.I3.
Bar scale=Imm

Fig.b Reverse surface detail.Outermost skeleton removed revealing longitudinal striae.
RHI.I.Bar scale=Imm

Fig.c Colony origin,viewed from underside.
(Specimen may be truly referrable to A.anceps).
MP4.I.Bar scale=Imm

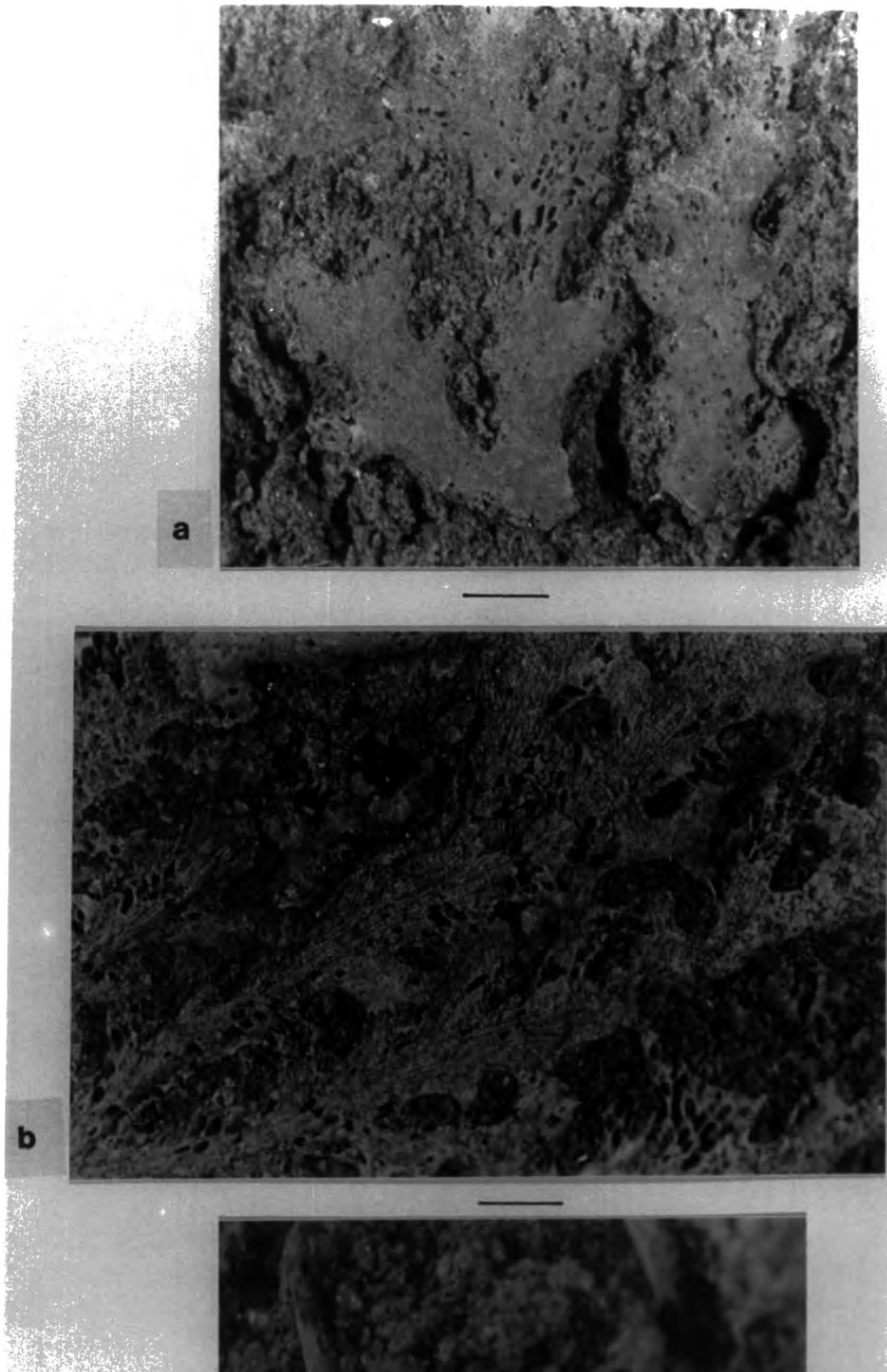

a
b
c

Plate 95. Acanthocladia laxa Korn

Fig.a Specimen Taf.IV fig.6 from the Korn collection. Bar scale=IOmm

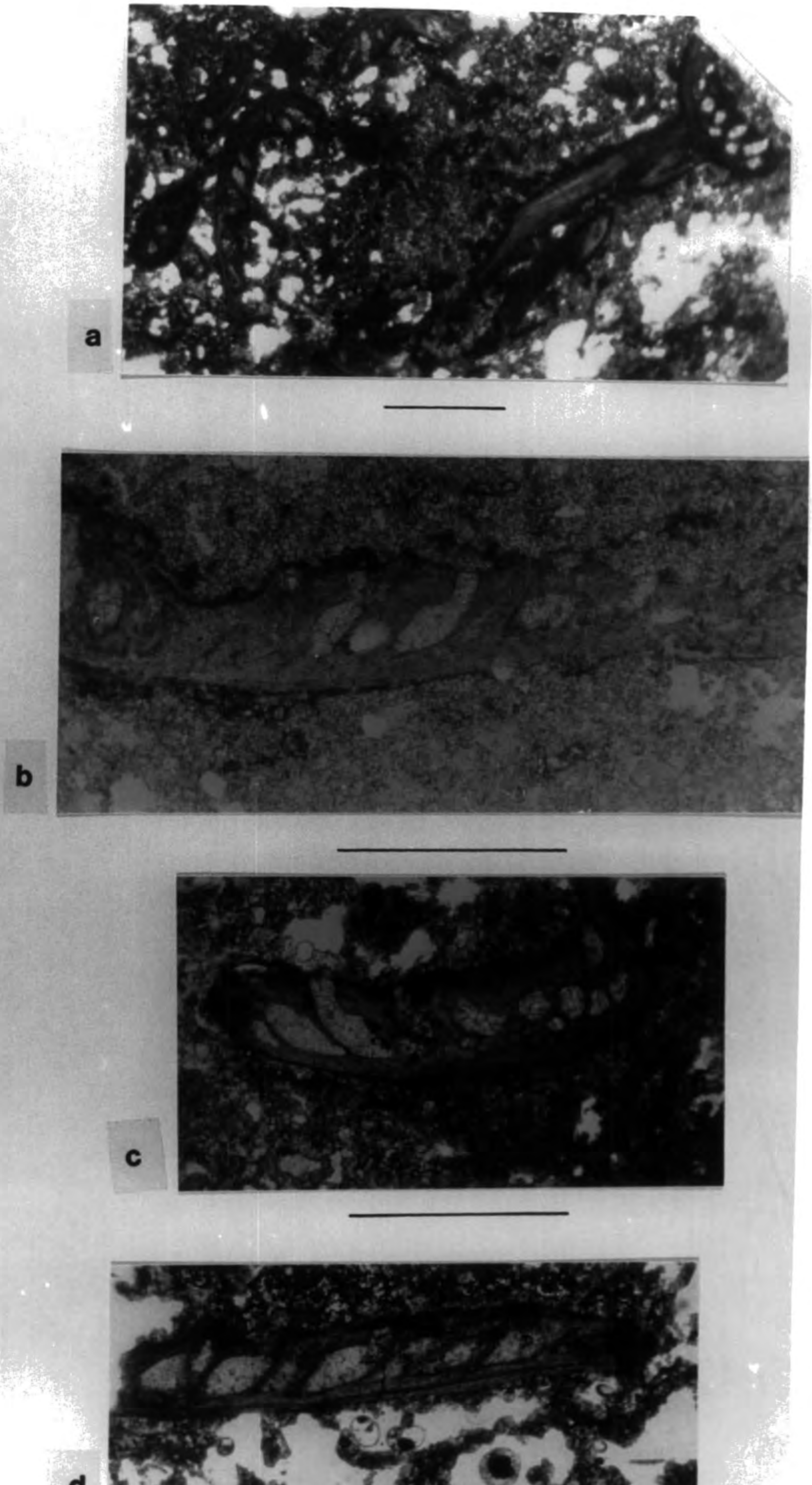
Fig.b Specimen Taf.IV fig.7 from the Korn collection, designated lectotype by Dreyer(I96I). Bar scale=IOmm

a

b

Plate 96. Acanthocladia laxa Korn

Fig.a	Section showing well-developed reverse surface spine.HDNI6. Bar scale=Imm
Fig.b	Longitudinal section.HDN5. Bar scale=Imm
Fig.c	Longitudinal/Oblique section.HDNI9a. Bar scale=Imm
Fig.d	Longitudinal section.HDN4. Bar scale=Imm


a
b
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d

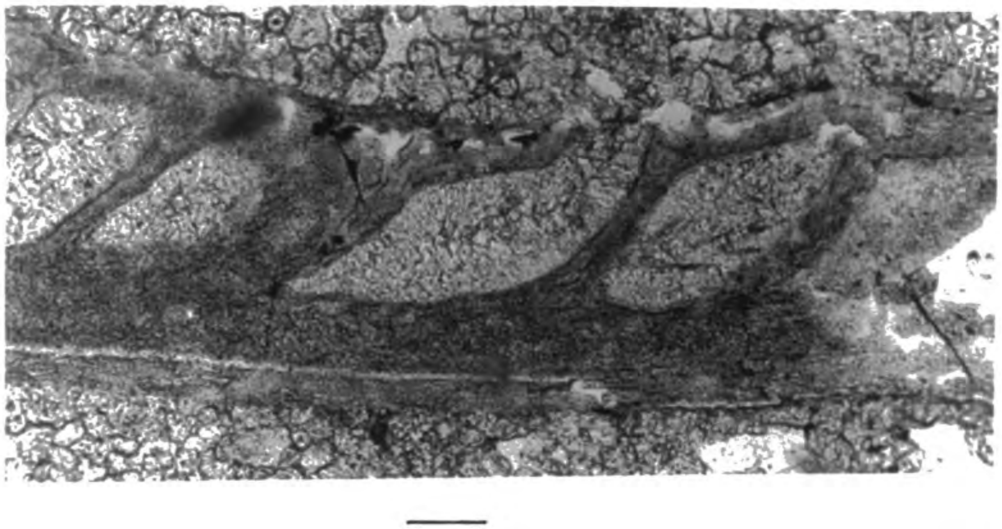
Plate 97. Acanthocladia laxa Korn

Fig.a Longitudinal section.HDN6.
Bar scale=O.Imm

Fig.b Longitudinal section through the same branch as in fig.a above.Thus demonstrating the shape variability of zooecial chambers which is a result of plane of section and which may occur within a single specimen.HDN6.
Bar scale=O.Imm

Fig.c Oblique section,showing skeletal rods.HDN3.
XPL.Bar scale=O.Imm

a



b

c

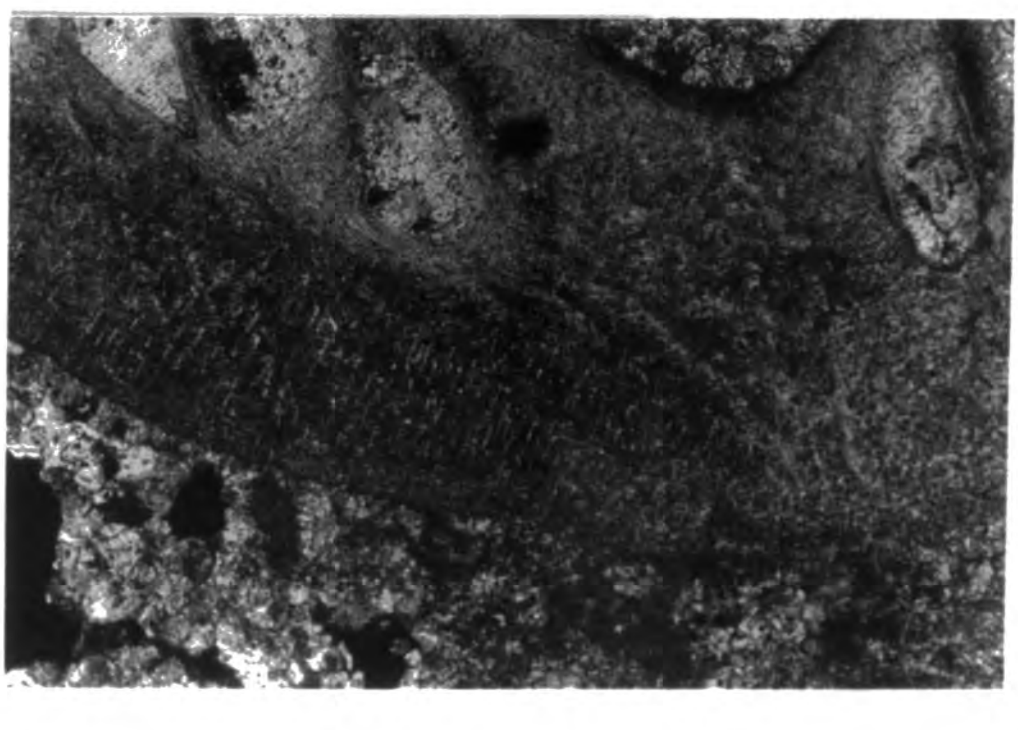


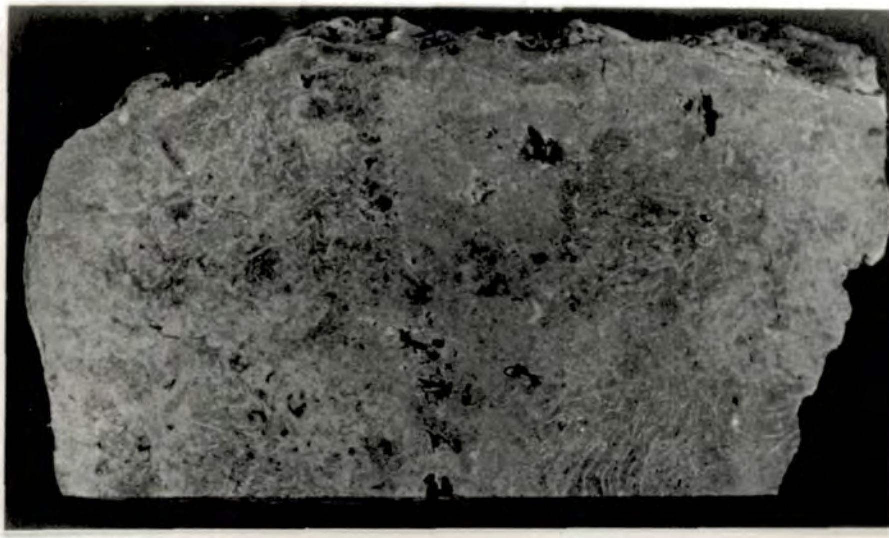
Plate 98. <u>Acanthocladia</u> <u>diffusus</u> Korn

Fig.a Polished block showing zoarial morphology in section.HYR25.
Bar scale=20mm

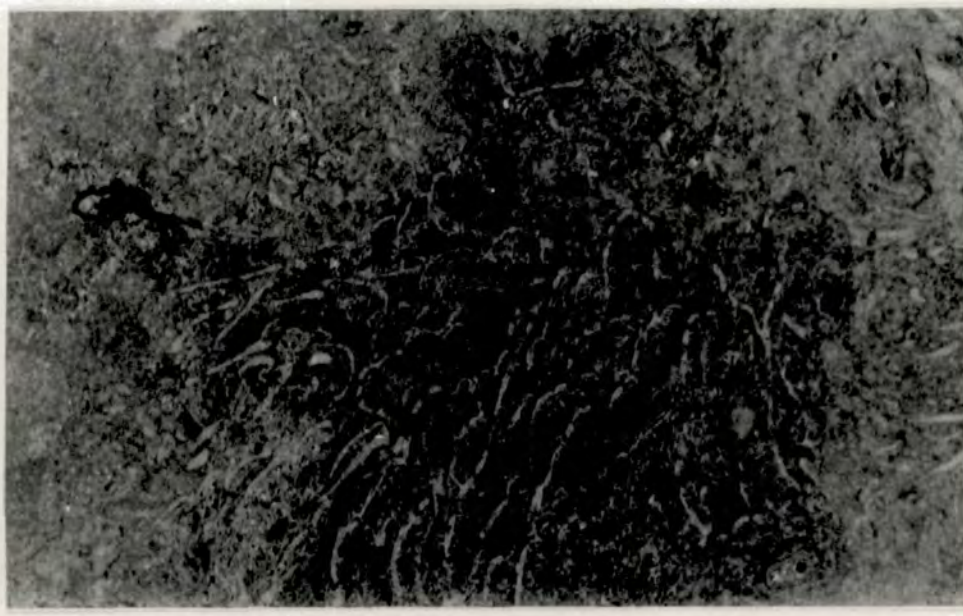
Fig.b As above at higher magnification.
Bar scale=IOmm

Fig.c Polished block showing preferred orientation of obverse surface.HM7.I8.
Bar scale=IOmm

a



b



c

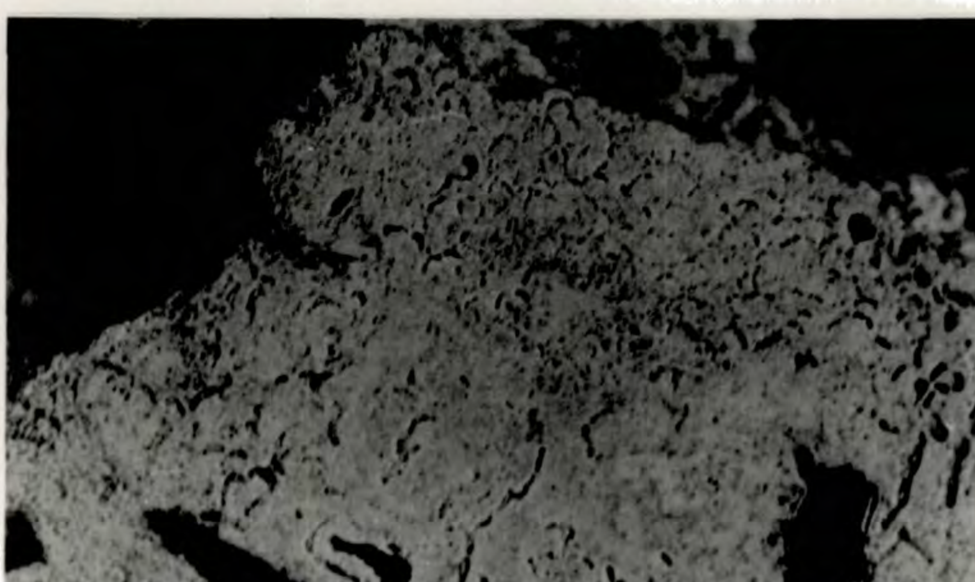


Plate 99. Acanthocladia diffusus Korn

Fig.a Zoarial morphology.Zoarium seen in transverse section.MP5.58a. Bar scale=20mm

Fig.b Zoarial morphology.Several zoaria occur in close proximity.MP5.58a. Bar scale=20mm

Fig.c Two zoaria,probably in life position - 'a' appears to be growing from left to right,'b' appears to be growing upwards. Growth of these colonies may thus have been in a cavity within the reef structure. BHI6.Bar scale=IOmm

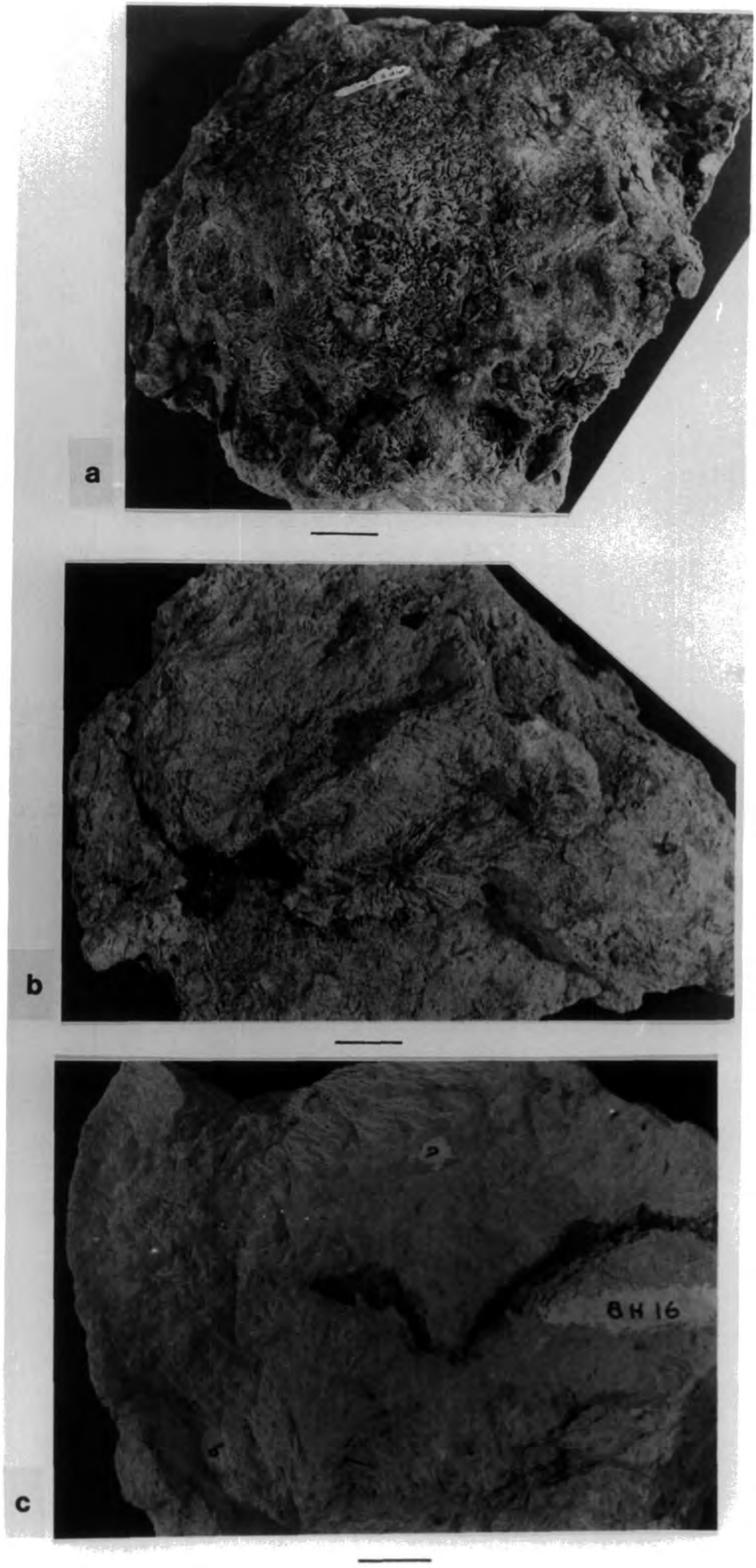

a
b
BH 16
c

Plate IOO. Acanthocladia diffusus Korn

Fig.a Zoarial morphology.BHI2.
Bar scale=IOmm

Fig.b Polished block showing one or more zoaria with densely-spaced branches and characteristic preferred orientation of the obverse surface.BHI2.
Bar scale=IOmm

Fig.c Reverse surface detail.BHI2.
Bar scale=Imm

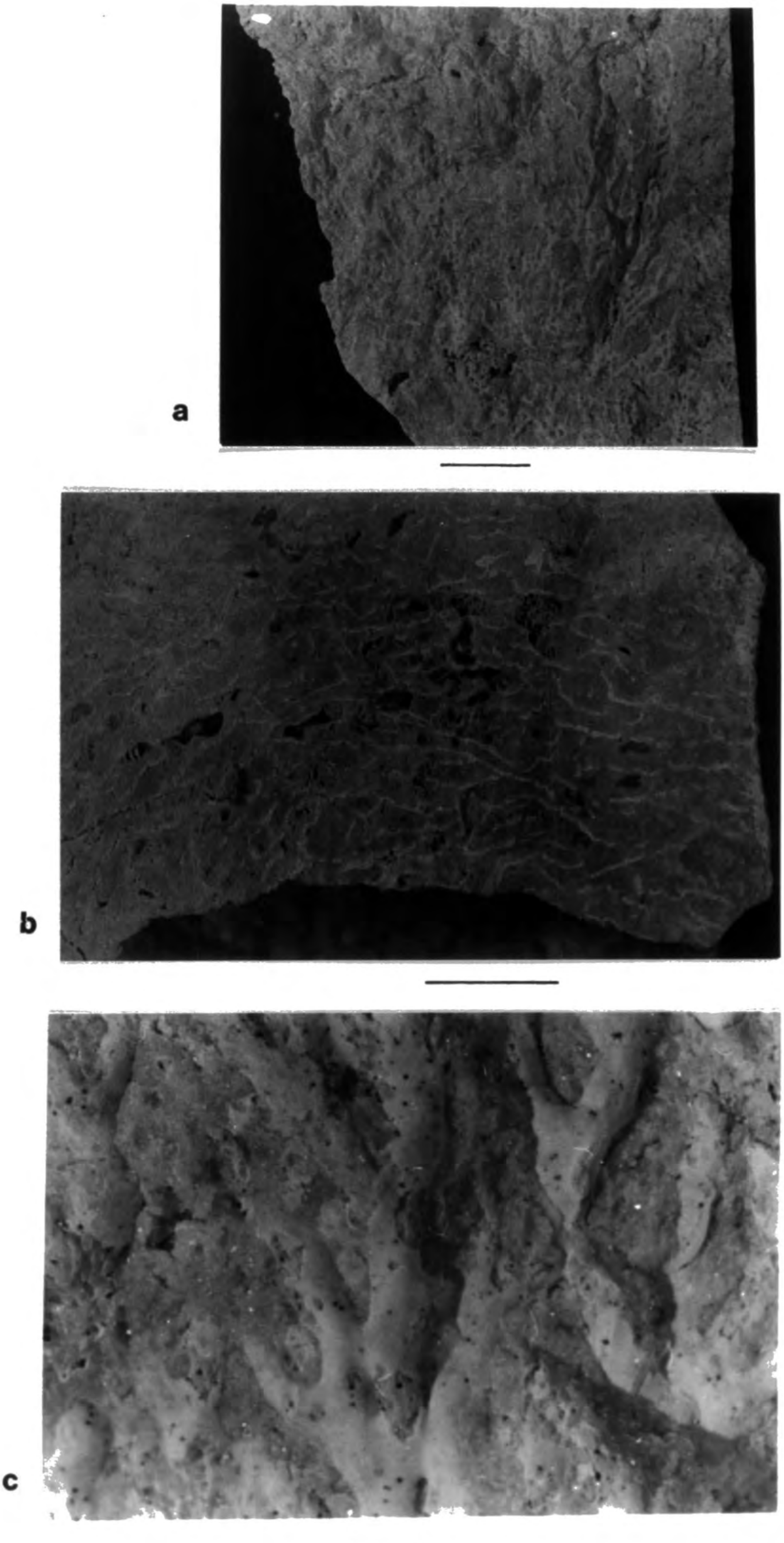


Plate IOI. Acanthocladia diffusus Korn

Fig.a Reverse surface detail.HYRI6.
Bar scale=Imm

Fig.b Reverse surface detail.HYRI8.
Bar scale=Imm

Fig.c Obverse surface detail.HTQI.
Bar scale=Imm

Plate IO2. Acanthocladia diffusus Korn

Fig.a Zoarium in cast preservation, showing zooecial chambers.HM7.I8.
Bar scale=Imm

Fig.b Zoarial morphology.Colony origin arrowed - colony appears to have grown down from its substratum of attachment.RHI.36.
Bar scale=IOmm

Fig.c Zooecial chambers in cast preservation.
HM7.I8.Bar scale=Imm

Fig.d Zoarial morphology.Cast preservation.
RHI.38.Bar scale=IOmm

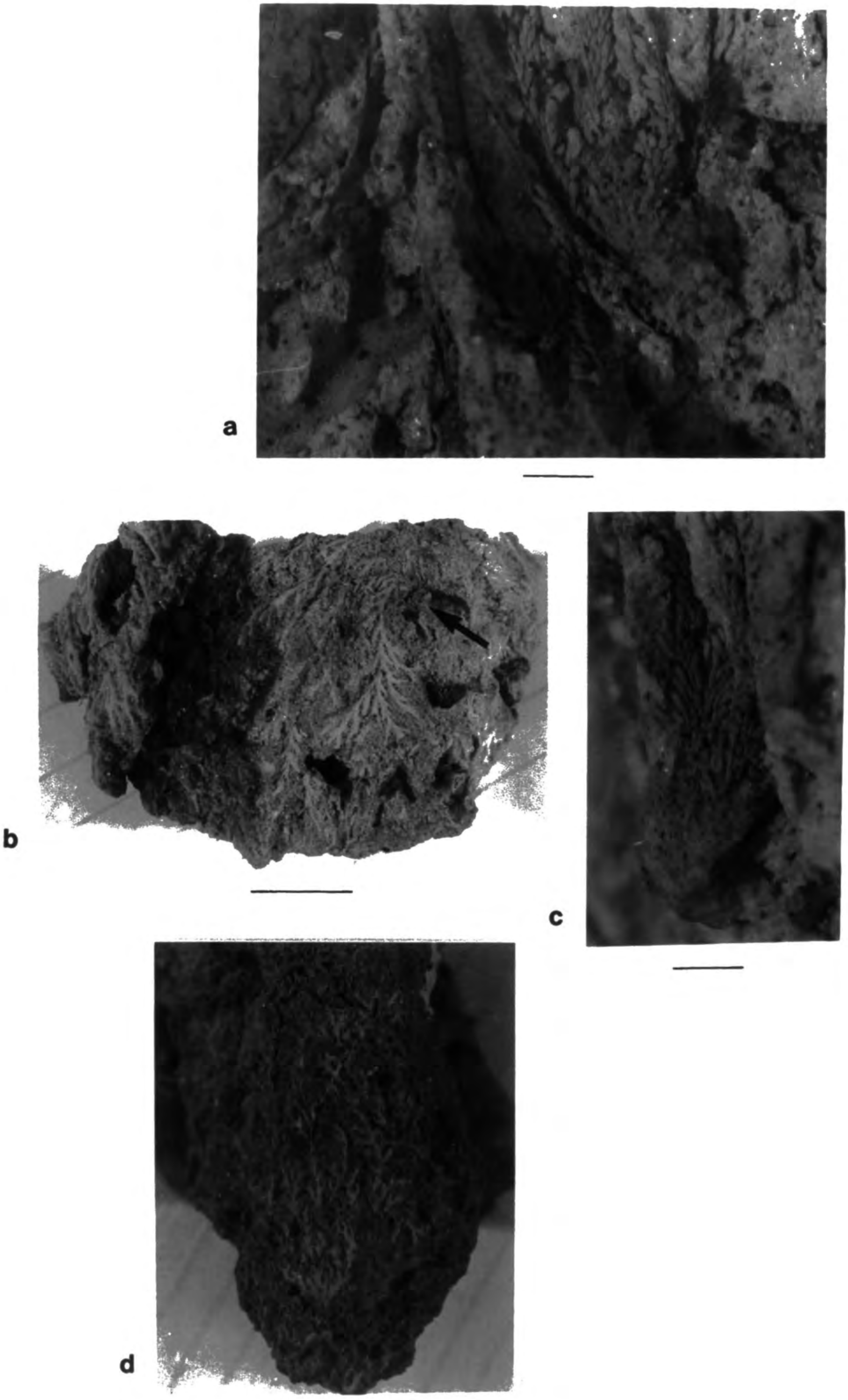

a
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Plate IO3. Acanthocladia diffusus Korn

Fig.a Specimen Taf.II fig.I5 from the Korn collection,selected as neotype to replace the missing lectotype.
Bar scale=IOmm

Fig.b Specimen Taf.II fig.I6 from the Korn collection.Bar scale=IOmm

Fig.c Specimen Taf.II fig.7 from the Korn collection,referred to Thamniscus dubius by Korn(I930).
Bar scale=IOmm

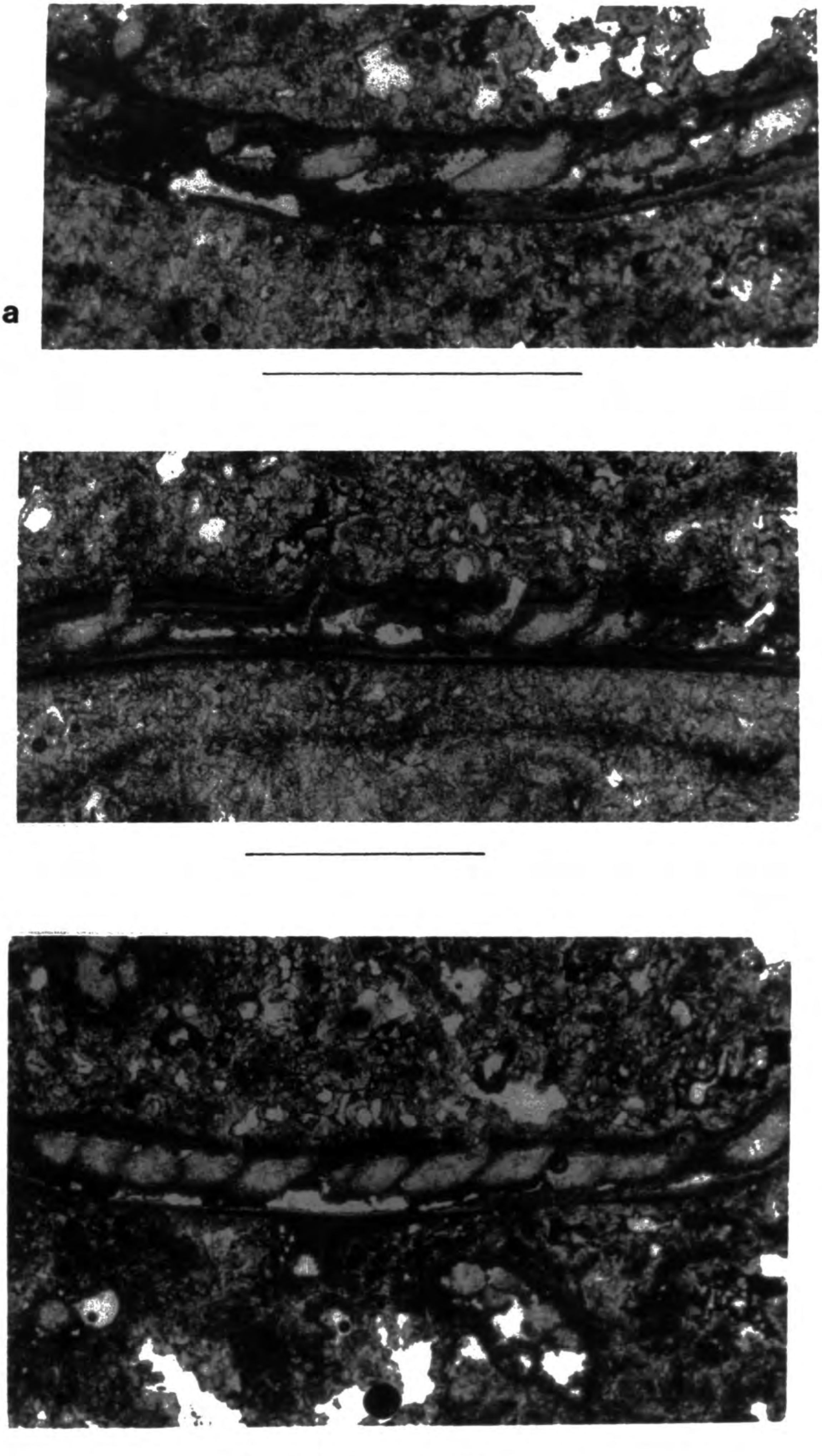

a

b

c

Plate IO4. *Acanthocladia diffusus* Korn

Fig.a	Longitudinal section.HYR2O. Bar scale=Imm
Fig.b	Longitudinal section.HYR2O. Bar scale=Imm
Fig.c	Longitudinal section.HYR2O. Bar scale=Imm


a
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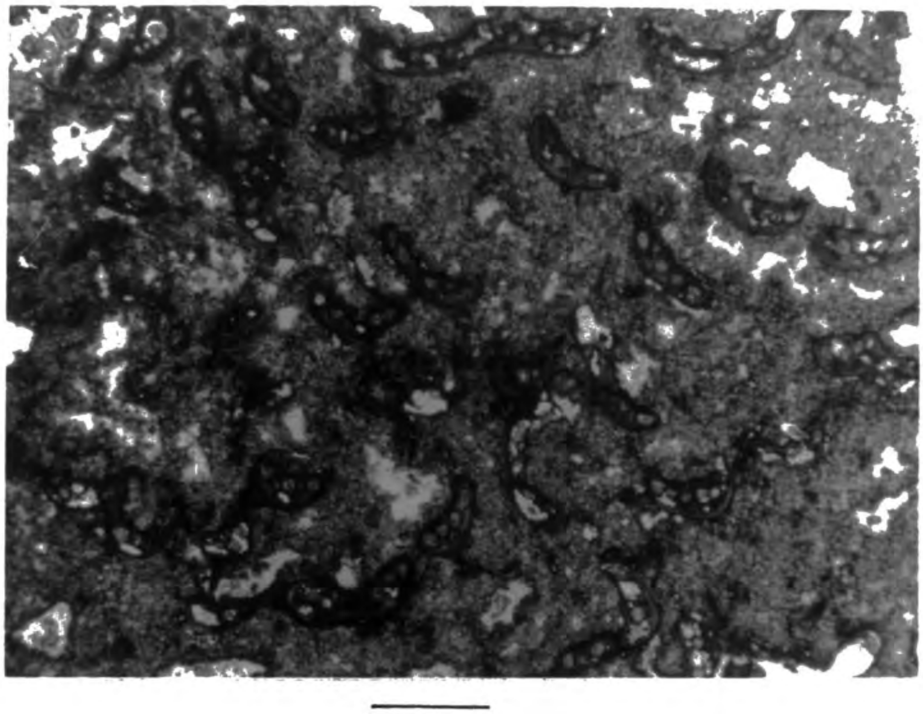
c

Plate IO5. _Acanthocladia_ _diffusus_ Korn

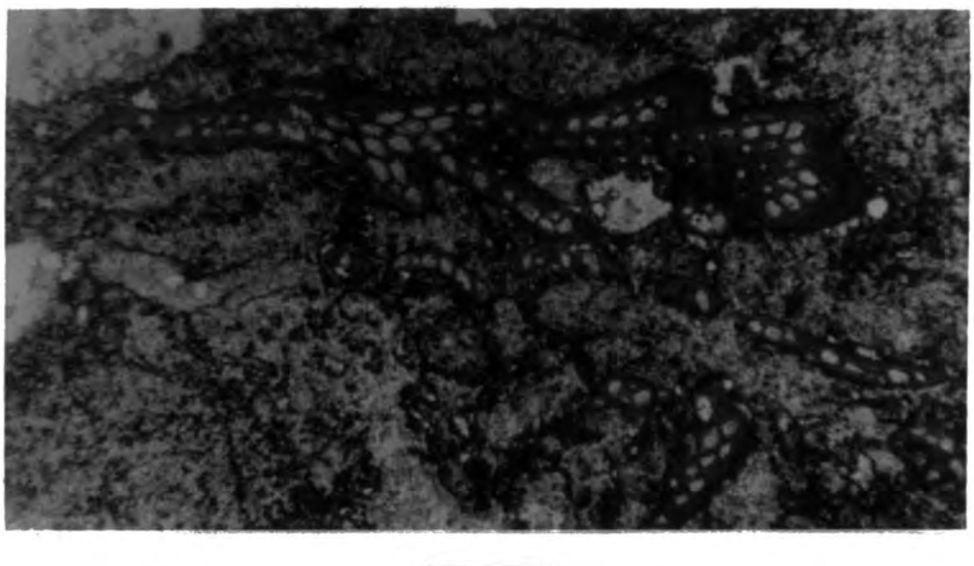
Fig.a Transverse section through branches which are assumed to be of the same zoarium.HYRI4a.
Bar scale=Imm

Fig.b Oblique tangential section.HYR2I.
Bar scale=Imm

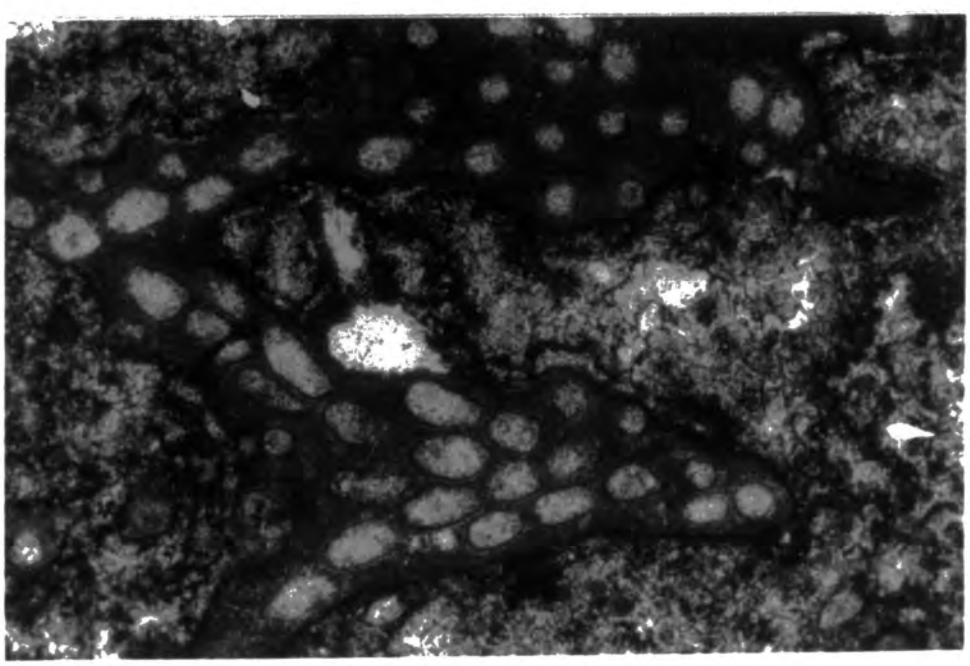
Fig.c Oblique tangential section.HYR23.
Bar scale=Imm



a



b



c

Plate IO6. Acanthocladia diffusus Korn

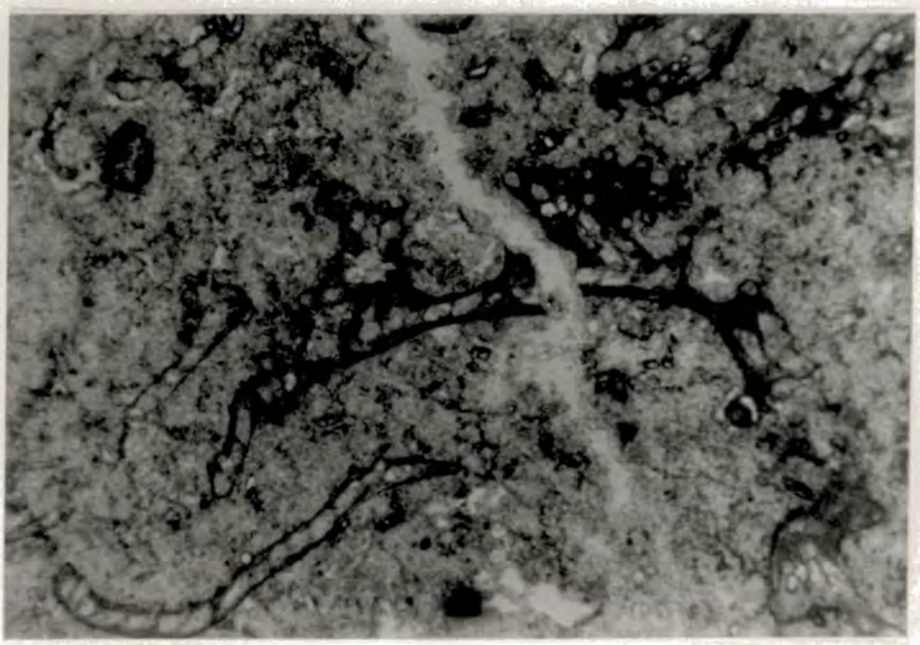
Fig.a Oblique longitudinal sections.HYR20.
Bar scale=Imm

Fig.b As above at higher magnification,showing large obverse surface node.
Bar scale=Imm

Fig.c Oblique section.HYRI5a.
Bar scale=Imm

a

b



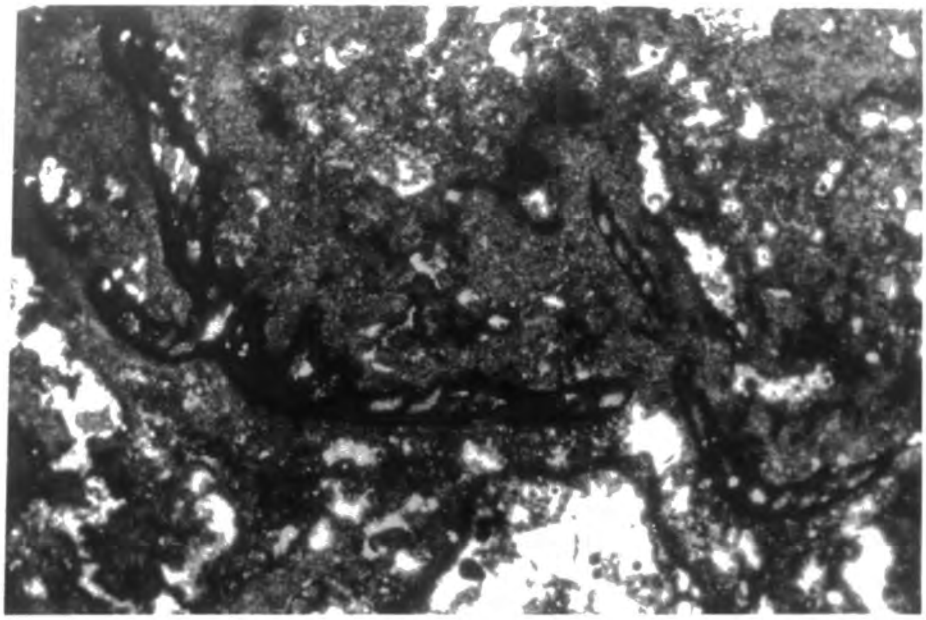
c

Plate IO7. Acanthocladia diffusus Korn

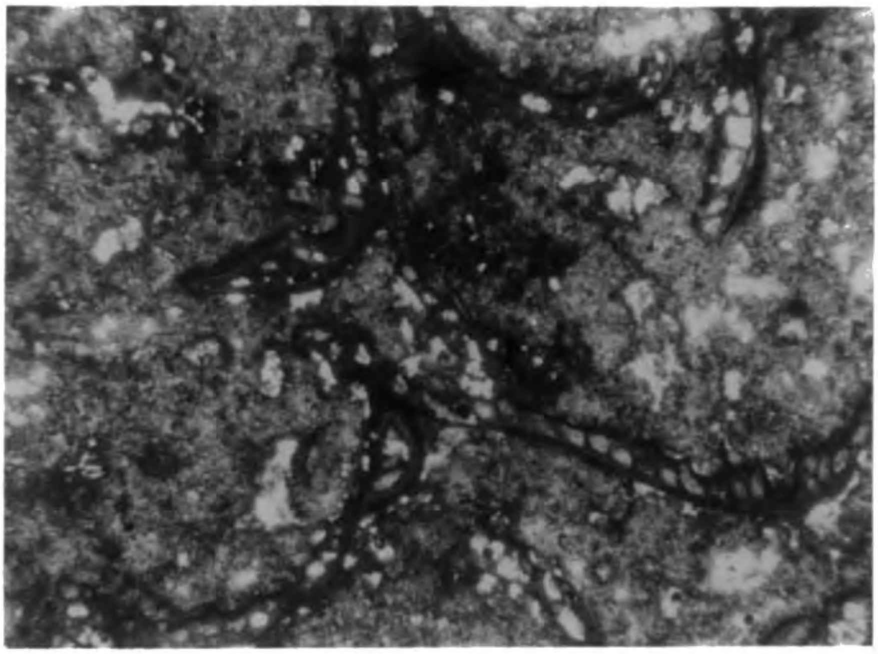
Fig.a Oblique section showing fusion of branches from adjacent zoarial laminae(left side of figure).HYRI4.
Bar scale=Imm

Fig.b Oblique section,showing fusion of branches. HYRI4a.Bar scale=Imm

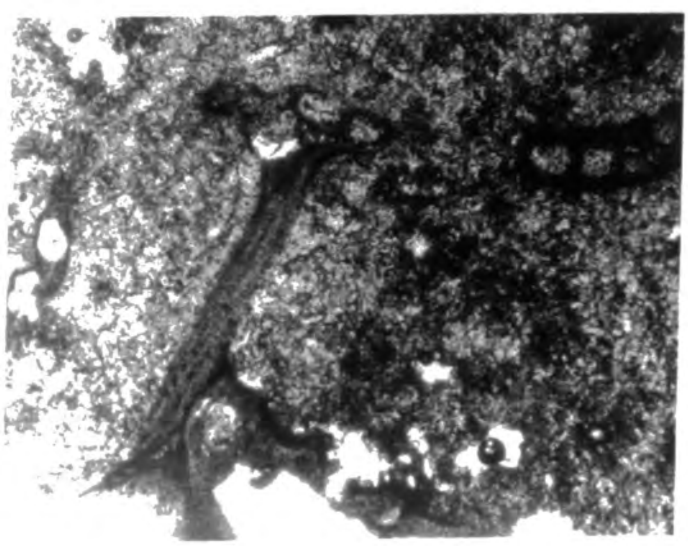
Fig.c Transverse section showing very large reverse surface spine.HYRI4.
Bar scale=Imm



a



b



c

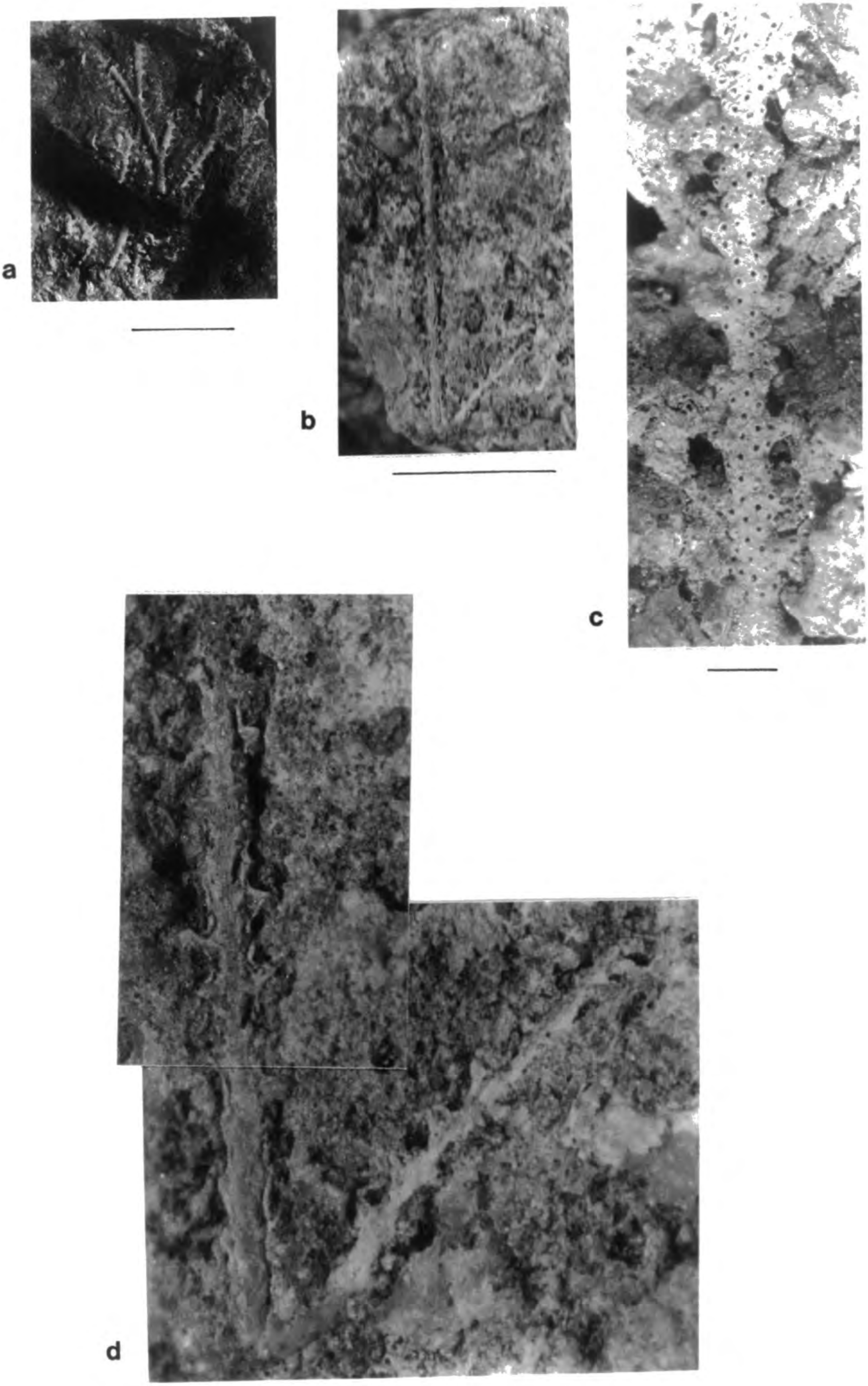
Plate I08. Acanthocladia minor Korn

Fig.a Specimen Taf.IV. fig.I2,from the Korn collection,chosen as lectotype by Dreyer(I96I).
Bar scale=IOmm

Fig.b Reverse surface,showing branch bifurcation.
RHI.I5.Bar scale=IOmm

Fig.c Obverse surface detail.RH2.55.
Bar scale=Imm

Fig.d Reverse surface detail - outermost skeleton not preserved.RHI.I5.
Bar scale=Imm


a
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d

Plate 109. <u>Acanthocladia</u> <u>magna</u> sp.nov.

Fig.a Obverse surface detail of holotype, RH2.43.
Bar scale=1mm

Fig.b Zoarial morphology,Holotype.RH2.43.
Bar scale=10mm

Fig.c Obverse surface detail,showing well-developed peristomes,often with a small notch at their proximal margin.Several nanate zooecia occur at the proximal end of the branch.
RH2.70.Paratype.Bar scale=1mm

Fig.d Obverse surface detail,mineralogically overgrown.RH2.73b(Paratype).
Bar scale=1mm

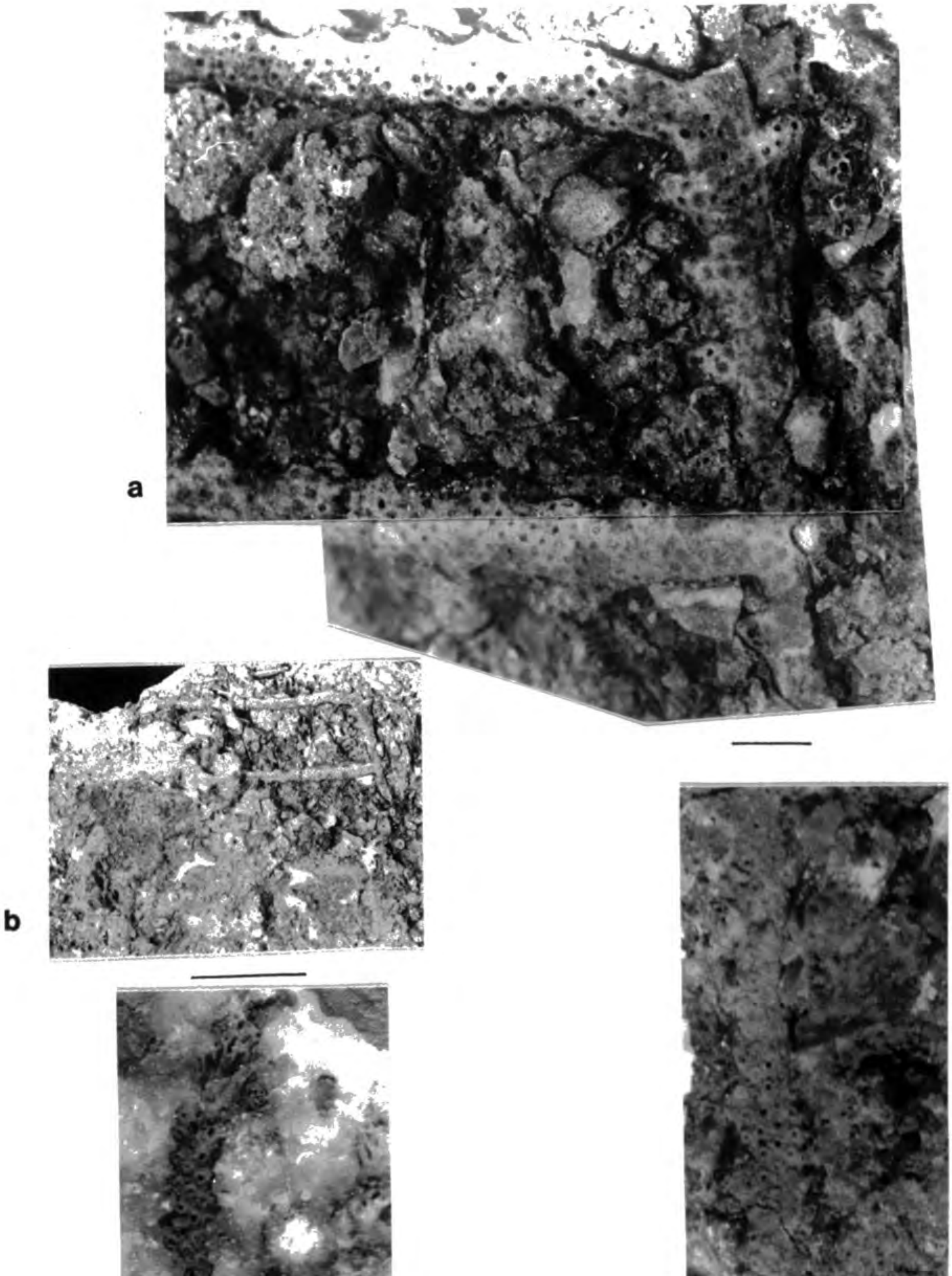
a
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Plate 110. Acanthocladia magna sp.nov.

Tangential section, questionably referred to A.magna. GLQ 16. Bar scale=1mm

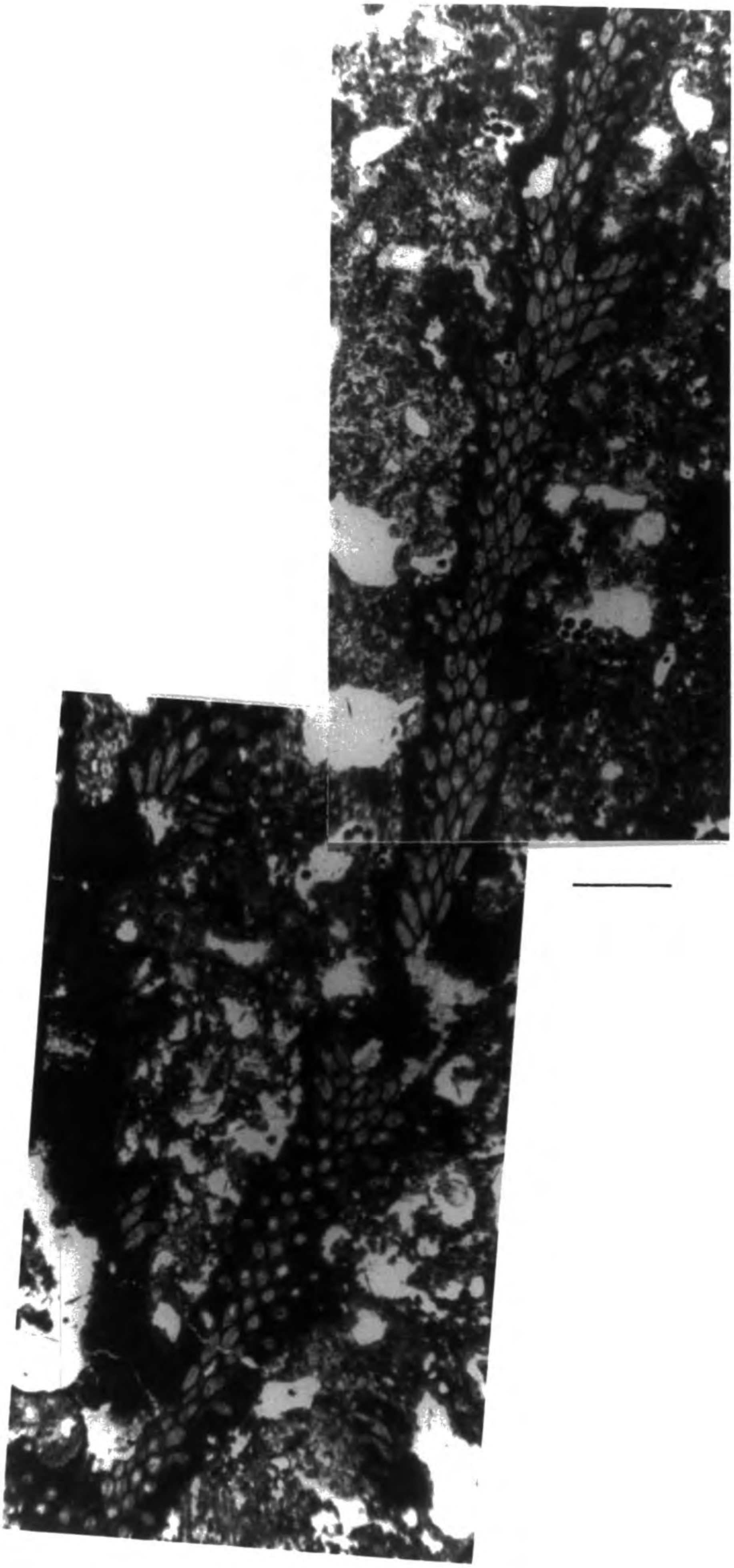

Plate III. Kalvariella typica Morozova

Fig.a Zoarial morphology.BHIOb.
Bar scale=IOmm

Fig.b Obverse surface detail.BHIOb.
Bar scale=Imm

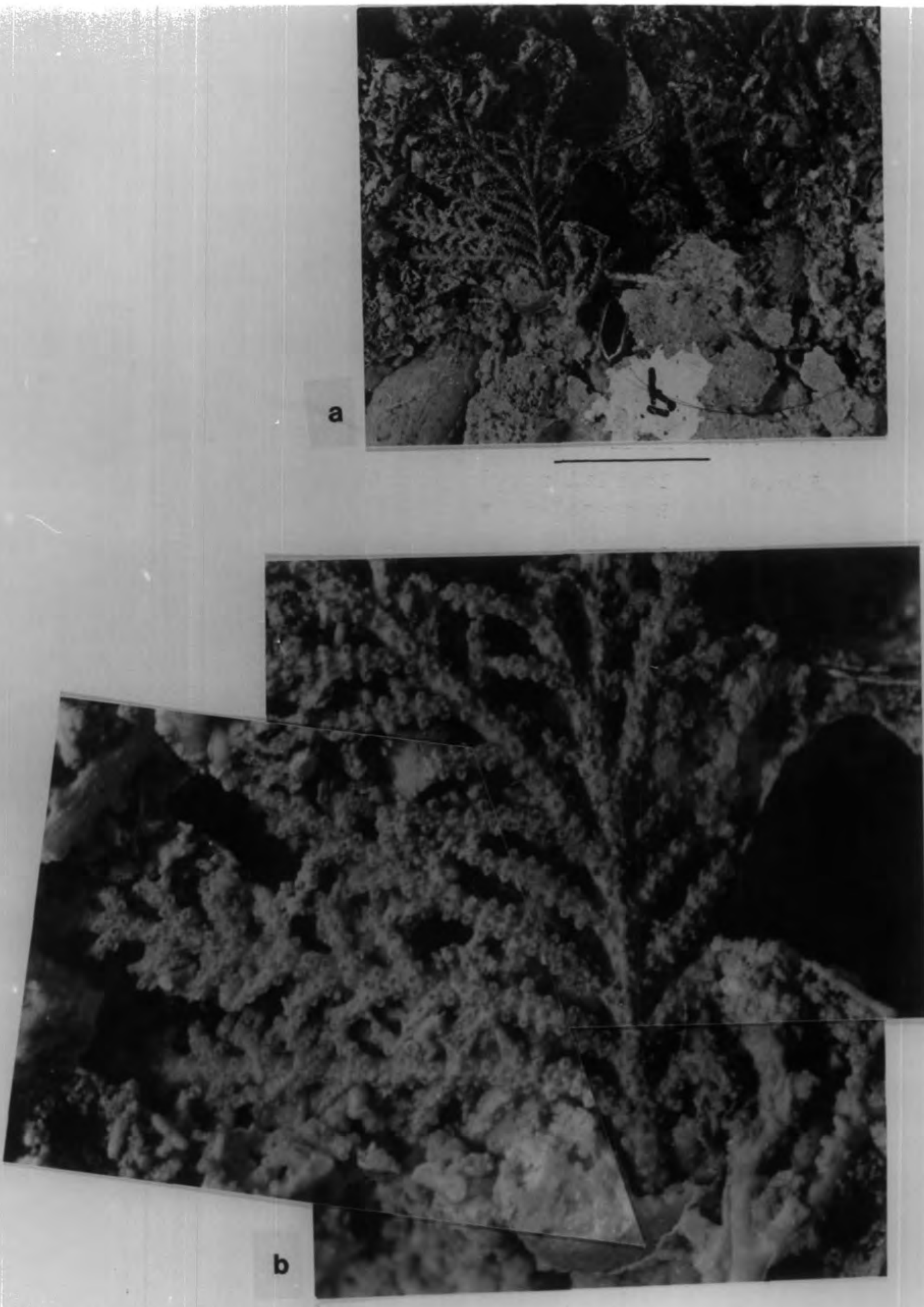
a
b

Plate II2. *Kalvariella typica* Morozova

Fig.a Obverse surface detail.RH2.52b.
Bar scale=Imm

Fig.b S.E.M. photomicrograph,obverse surface detail.Specimen questionably referred to *K.typica*.RH2.6I.
Bar scale=Imm

Fig.c As above,fig.b,at higher magnification, showing nanate zooecia.S.E.M. photomicrograph.
Bar scale=Imm

Fig.d S.E.M. photomicrograph of nanate zooecium.
RH2.6I.Bar scale=O.Imm

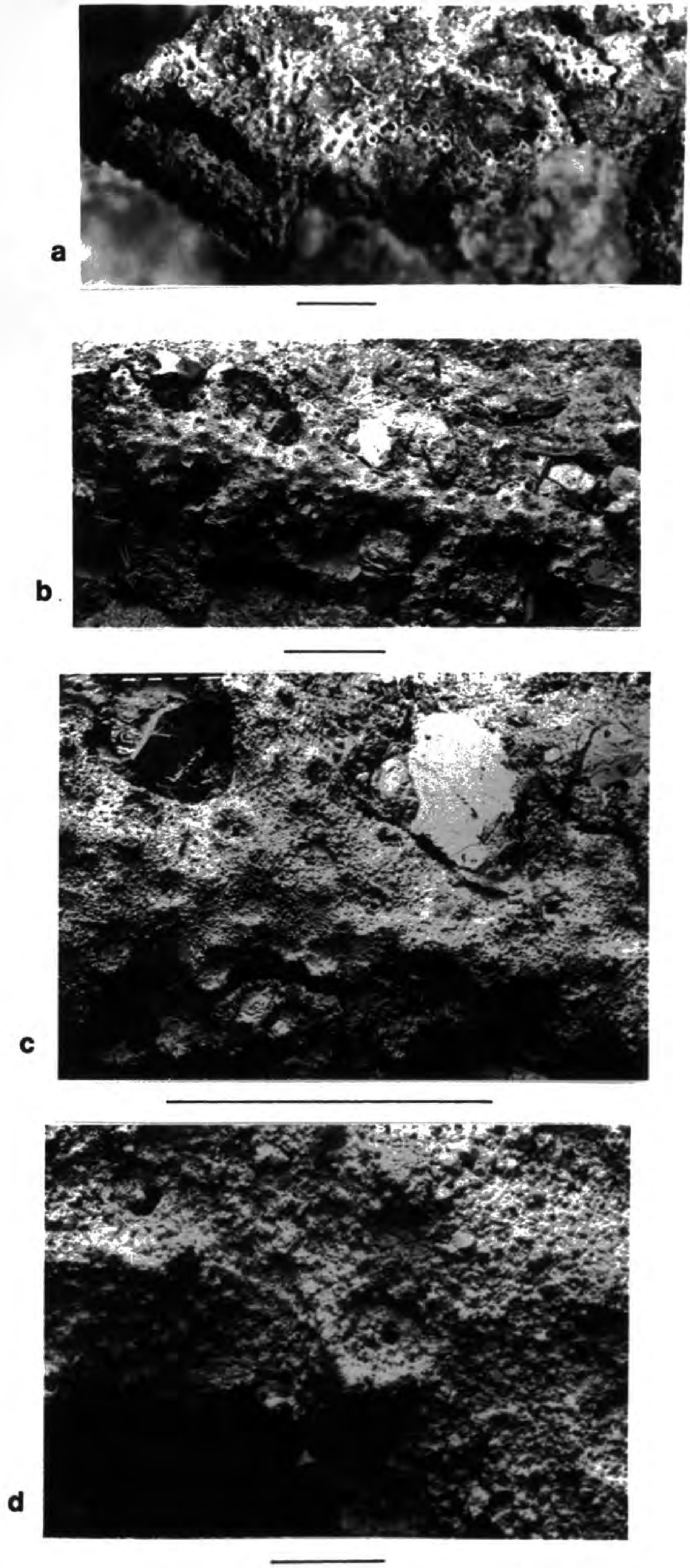
a
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Plate II3. *Penniretepora waltheri* Korn

Fig.a Zoarial morphology,?close to colony origin. HYR28.Bar scale=IOmm

Fig.b Reverse surface detail.HYR28. Bar scale=Imm

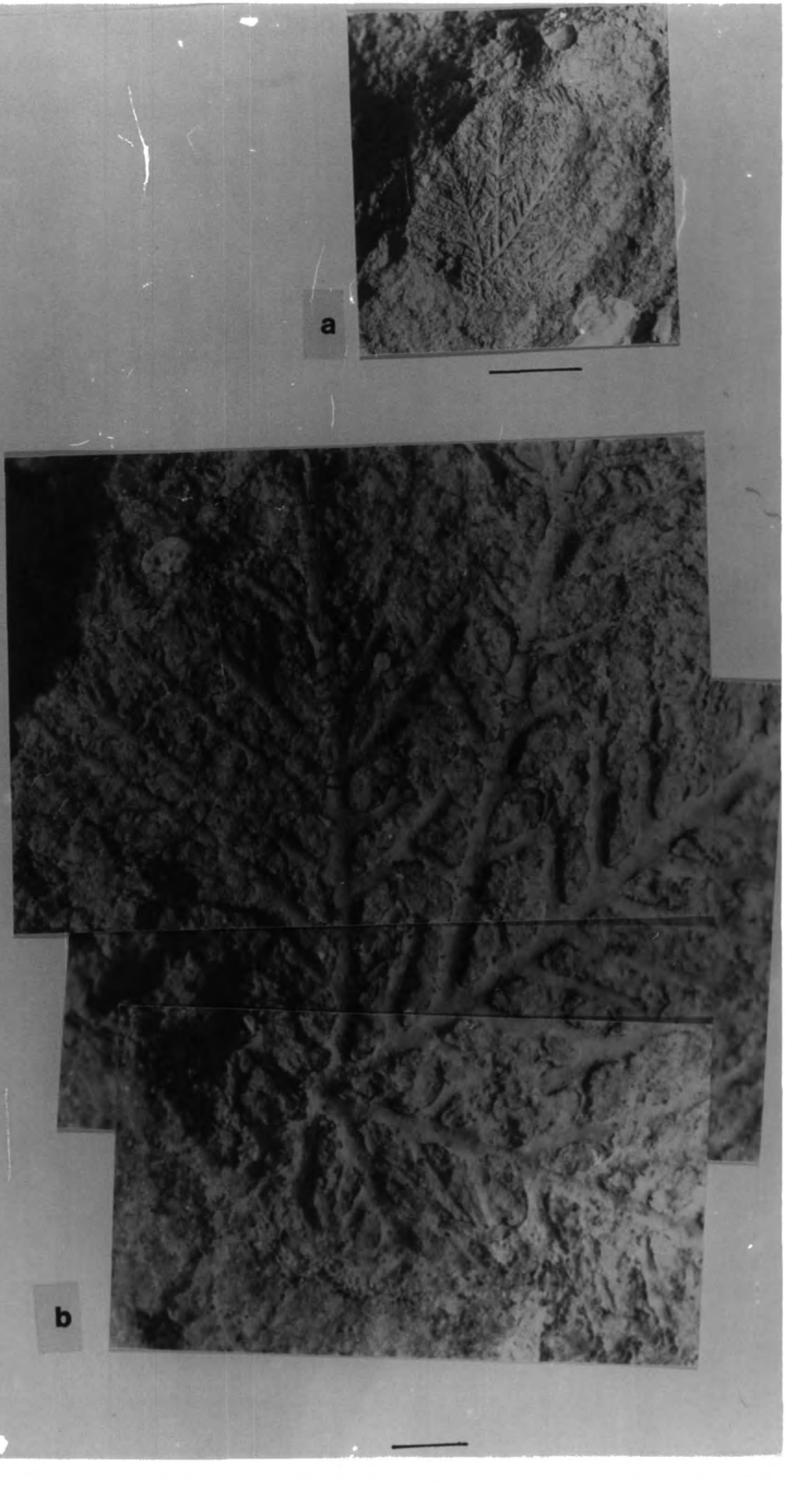
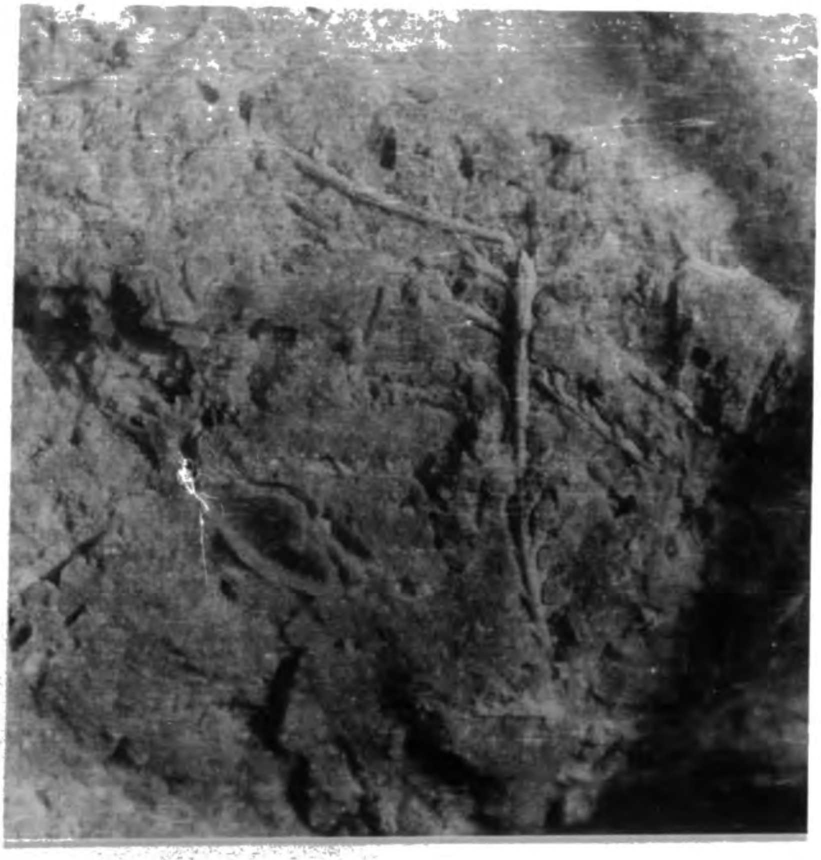

a
b

Plate II4. _Penniretepora waltheri_ Korn

Fig.a Specimen Taf.IV fig.I6 from the Korn collection.Reverse surface.
Bar scale=IOmm

Fig.b Specimen Taf.IV fig.I4,I5 from the Korn collection,chosen as lectotype by Dreyer(I96I).
Bar scale=IOmm.Obverse surface.



a

b

Plate II5. Penniretepora waltheri nodata subsp.nov.

Fig.a S.E.M. photomicrograph, showing reverse surface with characteristic nodes. RH2.42. Holotype. Bar scale=Imm

Fig.b As above at higher magnification. Bar scale=Imm

Fig.c Reverse surface detail. RH2.32. Bar scale=Imm

Fig.d Reverse surface detail. Node arrowed. RH2.36. Bar scale=Imm

Fig.e Reverse surface detail. RH2.34. Bar scale=Imm

Fig.f Internal detail of specimen fractured along mid-line of branch. RH2.33a. Bar scale=Imm

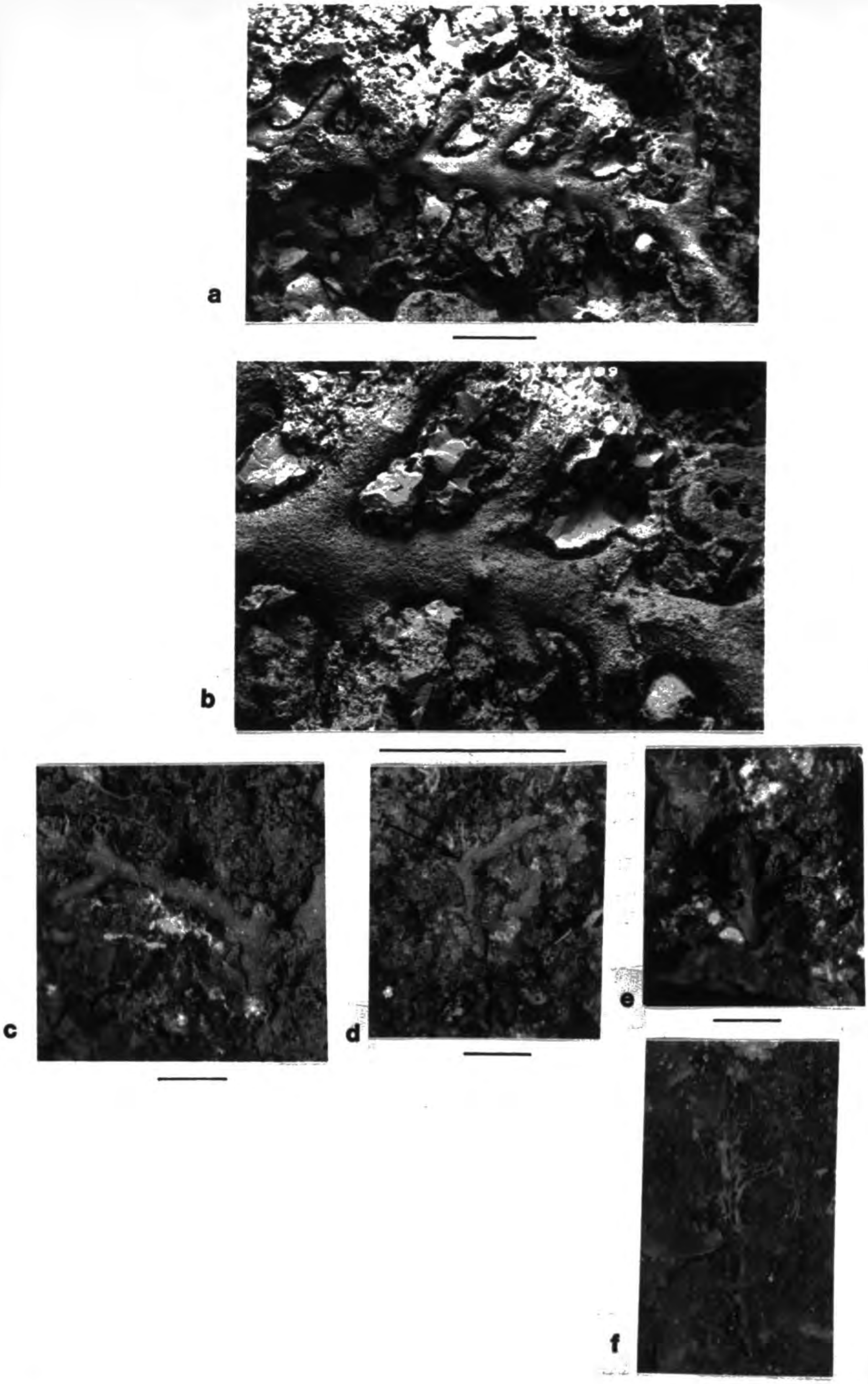

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Plate II6. <u>Penniretepora</u> <u>waltheri</u> <u>nodata</u> subsp.nov.

Fig.a Obverse surface detail.RH2.28.
Bar scale=Imm

Fig.b Main branch seen in profile,showing lateral branches in transverse section and obverse surface nodes with characteristic spacing.RH2.Ib.
Bar scale=Imm

Fig.c Obverse surface detail.RH2.Ib.
Bar scale=Imm

Fig.d S.E.M. photomicrograph of obverse surface. Slightly aberrant form - lateral branch in top right corner of figure has three rows of apertures for a short distance.RH2.Ia.
Bar scale=Imm

Fig.e As above at higher magnification.
Bar scale=Imm

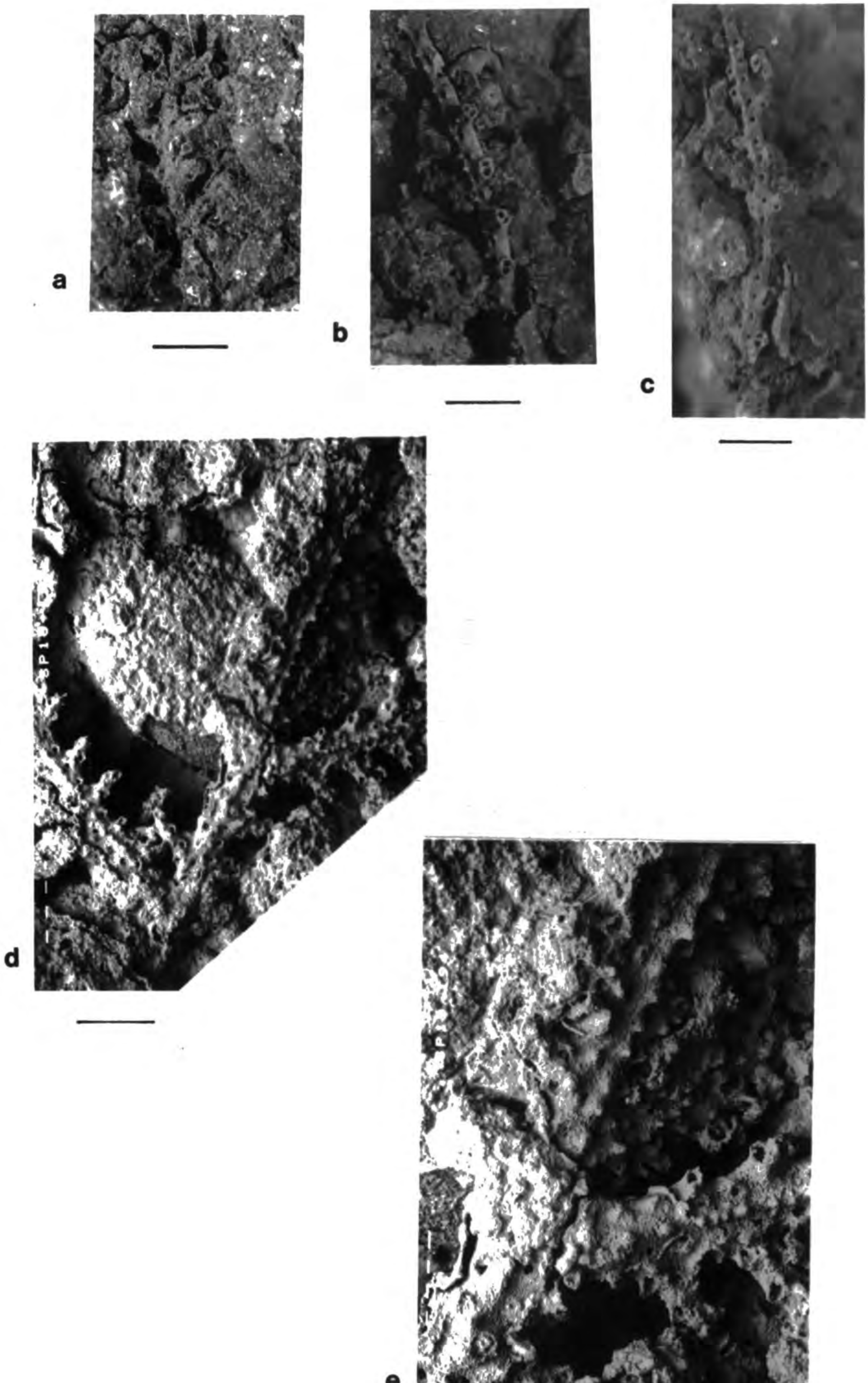
a
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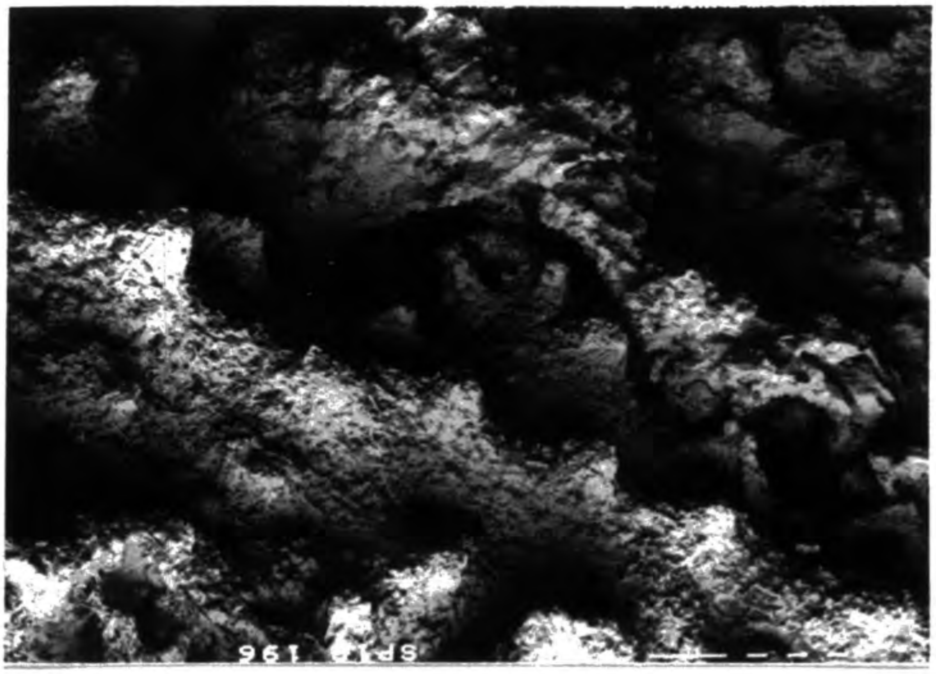
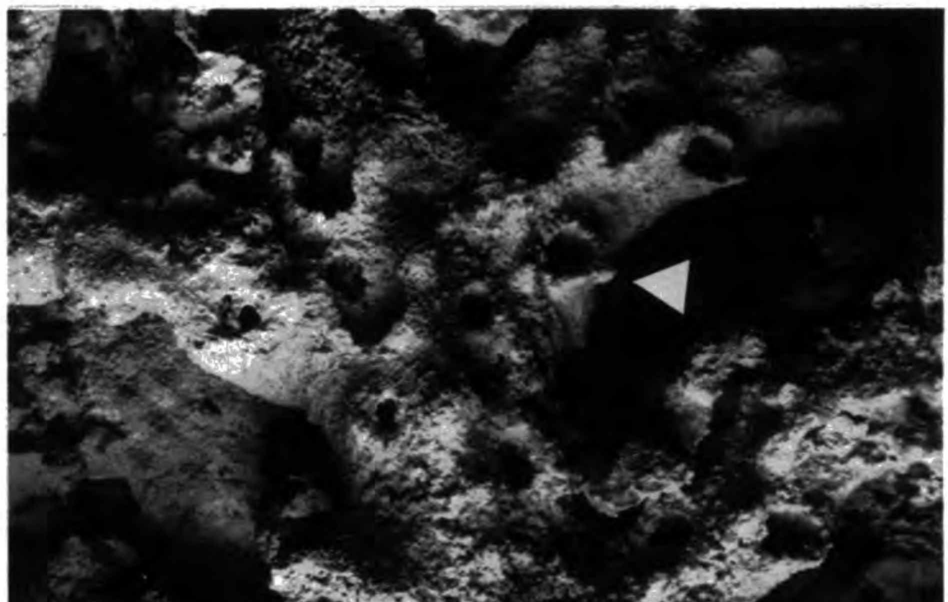
Plate II7. Penniretepora waltheri nodata subsp.nov.

Fig.a S.E.M. photomicrograph showing obverse surface nodes.RH2.Ia.
Bar scale=O.Imm

Fig.b S.E.M photomicrograph of obverse surface. Ovicells occur proximal to some autozooecial apertures(hard parts which probably enclosed the ovicells have not been preserved).Node which is developed on the edge of a peristome is arrowed.RH2.Ia.
Bar scale=Imm



a



b

Plate II8. *Penniretepora waltheri nodata* subsp.nov.

Fig.a Tangential section in XPL.The dark line along the centre of the branch is the 'inner platy core'.MP5.60. Bar scale=Imm

Fig.b As above in plane polarised light. (Scale as above).


a
b

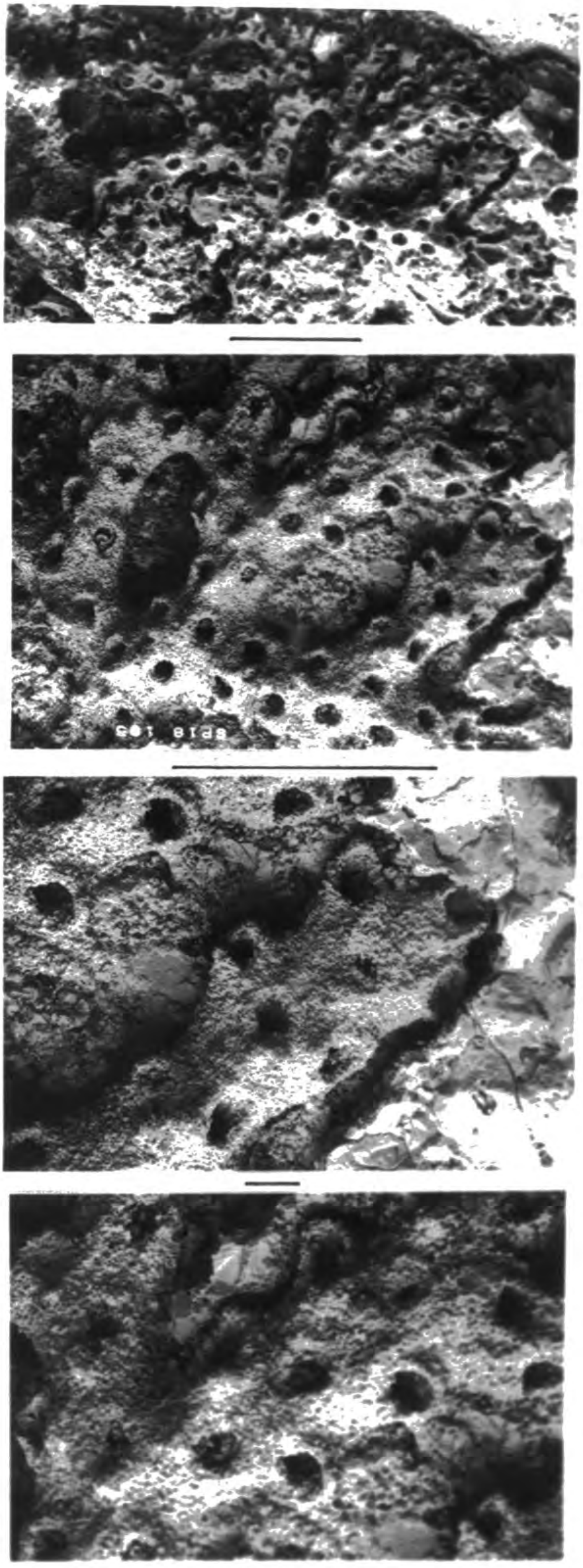
Plate II9. Ryhopora delicata gen.nov.,sp.nov.

Fig.a S.E.M. photomicrograph showing zoarial morphology.RH2.30b.Holotype. Bar scale=Imm

Fig.b As above at higher magnification.S.E.M. photomicrograph.Bar scale=Imm

Fig.c As above at higher magnification,showing obverse surface detail.S.E.M. photomicrograph. Bar scale=O.Imm

Fig.d As above at higher magnification.S.E.M. photomicrograph. Bar scale=O.Imm



a

b

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d

Plate I20. Ryhopora delicata gen.nov.,sp.nov.

Fig.a Tangential section.Questionably referred to R.delicata.MP5.I00a.
Bar scale=Imm

Fig.b As above in XPL.
Bar scale=Imm

Plate I2I. Dyscritella columnaris Schlotheim

Fig.a Colony encrusting a crinoid stem. BII9A.Bar scale=IOmm

Fig.b Zoarial morphology,showing zooecial chambers in cast preservation.694F. Bar scale=IOmm

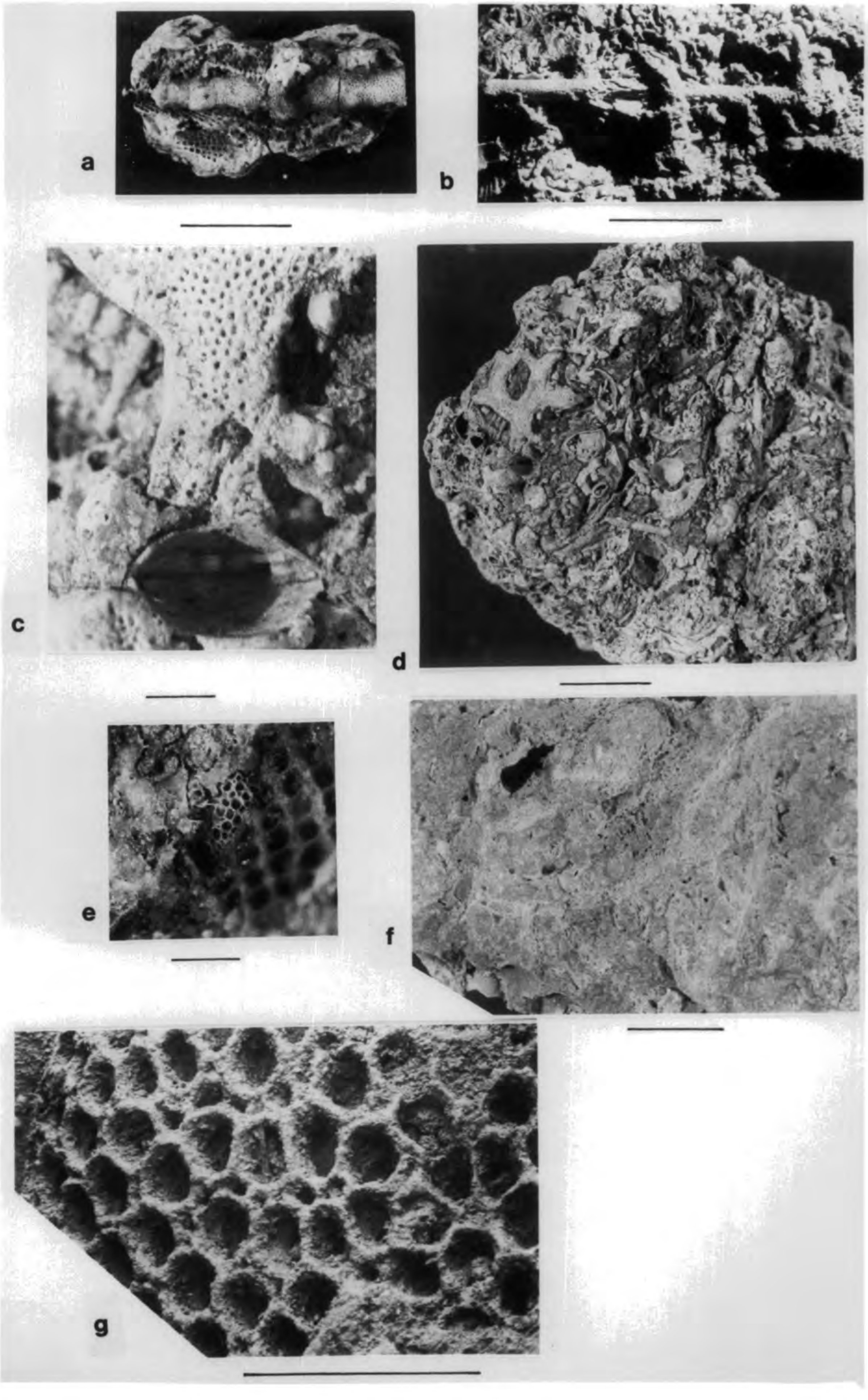
Fig.c Colony attached to the brachiopod Dielasma.Preservation of D.columnaris below the level of the obverse surface. MP5.43.Bar scale=Imm

Fig.d Zoarial morphology,showing intra-zoarial fusion of branches.MP5.43. Bar scale=IOmm

Fig.e Colony encrusting the reverse surface of Synocladia virgulacea,showing growth front.RH2.43. Bar scale=Imm

Fig.f Zoarial morphology,cast preservation. MP5.45.Bar scale=IOmm

Fig.g S.E.M. photomicrograph,showing apertures of autozooecia and mesozooecia.Overgrown by dolomite.BI34B. Bar scale=Imm


a
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e
f
g

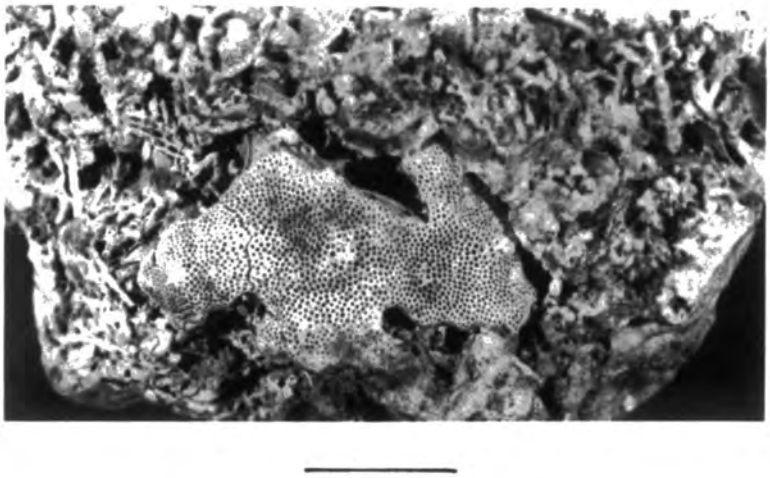
Plate I22. Dyscritella columnaris Schlotheim

Fig.a Encrusting zoarium referred to "Alveolites buchiana"King by King(I850). Tentatively placed in synonomy with D.columnaris here.BII8. Bar scale=IOmm

Fig.b As above at higher magnification.In spite of the poor preservation it is clear that very few mesozooecia are developed. Bar scale=Imm

Fig.c Zooecial chambers in cast preservation. 694F.Bar scale=Imm

a



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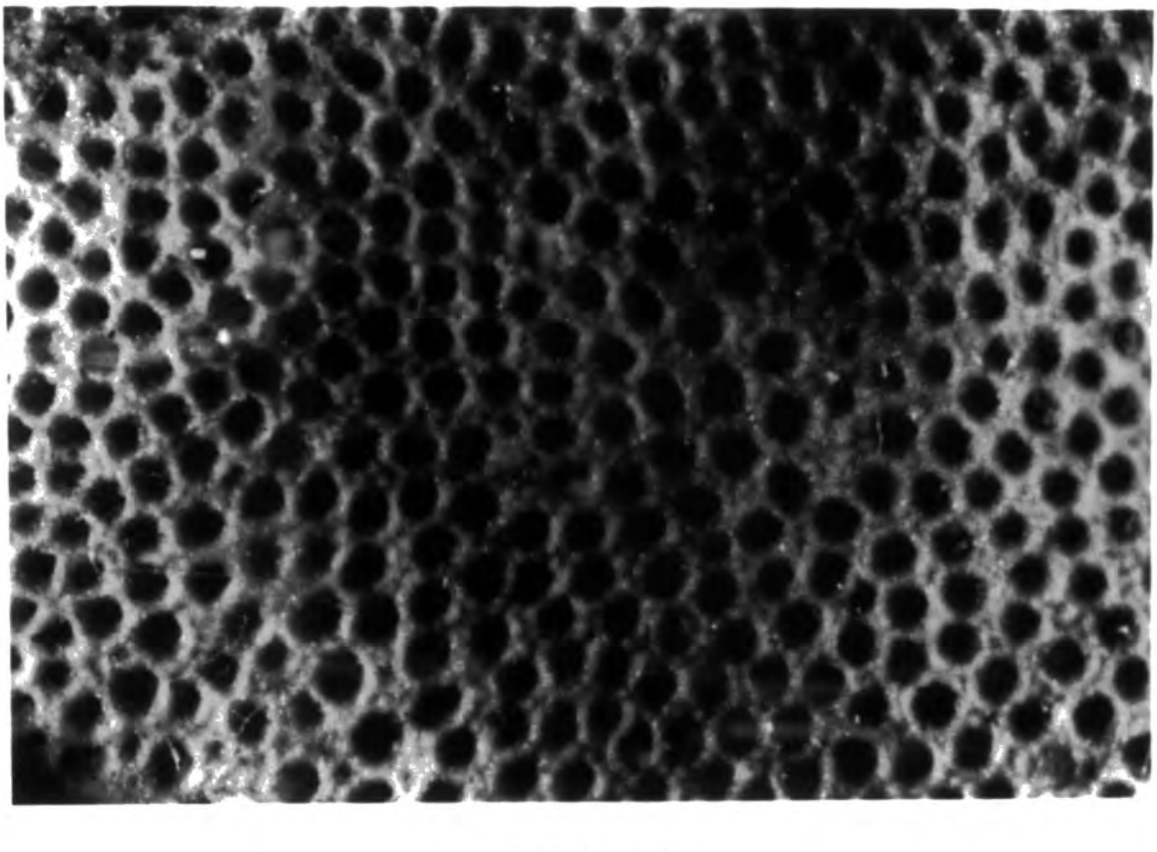

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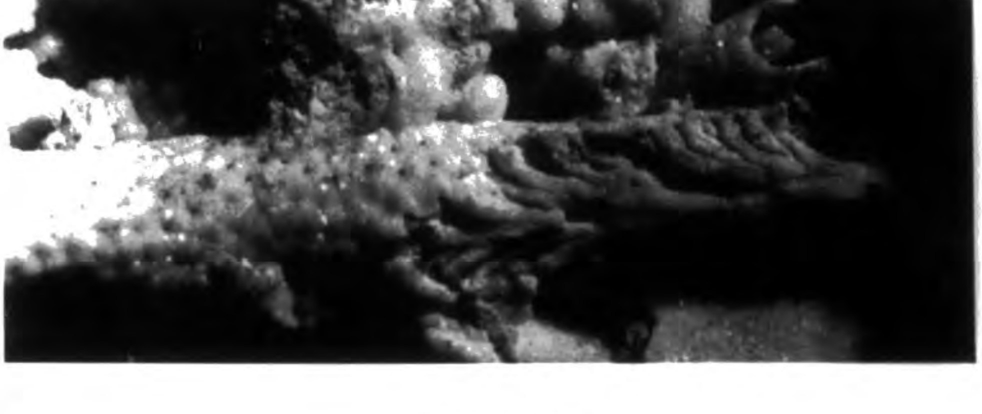
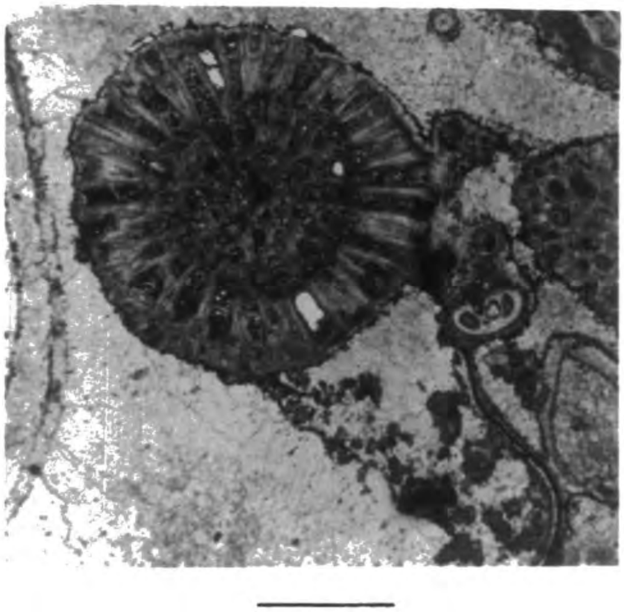


Plate I23. _Dyscritella_ _columnaris_ Schlotheim

Fig.a Transverse section.MP5.209.
Bar scale=Imm

Fig.b As above at higher magnification.
Bar scale=Imm

Fig.c As above at higher magnification,showing secondary overgrowth and acanthostyles.
Bar scale=0.Imm



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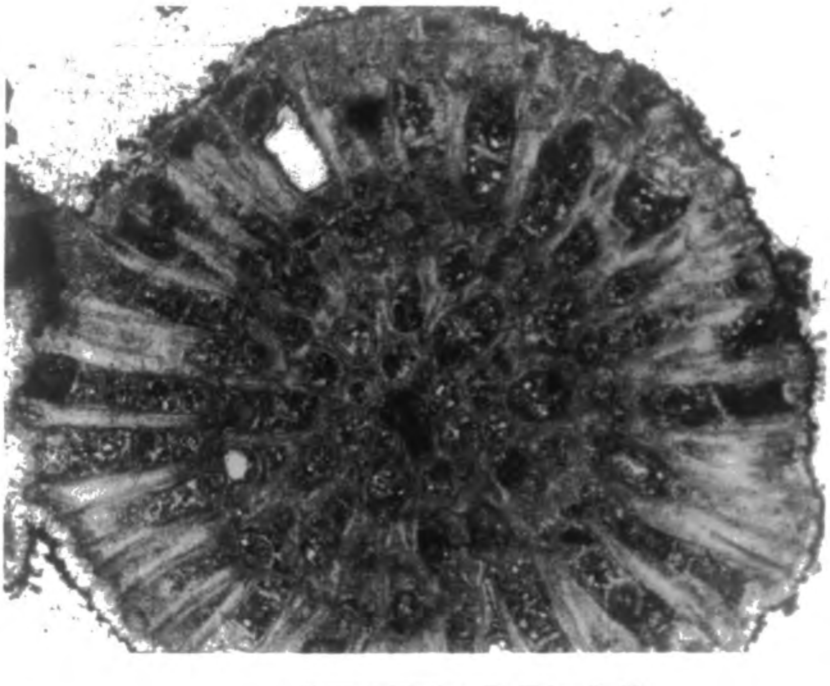

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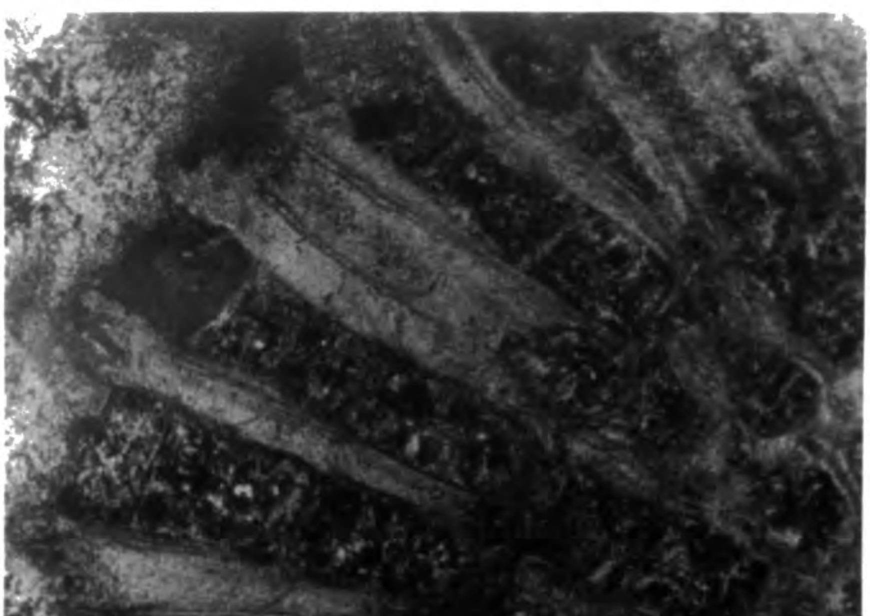


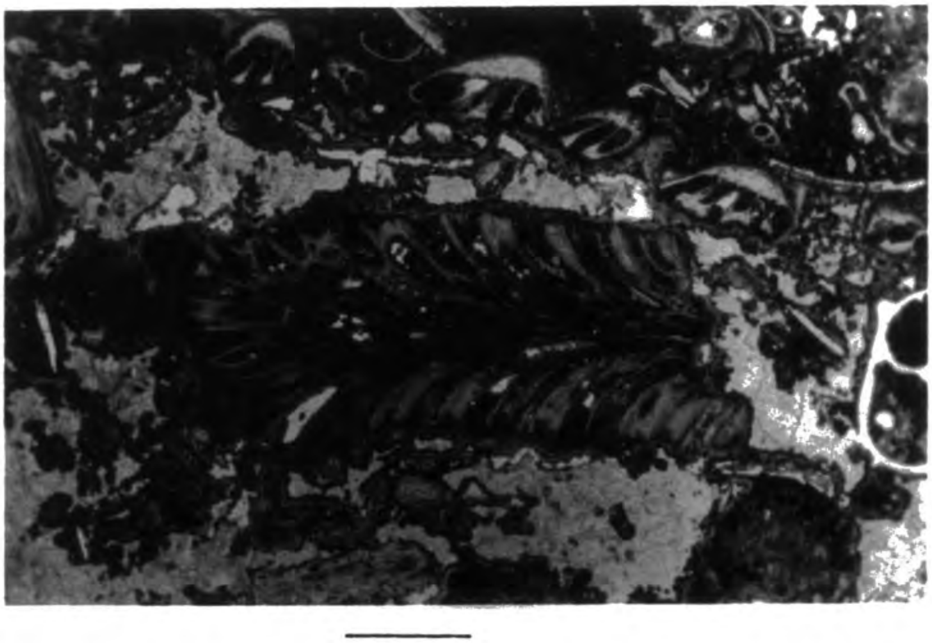
c

Plate I24. Dyscritella columnaris Schlotheim

Fig.a Longitudinal section.Atypical specimen showing no diaphragms.MP5.2I4. Bar scale=Imm

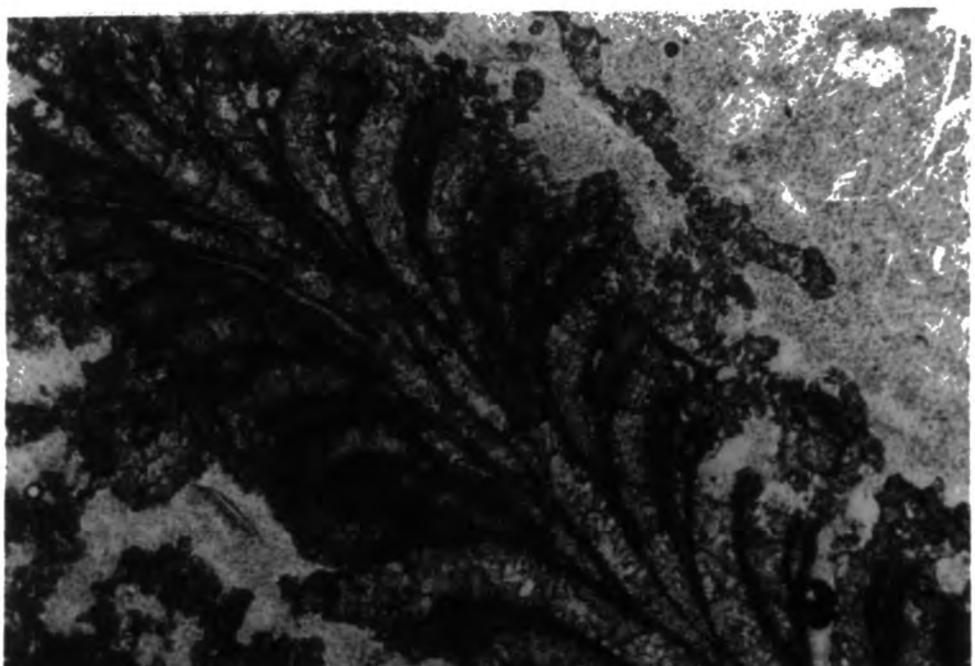
Fig.b As above at higher magnification. Bar scale=Imm

Fig.c Longitudinal section,showing diaphragms and curvature of zooecial chambers in the exozone.HDN50. Bar scale=Imm



a

b



c

Plate I25. Dyscritella columnaris Schlotheim

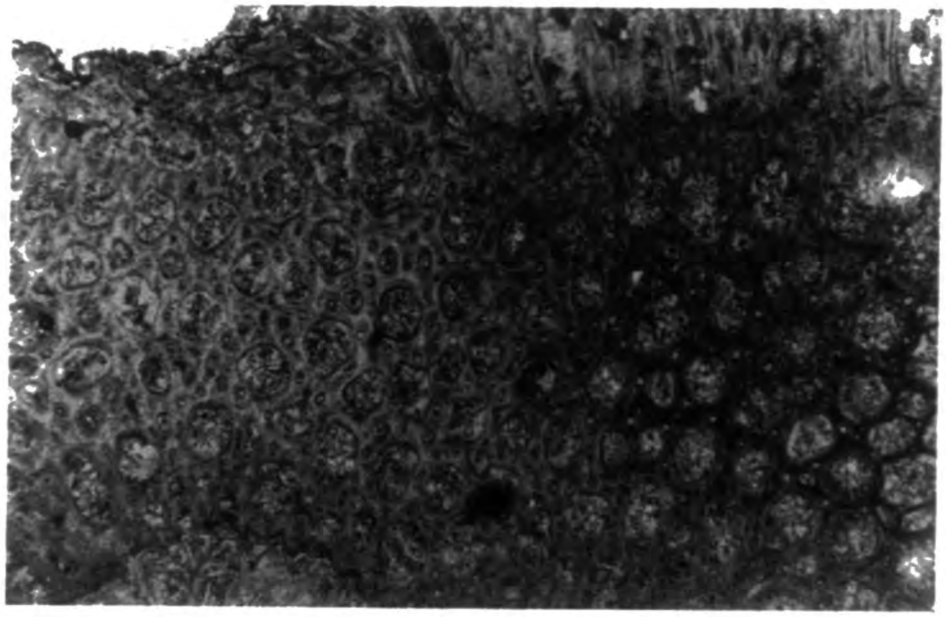
Zoarium in longitudinal and shallow
tangential sections.MP5.2I2.
Bar scale=Imm

Plate I26. Dyscritella columnaris Schlotheim

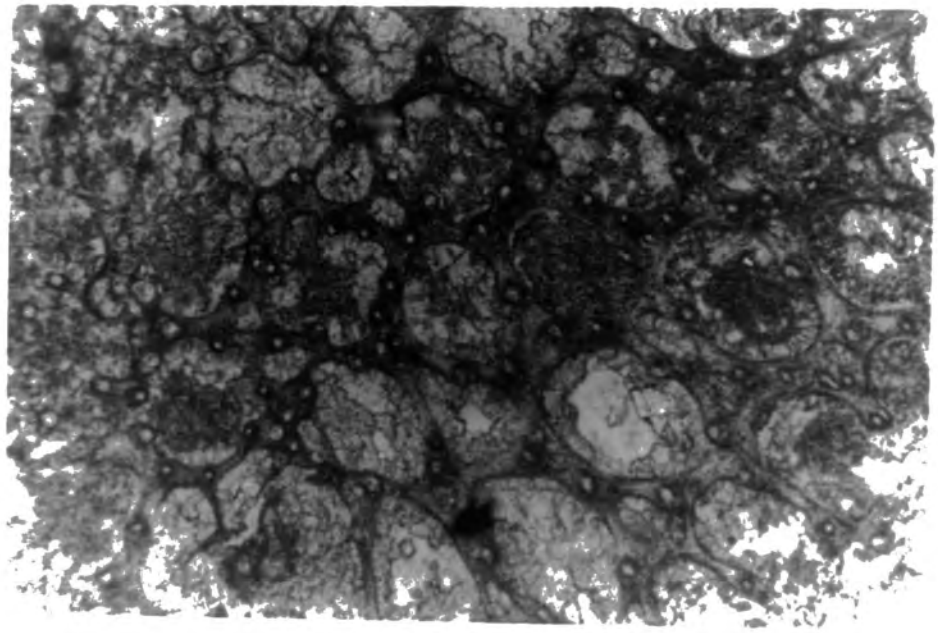
Fig.a — Shallow tangential section showing autozooecial and mesozooecial apertures and acanthostyles.Secondary overgrowth developed.MP5.2I2.
Bar scale=Imm

Fig.b — Shallow tangential section showing acanthostyles which indent the walls of autozooecia in places.HDN52.
Bar scale=0.Imm

Fig.c — Shallow tangential section.MP5.203.
Bar scale=Imm



a



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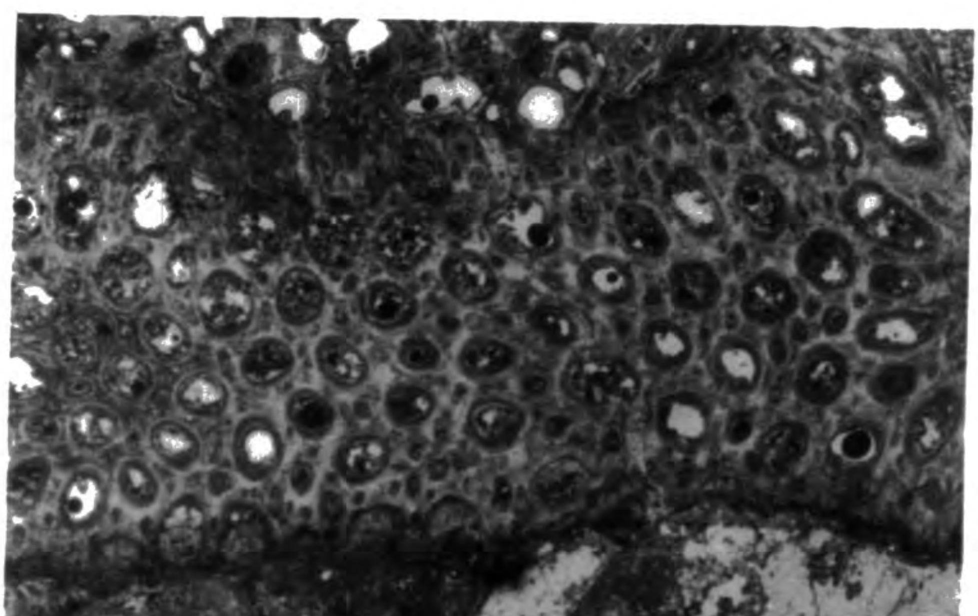


c

Plate I27. _Dyscritella_ _columnaris_ Schlotheim

Fig.a Zoarium with two layers of secondary overgrowth.HDN50.
Bar scale=Imm

Fig.b As above at higher magnification.The arrow on the left shows an area where the basal lamina is raised above the level of the exozone below.The arrow on the right shows the basal lamina extending down into a zooecial chamber.HDN50.
Bar scale=Imm

Fig.c Close-up of secondary overgrowth showing the basal lamina'draped'over an acanthostyle (left centre of figure).HDN50.
Bar scale=0.Imm

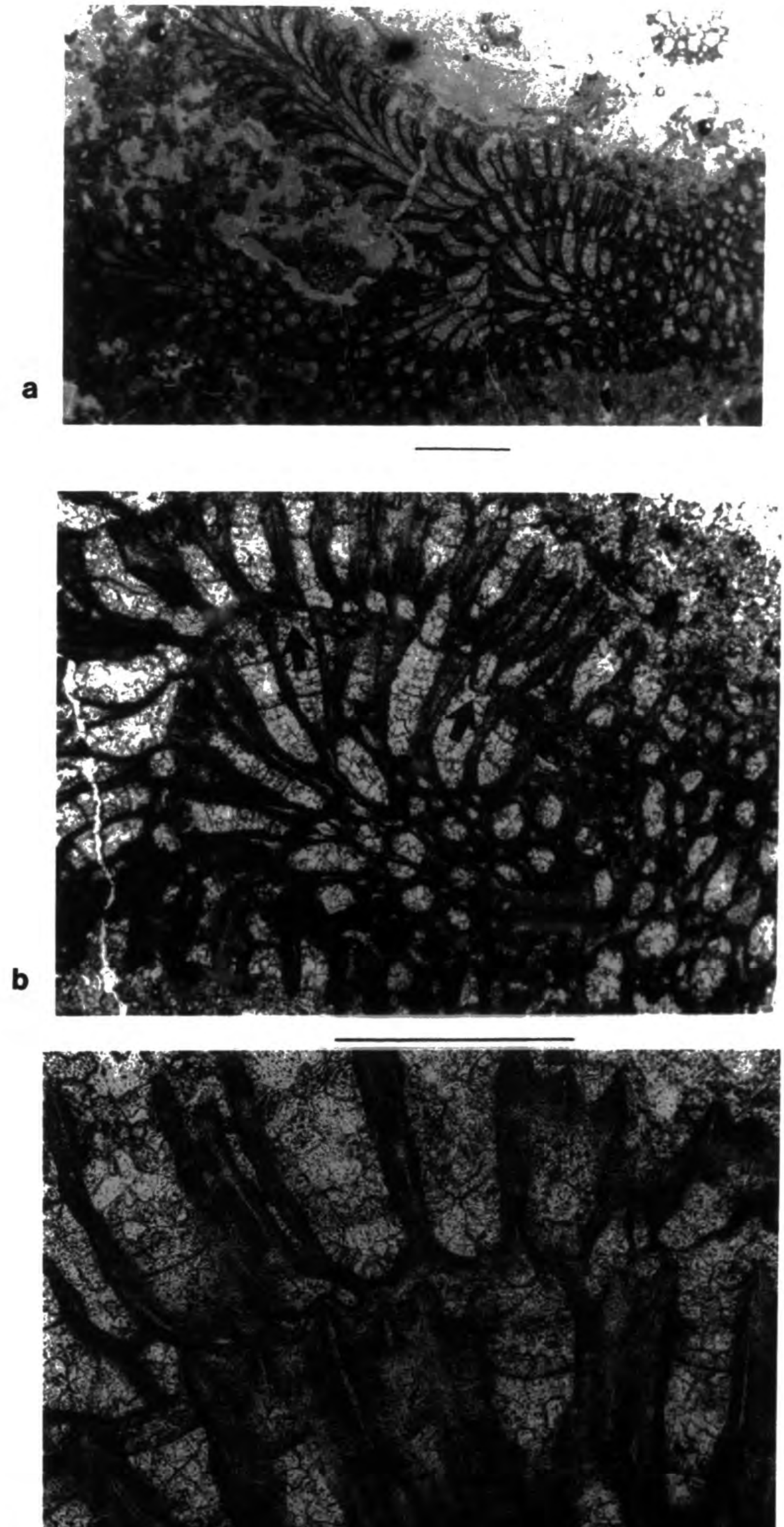
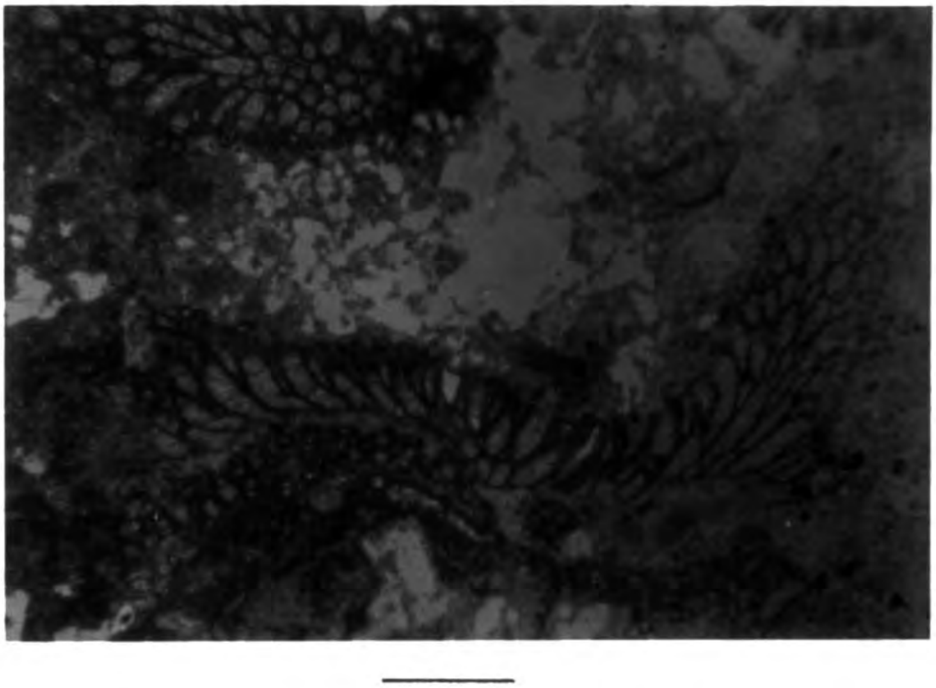


Plate I28. _Dyscritella_ _columnaris_ Schlotheim

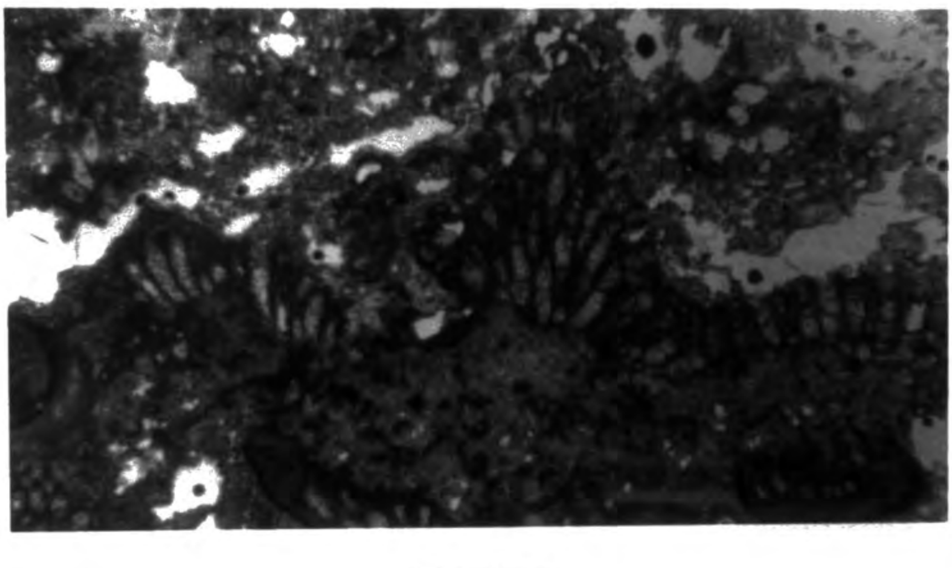
Fig.a Adnate and erect growth within the same zoarium.HDNI5.
Bar scale=Imm

Fig.b Adnate zoarium with the beginning of erect growth.Zoarium encrusting a lithified substratum.HDNI4.
Bar scale=Imm

Fig.c Zoarium with seven layers of secondary overgrowth(only five visible in figure).
MP5.206.Bar scale=Imm



a



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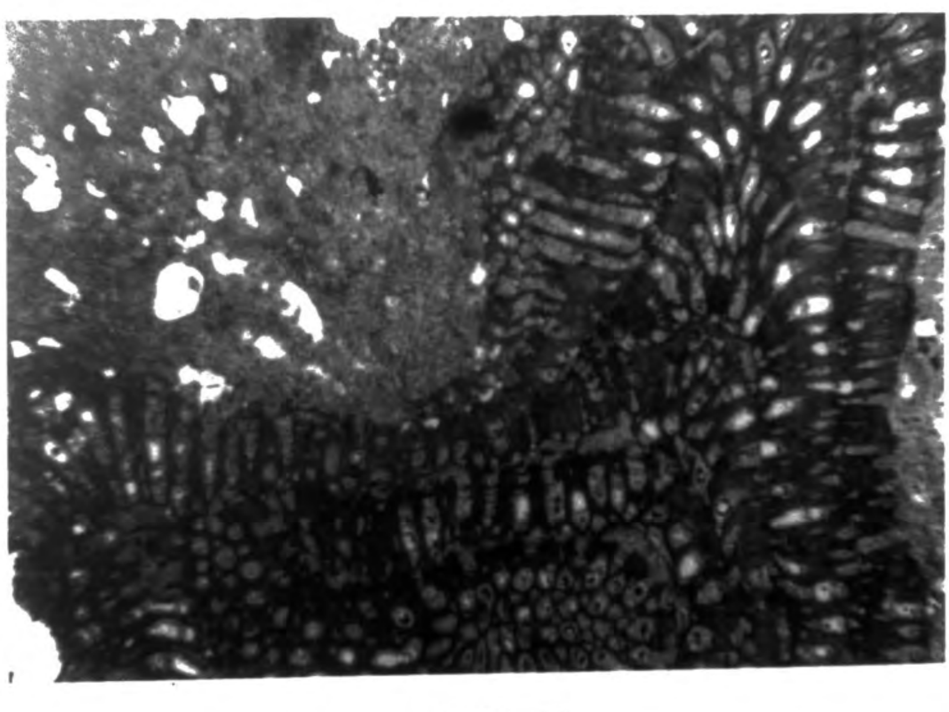


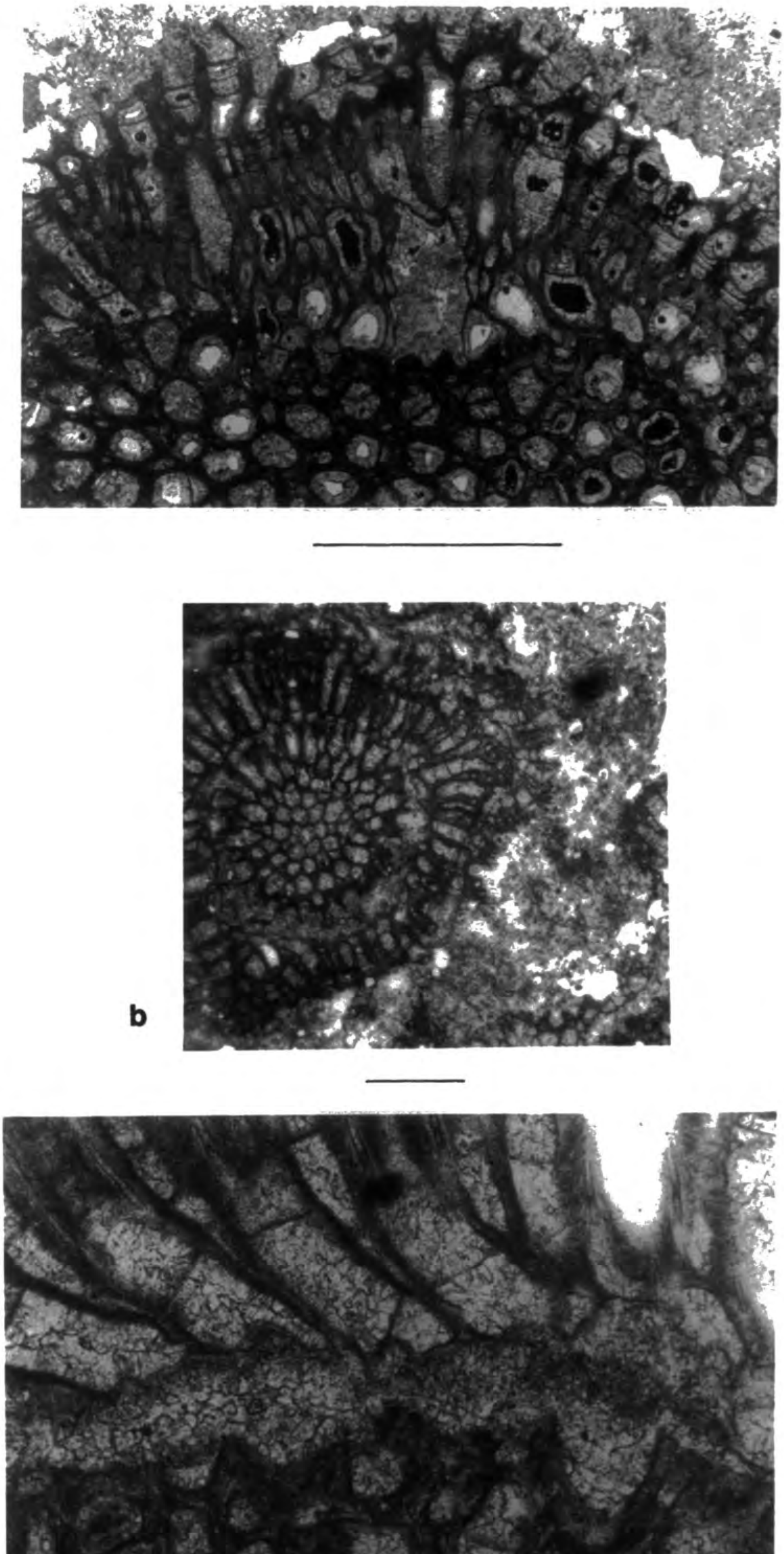
c

Plate I29. _Dyscritella_ _columnaris_ Schlotheim

Fig.a Secondary overgrowth with the basal lamina sharply deflected above the underlying exozone.MP5.7I. Bar scale=Imm

Fig.b Secondary overgrowth whose basal lamina is raised above the level of the underlying exozone throughout most of its length.For interpretation of a similar feature see figure 74. GLQIOO.Bar scale=Imm

Fig.c Secondary overgrowth with the basal lamina raised above the level of the underlying exozone.HDNI5. Bar scale=O.Imm



a

b

c

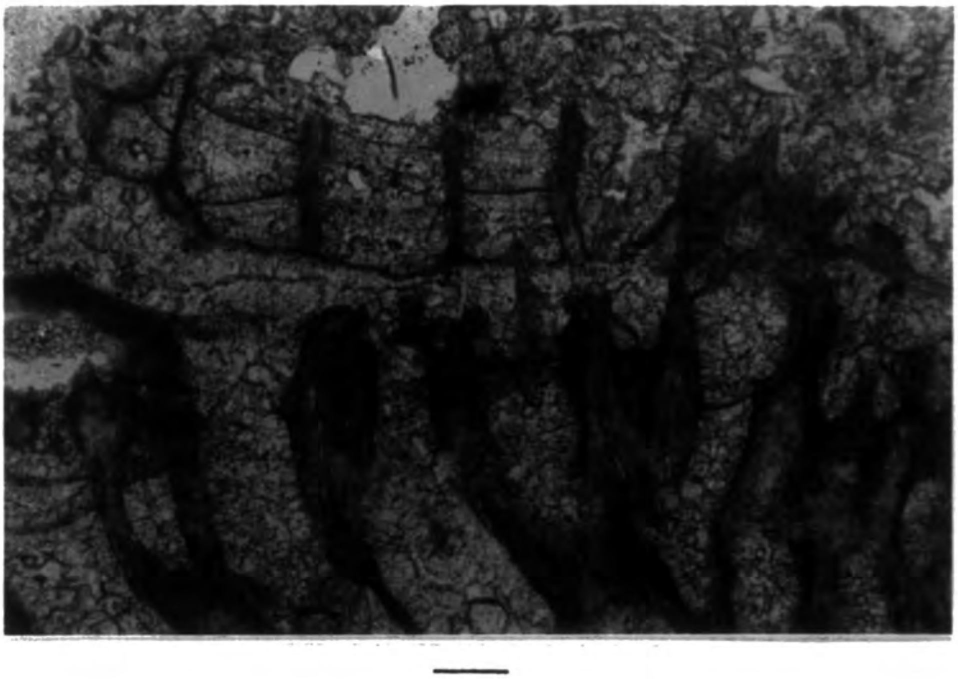
Plate I30. Dyscritella columnaris Schlotheim

Fig.a Secondary overgrowth,showing deflection of basal lamina around an acanthostyle. HDNI5.Bar scale=0.Imm

Fig.b Colony encrusting the reverse surface of Acanthocladia laxa.HDNI5. Bar scale=Imm

Fig.c Cavity within a zoarium.It may represent the former position of a foreign body which was incorporated into the colony during growth but which is not now present.MP5.205. Bar scale=Imm

a



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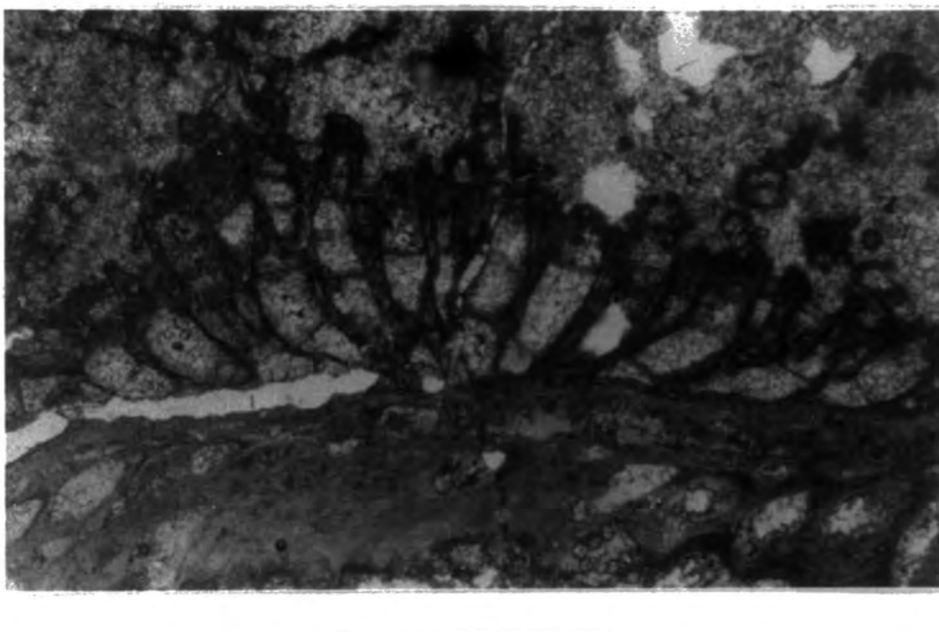

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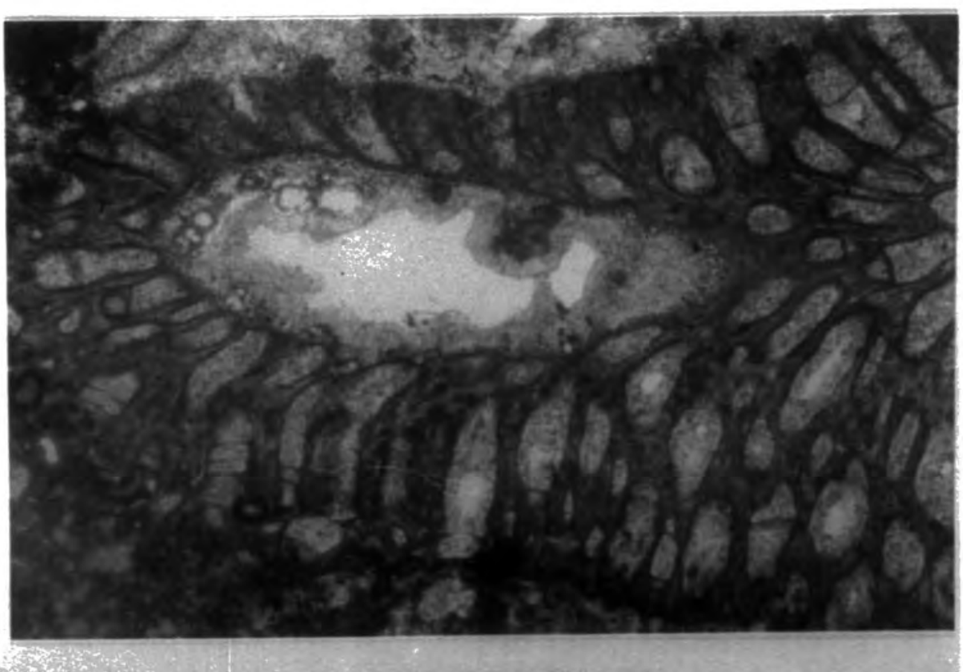

Plate I3I. Dyscritella columnaris Schlotheim

Fig.a Branch of Acanthocladia ?laxa encrusted by D.columnaris.overgrowth of Acanthocladia may have taken place while it was in life position(?and while the colony was still alive) since the branch is completely surrounded by zooecia of D.columnaris. GLQIOO.Bar scale=Imm

Fig.b Encrusting algae or worm tubes incorporated within a secondary overgrowth(arrowed).They are attached to a terminal diaphragm.The overgrowth extends for the whole width of the zoarium,see text p. 305 for discussion.HDN5I. Bar scale=Imm

Fig.c ?Encrusting foram incorporated within a zoarium of D.columnaris.GLQIOO. Bar scale=Imm

Fig.d Zoarium encrusting a lithified substratum. HDNI7.Bar scale=Imm

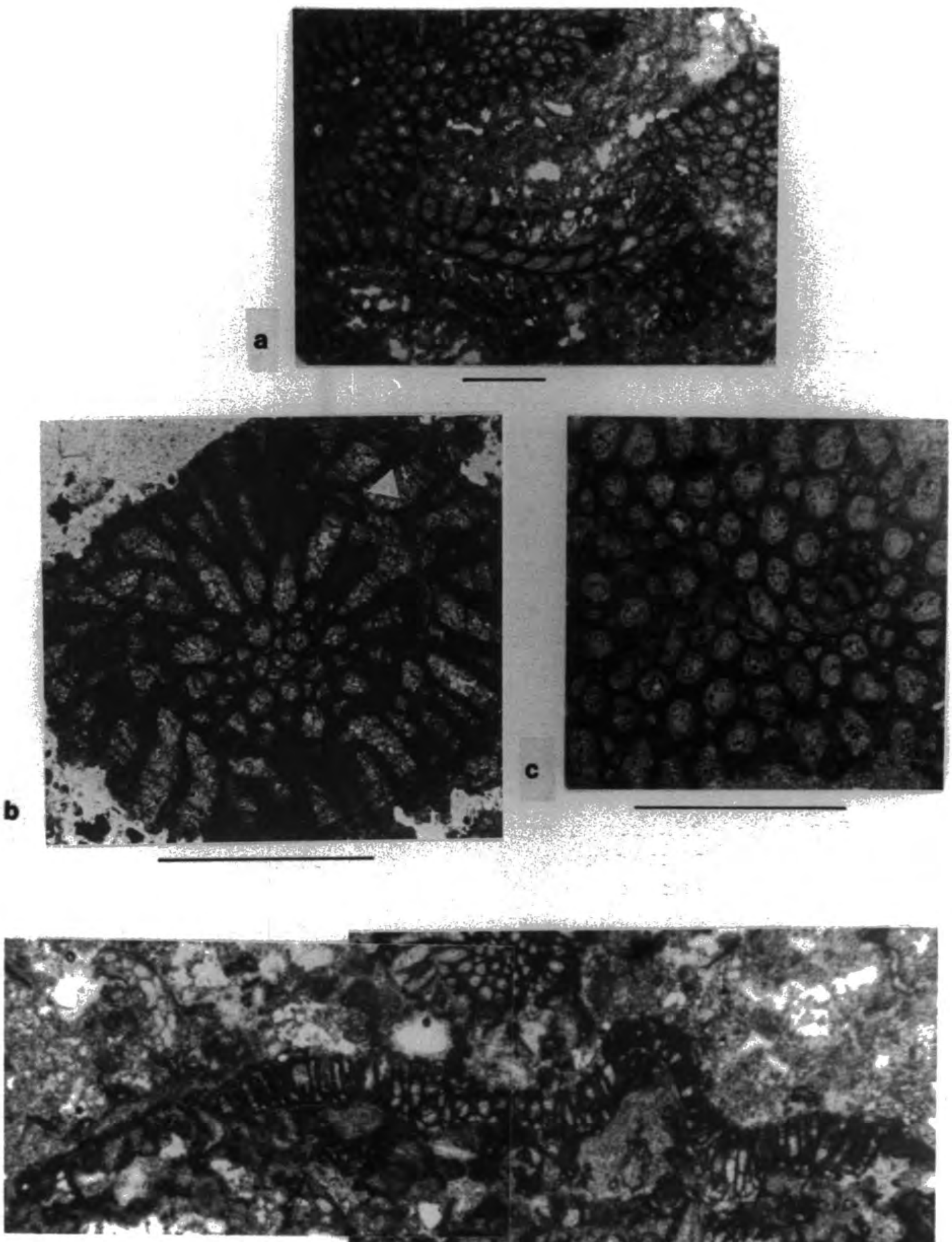
a
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Plate I32. <u>Dyscritella</u> <u>columnaris</u> Schlotheim

Adnate and erect growth within the same zoarium,encrusting a lithified substratum. HDNI7.Bar scale=Imm

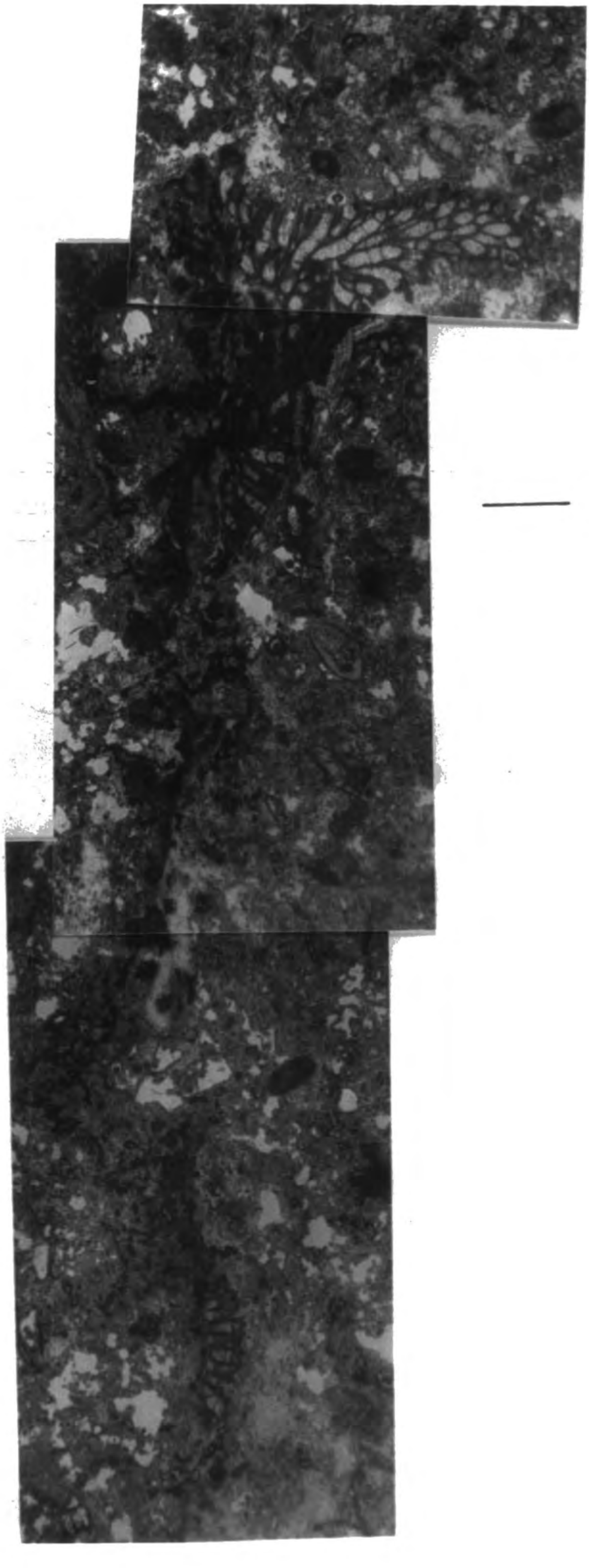
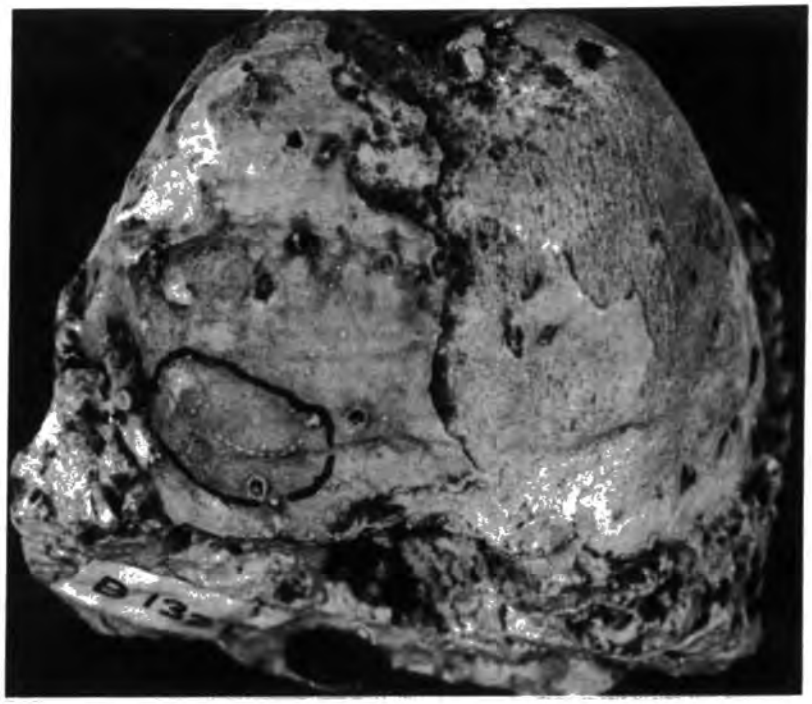


Plate I33. Corynotrypa voigtiana King

Fig.a Lectotype, specimen BI32, from the King collection, encrusting the brachiopod Horridonia.
Bar scale=IOmm

Fig.b S.E.M. photomicrograph showing parent branch with two lateral branches; the more proximal branch diverges at an angle greater than 90° .RH3.I, encrusting Horridonia.
Bar scale=Imm

Fig.c S.E.M. photomicrograph showing paired lateral branches.RH3.I, encrusting Horridonia.
Bar scale=Imm



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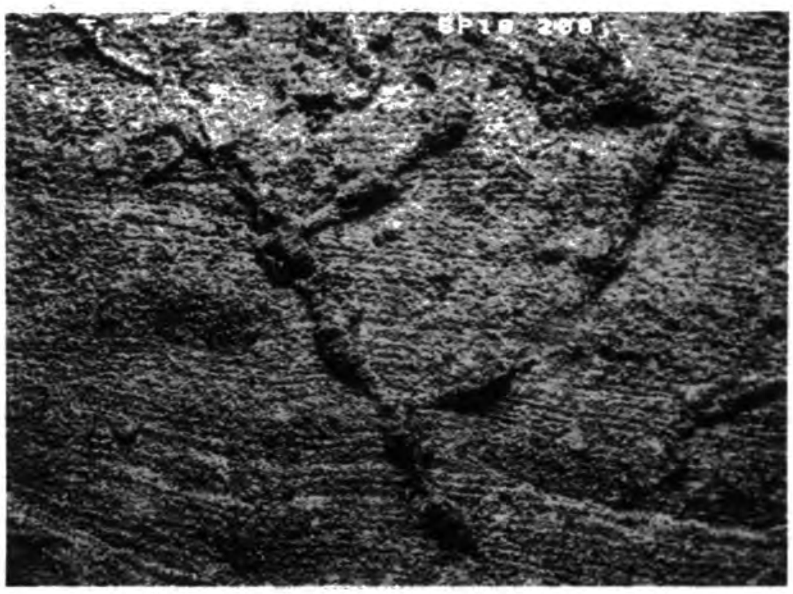

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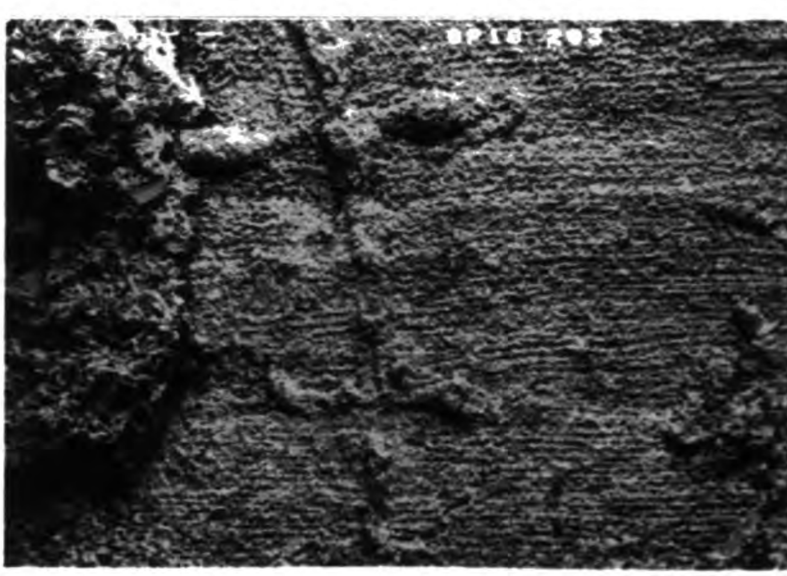


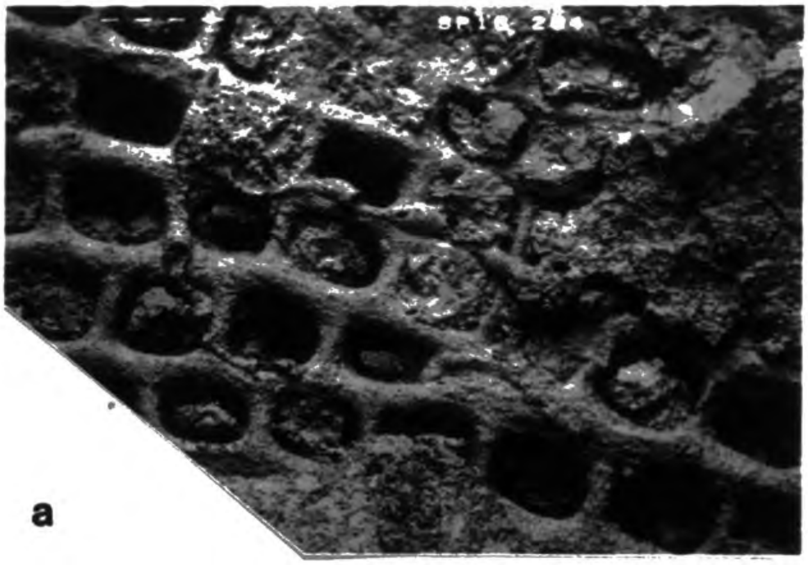
c

Plate I34. *Corynotrypa voigtiana* King

Fig.a S.E.M. photomicrograph showing colony encrusting the reverse surface of *Fenestella retiformis*.RH2.26. Bar scale=Imm

Fig.b As above at higher magnification,showing zooecium which is distorted and shorter than normal,probably as a result of the constraints imposed on morphology by the substratum(arrowed).S.E.M. photomicrograph.Bar scale=Imm

Fig.c Close-up of zooecia.S.E.M. photomicrograph. RH2.26.Bar scale=O.Imm



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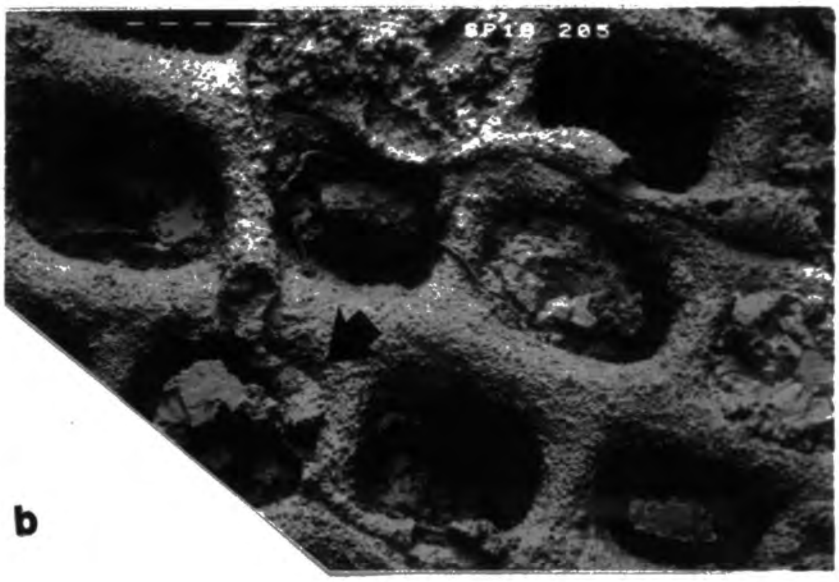

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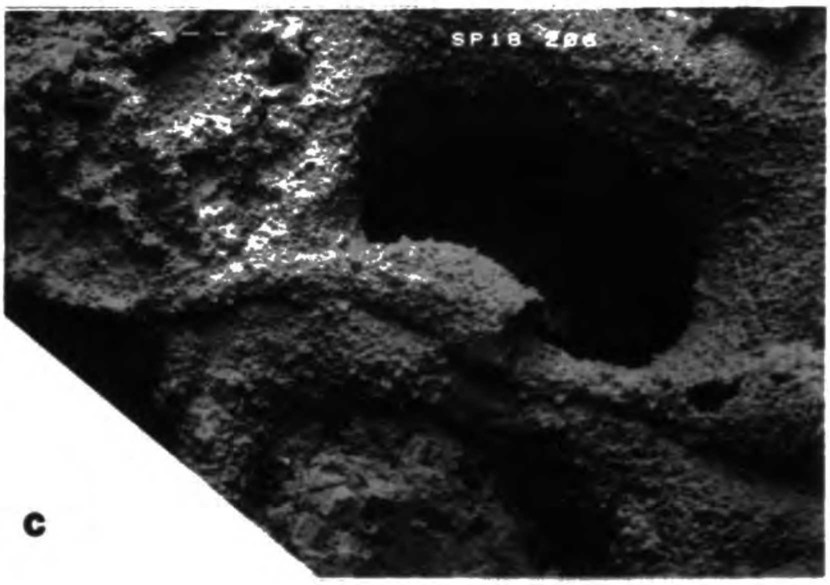


c

Plate I35. Corynotrypa voigtiana King

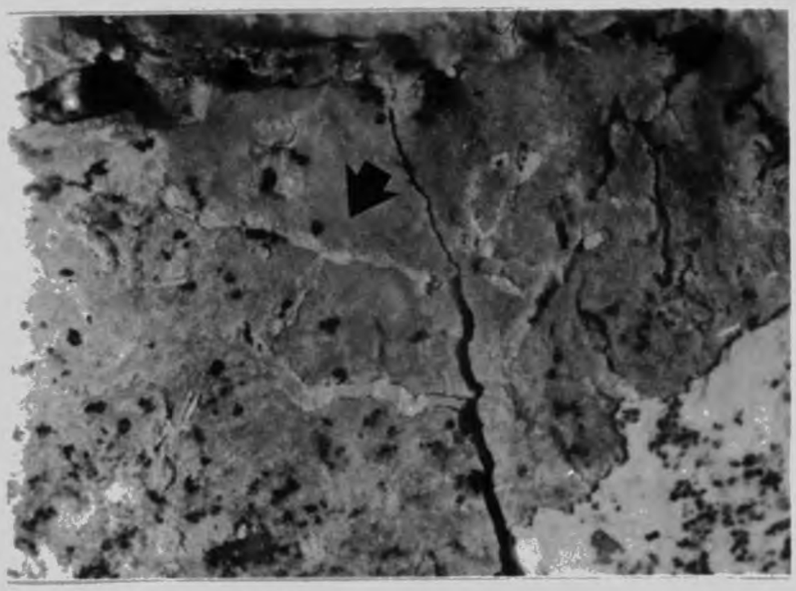
Fig.a Horridonia encrusted by C.voigtiana. See figs.'b' and 'c' below.RH4.29. Bar scale=IOmm

Fig.b Zoarium in cast preservation with substratum of attachment(Horridonia) removed.Arrowed is apparent colony origin consisting of a group of three radiating zooecia;the absence of a protoecium suggests this may represent an example of colony regeneration after fragmentation(e.g.Taylor(I985)). RH4.29a.Bar scale=Imm

Fig.c Zoarium(arrowed) preserved as in fig.b above.Lateral zooecium abuts against adjacent branch which may or may not be from the same colony.RH4.29b. Bar scale=Imm

a

b



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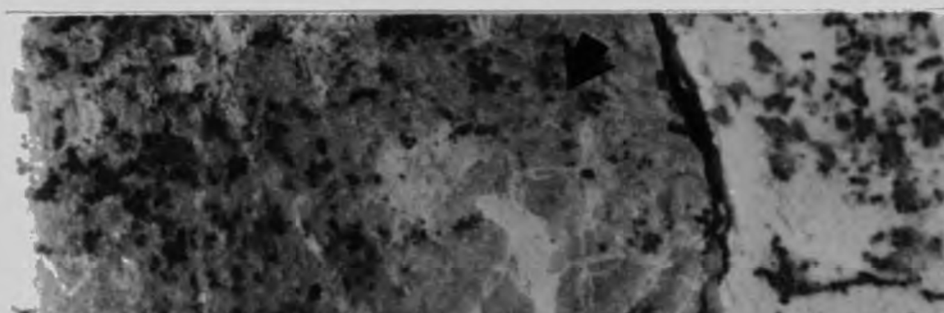
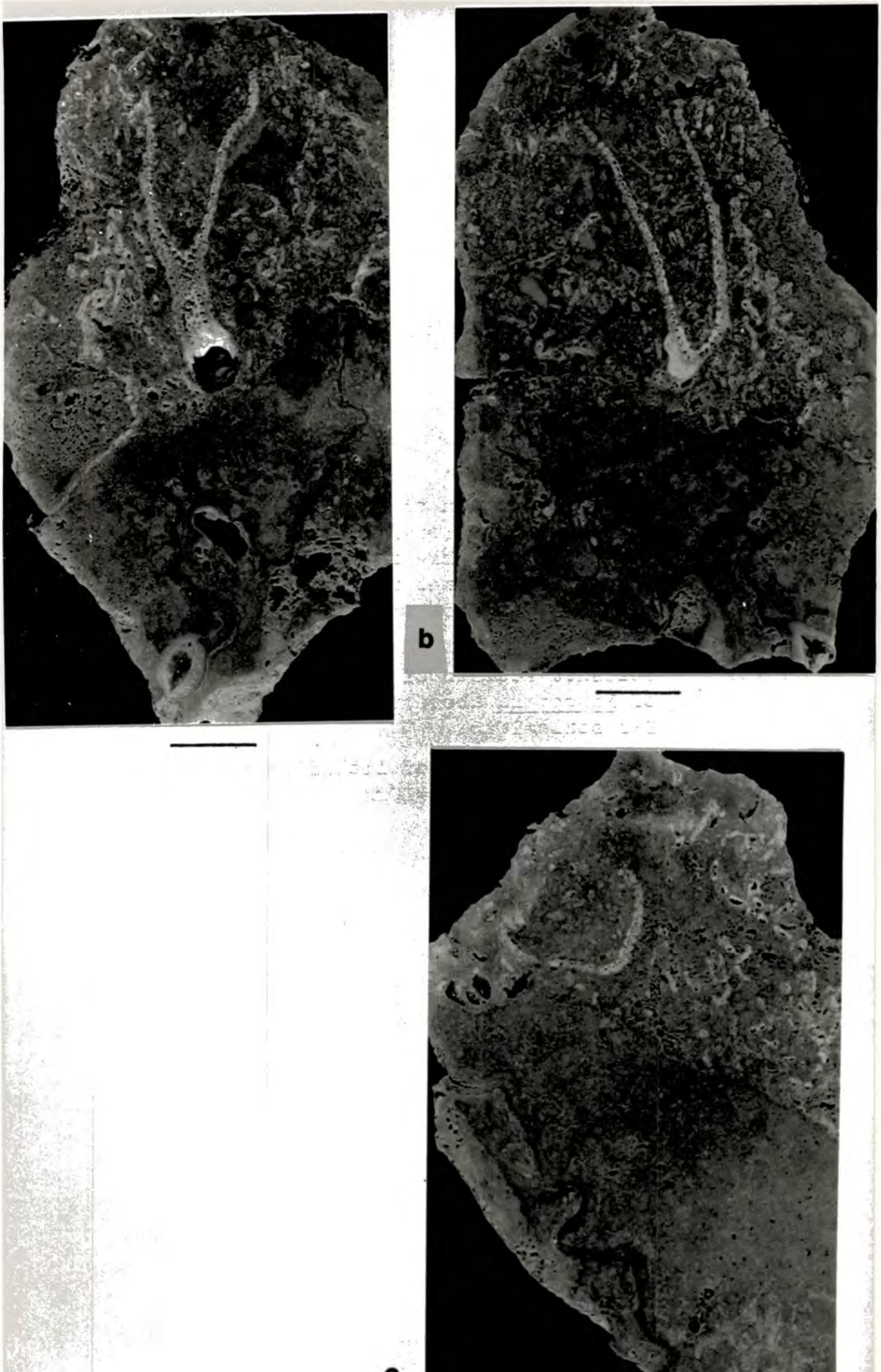


Plate I36. Lithified crust.

Fig.a Polished section of lithified crust, showing zoarium of Kingopora above the crust(and probably attached to it) and sharply re-entrant angles developed in the lower surface of the crust.MP5.3/2. Bar scale=IOmm

Fig.b Polished section of lithified crust;zoarium of Kingopora above the crust.MP5.3/3. Bar scale=IOmm

Fig.c Polished section of lithified crust. MP5.3/4.Bar scale=IOmm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c

Plate I37. Synocladia virgulacea Sedgwick

Zoarium preserved as a mould. Branches on the right side of the specimen grow 'below' the level of the colony origin. (See fig.98 for interpretation).MPI.80. Bar scale=IOmm

Plate I38. Bryozoa as substrata.

Fig.a Obverse surface of <u>Fenestella retiformis</u> encrusted by algal filaments.RH2.22. Bar scale=Imm

Fig.b <u>Acanthocladia</u> with an algal filament or worm tube growing from a zooecial chamber onto the obverse surface.MP5.28. Bar scale=Imm

Fig.c As above,fig.b,at higher magnification. Bar scale=O.Imm

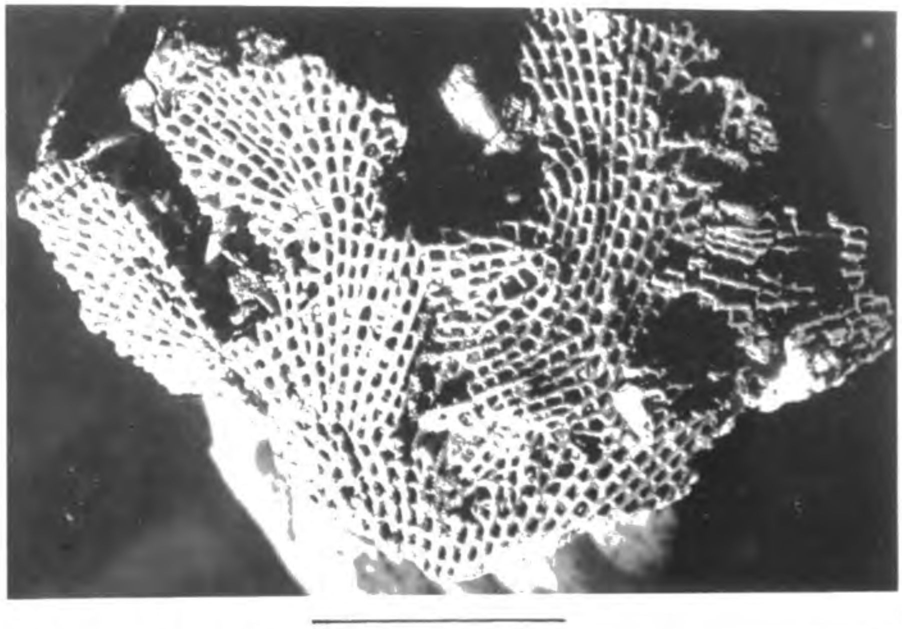
Plate I39. Predation.

Fig.a Zoarium of Fenestella retiformis where some branches appear to have grown back across a hole in the meshwork(centre of figure).This may be an example of colony repair of damage caused by predation. 7I7F.Bar scale=IOmm

Fig.b As above at higher magnification,showing 'repaired' part of zoarium. Bar scale=Imm

Fig.c Tooth of the fish Acrolepis,not previously known from the Zechstein reef. Bar scale=Imm

Fig.d Tooth of the fish Janassa,known to be a predator of bryozoans in the Küpferschiefer(Schaumberg(I979)). Specimen belonging to N.T.J.Hollingworth. Bar scale=Imm



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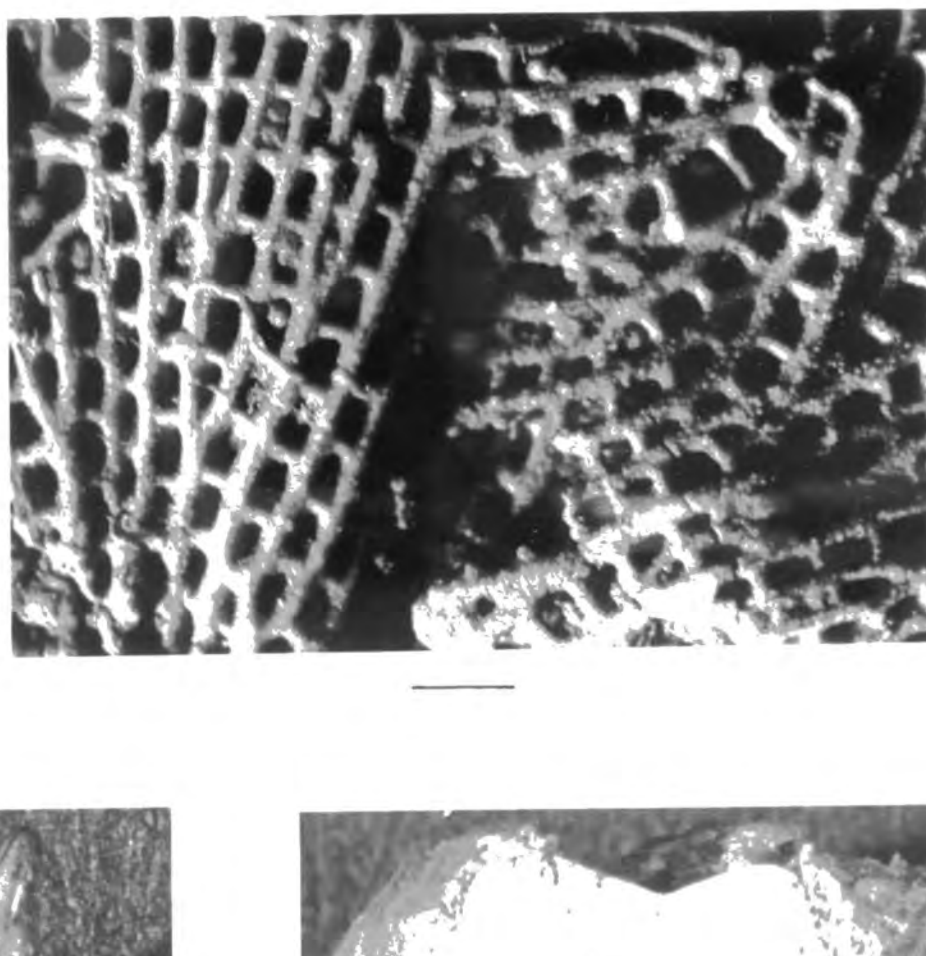

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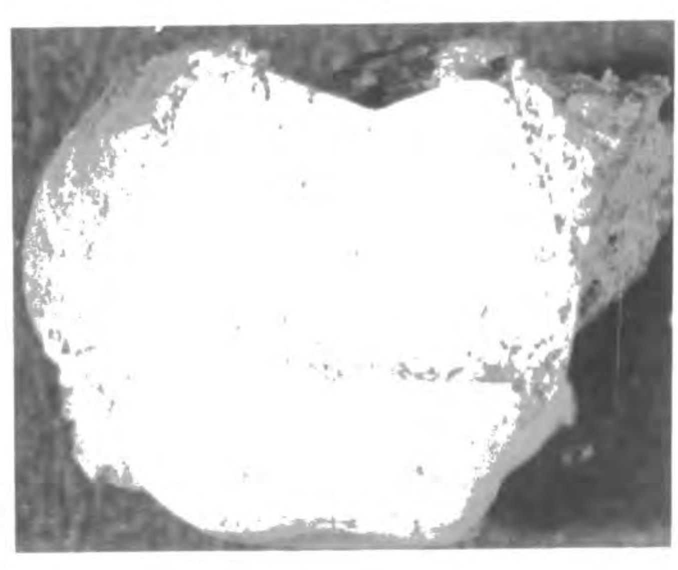


d

Plate I40. Locality HYR, Road cut at Hylton Castle.

Fig.a General view. Algal laminites are dominant in lithologies of the foreground.

Fig.b Central part of exposure, composed mostly of bryozoan biolithite. _Fenestella retiformis_ and _Synocladia virgulacea_ occur abundantly in life position in the upper part of the face. Small patch of densely-spaced zoaria of _Acanthocladia diffusus_ is arrowed.

a

b

Plate I4I. Locality HYR, Road cut at Hylton Castle.

Fig.a — Algal laminites of the stratigraphically lowest part of the outcrop.
Hammer is 50cm long.

Fig.b — Detail of algal laminites.
Hammer is 50cm long.

Fig.c — Thin lensoid bed of comminuted bryozoan and shelly debris, occurring within the algal laminites.
Diameter of lens cap is 6cm.

a

b

c

Plate I42. Localities HYR and HYQ.Hylton Castle.

Fig.a Patch of Acanthocladia diffusus,approx. $\frac{1}{2}m^2$ in extent.Hammer is 50cm long.

Fig.b HYQ.Zoaria of Synocladia virgulacea, seen in transverse section,which appear to have grown from a near vertical substratum.Zoaria are stacked one on top of another.Diameter of lens cap is 6cm.

a

b

Plate I43. Locality HM5.Humbledon hill.

Fig.a Transition from bedded dolomite to massive reef rock.
Cat is 30cm long.

Fig.b Transition from bedded dolomite to massive reef rock.As above,from a distance.

a

b

Plate I44. Locality SBC.Cold Hesledon,railway cutting.

Fig.a Algal laminites of the reef flat which outcrop in the western part of the cutting.

Fig.b Steeply dipping algal laminar encrustation, upper reef slope (½m to right of hand).

Fig.c Zoaria of *Synocladia virgulacea* which appear to have grown downwards from algal mounds.


a


b

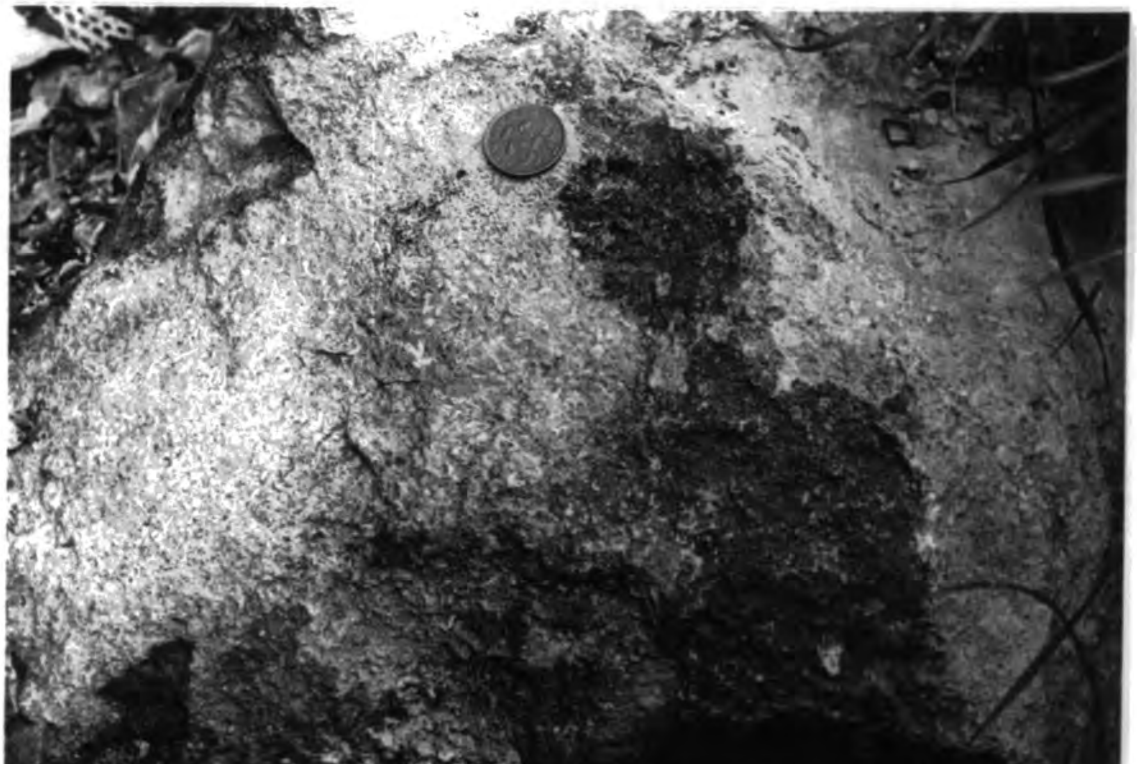

c

Plate I45. Locality HD.Townfield quarry.

Fig.a Algal laminites with an easterly dip, outcropping at the top of the quarry.

Fig.b Fossiliferous block with characteristic association of Dyscritella columnaris and Acanthocladia laxa.

a



b

Plate I46. Locality HTQ.Hawthorn Quarry.

Fig.a General view.Lowest bench is in the reef,the second bench is in the Hesleden Dene stromatolite biostrome.

Fig.b Close-up of lowest bench.

Fig.c Typical reef lithology at this locality, consisting of densely-spaced zoaria of *Acanthocladia diffusus*.Pencil for scale in top left corner of figure.

a

b

c

Plate I47. Locality HN.High Newport,railway cutting.

Fig.a Zoaria of Synocladia virgulacea which appear to have grown from a near vertical surface,and are stacked one on top of another.Car keys for scale.

Fig.b As above.

a

b