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**A STUDY OF SOME IRISH LOWER CARBONIFEROUS
FISH MICROVERTEBRATES**

A thesis submitted for the degree of Doctor in Philosophy

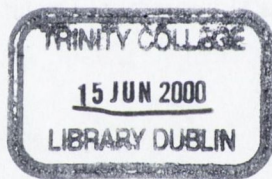
to the University of Dublin, Trinity College

VOLUME 2

by

Margaret Duncan

October 1999



Thesis
5708.2

VOLUME 2

PLATES:

- 1 *Thrinacodus incurvus* ferox morphotype
- 2 *Thrinacodus incurvus* ferox morphotype
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- 9 *Thrinacodus incurvus* ferox morphotype
- 10 *Thrinacodus incurvus* ferox morphotype
- 11 *Thrinacodus incurvus* nanus morphotype
- 12 *Thrinacodus incurvus* nanus morphotype
- 13 *Lissodus* Morphotype 1
- 14 *Lissodus* Morphotype 1
- 15 *Lissodus* Morphotype 1
- 16 *Lissodus* Morphotype 1
- 17 *Lissodus* Morphotype 1
- 18 *Lissodus* Morphotype 1
- 19 *Lissodus* Morphotype 1
- 20 *Lissodus* Morphotype 2
- 21 *Lissodus* Morphotype 3
- 22 *Lissodus* Morphotype 3
- 23 *Lissodus* Morphotype 4
- 24 *Lissodus* Morphotype 4
- 25 *Lissodus* Morphotype 4
- 26 *Lissodus* Morphotype 5
- 27 *Lissodus* Morphotype 5
- 28 *Lissodus* Morphotype 5
- 29 *Lissodus* Morphotype 1
- 30 *Lissodus* Morphotype 5
- 31 *Lissodus* Morphotype 5
- 32 *Lissodus* Morphotype 5
- 33 cf. *Denaea*
- 34 cf. *Denaea*
- 35 cf. *Denaea*
- 36 cf. *Denaea*
- 37 cf. *Denaea*
- 38 cf. *Denaea*
- 39 cf. *Denaea*
- 40 *Protacrodus* Morphotype 1 & 2
- 41 *Protacrodus* Morphotype 3
- 42 *Lissodus* Morphotype 2 & 3; Tricuspate tooth
- 43 Chondrichthyan Pavement Dentition (CPD) Type 1
- 44 CPD Morphotype 2
- 45 CPD Morphotype 3
- 46 CPD Morphotype 4
- 47 CPD Morphotype 4
- 48 CPD Morphotype 5
- 49 CPD Morphotypes 6 & 7
- 50 Actinopterygian Scales
- 51 Actinopterygian Scales
- 52 Actinopterygian Tooth Plate/Jaw
- 53 Unknown - Possible Gill Rakers or Spines
- 54 Odd non-classified denticles
(1. Handle-Bar Mustache; 2. Possible Chondrichthyan
denticle; 3. Possible Chondrichthyan denticle)
- 55 Chondrichthyan denticles/scales
(Morphotype 1 - Morphotype 5)
- 56 Chondrichthyan composite scales/denticles
(Morphotypes 1 & 2)

- 57 Chondrichthyan composite scales/denticles
(Ctenacanth Type)
- 58 Actinopterygian Flat Scales
- 59 Chondrichthyan mucous membrane denticles Morphotype 1
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Possible 'Thrinacodus-type' denticle
- 62 Hybodont Placoid Type Scales - Morphotype 1 heart-shaped denticles
- 63 Hybodont - Morphotype 2 raised button like denticles;
Morphotype 3 thorn like; Morphotype 4 thorn like.
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- 65 Acanthodian Scales
- 66 Actinopterygian Scales
- 67 Actinopterygian Scales
- 68 Actinopterygian Scales
Hybodont - Morphotype 3 thorn like
- 69 Actinopterygian Scales; Unknown
Hybodont - Morphotype 2 raised button like denticles
- 70 Sarcopterygian Teeth (probable)
- 71 Sarcopterygian Teeth (probable); Teeth of unknown affinity
- 72 Bar Morphotype A
- 73 Bar Morphotype A
- 74 Bar Morphotype A
- 75 Bar Morphotype A
- 76 Bar Morphotype A
- 77 Bar Morphotype B
- 78 Bar Morphotype B
- 79 Bar Morphotype C
- 80 Bar Morphotype D
- 81 Bar Morphotype D
- 82 Bar Morphotype D
- 83 Bar Morphotype D
- 84 Bar Morphotype D
- 85 Bar Morphotype D
- 86 Bar Morphotype E
- 87 Bar Morphotype F
- 88 Bar Morphotype F
- 89 Bar Morphotype F
- 90 Bar Morphotype F
- 91 Bar Morphotype G
- 92 Bar Morphotype G

Explanation of Locations and Lithology

- Kilbride Quarries** Kilbride Limestone Formation, *Polygnathus mehli* conodont Biozone, Ivorian (probably Freyrian), late Tournaisian, Dinantian. Disused quarry, near Nobber, Co. Meath (N 845 848); crinoidal limestone.
- Lyraun Cove** Lyraun Cove Shale Member, Porter's Gate Formation, *Polygnathus inornatus* conodont Biozone, Hastarian, Tournaisian, Dinantian. Small cove section, near Porter's Gate, Hook Head, Co. Wexford (S 276 100); calcareous mudstone-dolomitic limestone.
- Urlingford Core** Upper Ballysteen Limestone, *Polygnathus mehli* conodont Biozone, Ivorian (pre-Freyrian), late Tournaisian, Dinantian. Bore hole 3246/4 181.6-252.7m, Urlingford, Co. Kilkenny; thinly bedded crinoidal limestone.
- Moyola River** Mormeal Member, Altagoan Formation, PU miospore Biozone, ?Ivorian ?Freyrian, Tournaisian, Dinantian. Faulted river section, Moyola River, near Draperstown, Co. Derry (H 792 974); channel fill within sabhka/tidal flat, calcarenite with evaporite.

Plate 1

Thrinacodus incurvus ferox morphotype

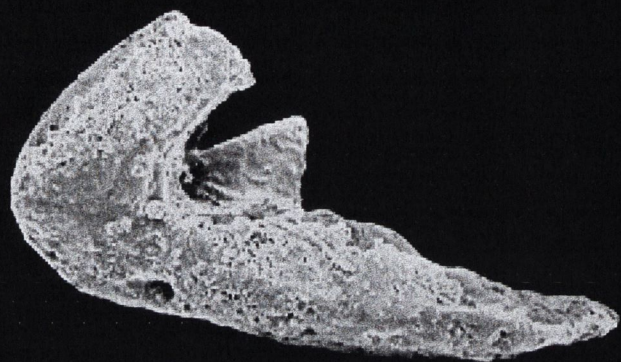
Figures A, B, C Kilbride TCD 36792

A - Lateral view; B - Ventral view; C - Dorso-lingual view
Intermediate morphology with the principal cusp to the right;
the twist through the base is best seen in view C.

Figures D, E Kilbride TCD 36800

D - Dorsal view; E - Dorso-labial view
Delicate end member with principal cusp to the right: both
views show the twist along the base; view D shows the way
the raised ribs run from the principal cusp to the middle cusp and
from the middle cusp to the left lateral cusp.

(scale bar: A & C 200µm; B, D & E 500µm)



— A



B



C



D



E

Plate 2

Thrinacodus incurvus ferox morphotype

Figures A-F Kilbride TCD 36793

A - Ventral view; B - Labial view; C - Labial view; D - Labio-lateral view; E - Ventral view; F - Lateral view

Intermediate morphology with the principal cusp to the left; views B and C show the extension of the raised ribs from the principal cusp to the middle cusp; view D shows the central lumen of the principal cusp and the shape of the cross section of the cusps and of the base.

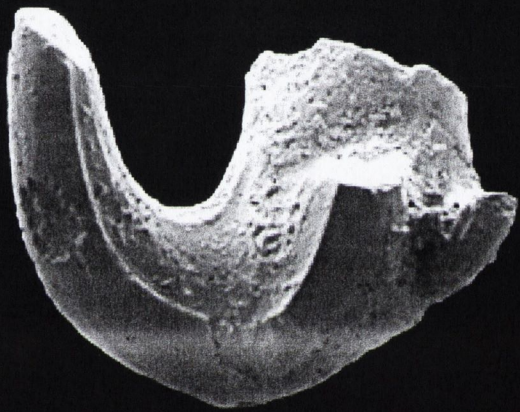
(scale bar A, C-F 200µm; B 500µm)



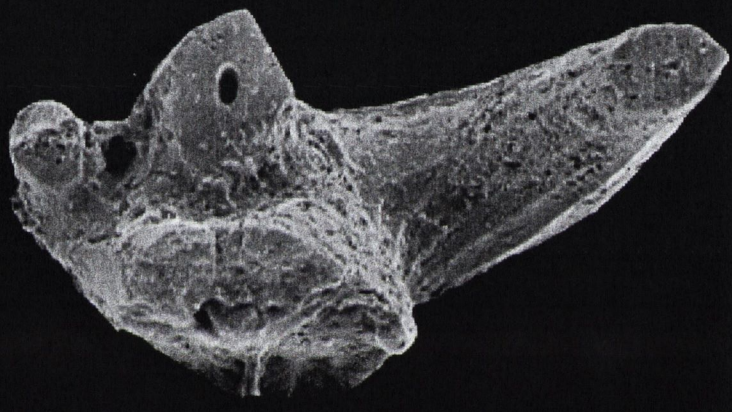
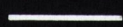
A



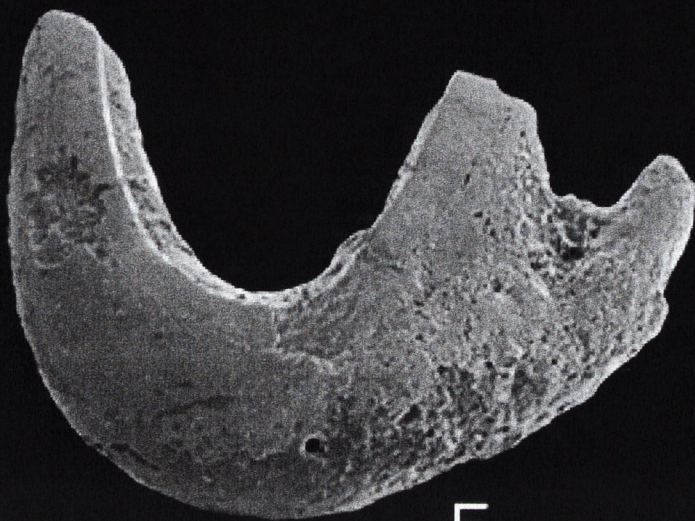
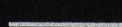
B



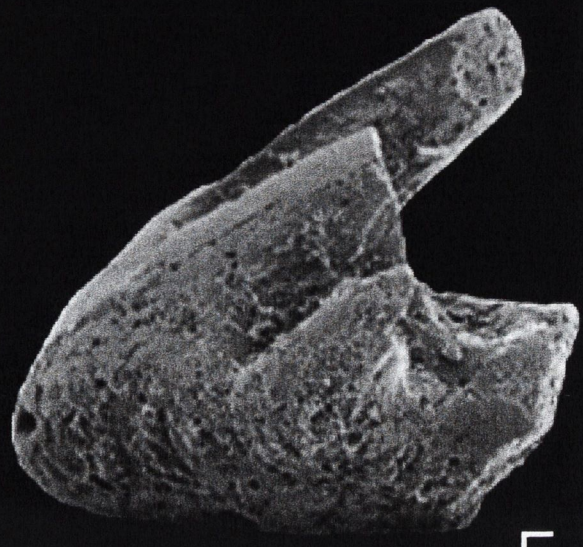
C



D



E



F



Plate 3

Thrinacodus incurvus ferox morphotype

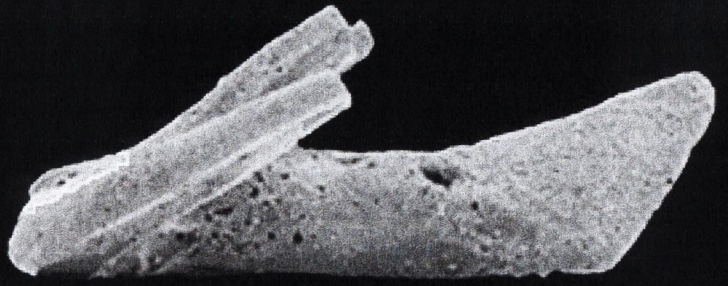
Figures A - G Kilbride TCD 36794

A - Dorsal view; B - Lateral view; C -Lateral view; D -Dorsal view; E - Dorso-lingual view; F - Labial view; G - Lingual view
Delicate end member with principal cusp to the right and flange at distal end of base on the left; basal canal openings well illustrated in A, B, D, E, F & G; G shows the angle of twist along the base.

(scale bar: A-D 500µm; E-G 200µm)



A



B



C



D



E



F



G

Plate 4

Thrinacodus incurvus ferox morphotype

Figures A - E Kilbride TCD 36795

A - Dorsal view; B - Dorsal view; C - Lateral view; D - Labial view;
E - Dorso-lingual view

Intermediate morphology with principal cusp to the right and the curl
over of the flange at the distal end of the base.

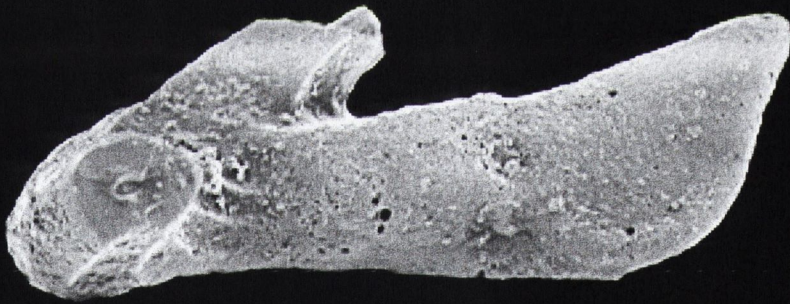
(scale bar: A & B 500 μ m; C-E 200 μ m)



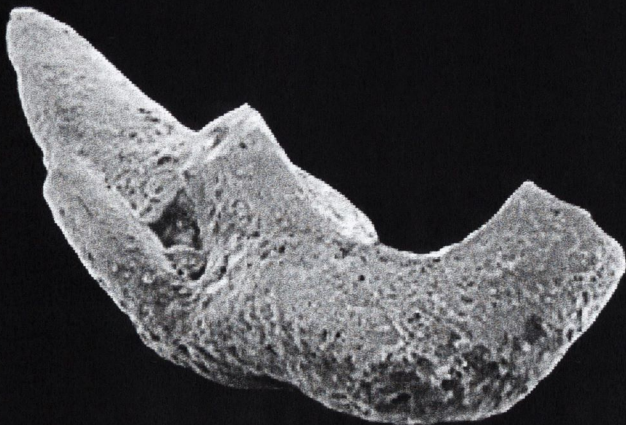
A



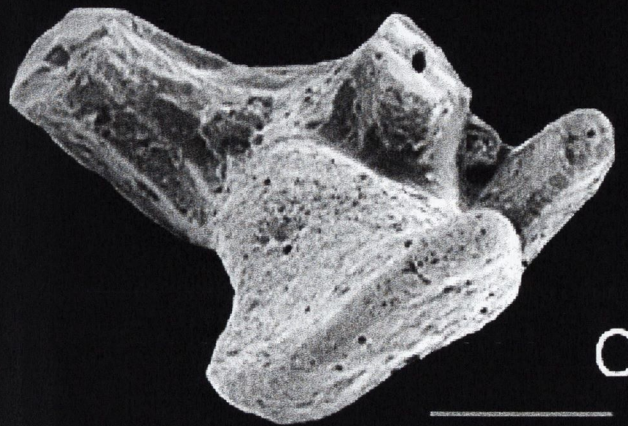
B



E



D



C

Plate 5

Thrinacodus incurvus ferox morphotype

Figures A & B Kilbride TCD 36796

A - Dorsal view; B - Dorso-labial view

Robust end member with principal cusp to the left.

Figures C & D Kilbride TCD 36797

C - Dorsal view; D - Dorso-labial view

The middle cusp is sharply angled over the base compared to other specimens. N.B. a hair was airbrushed out from this image.

(scale bar: A-D 500µm)



A



B



C



D

Plate 6

Thrinacodus incurvus ferox morphotype

Figures A, B, C Kilbride TCD 36798

A - Dorso-lingual view; B - Dorsal view; C - Dorso-labial view

Delicate end member with principal cusp to right; curl over of flange at the left distal margin of the base is seen in A, B & C; large single basal canal is seen in A & B.

Figures D - F Kilbride TCD 36799

D - Lateral view; E - Dorsal view; F - Dorso-labial view

Delicate end member with principal cusp to right; a large basal canal is seen in D - F with a small opening proximally.

(scale bar: A & B 200µm; C-F 500µm)

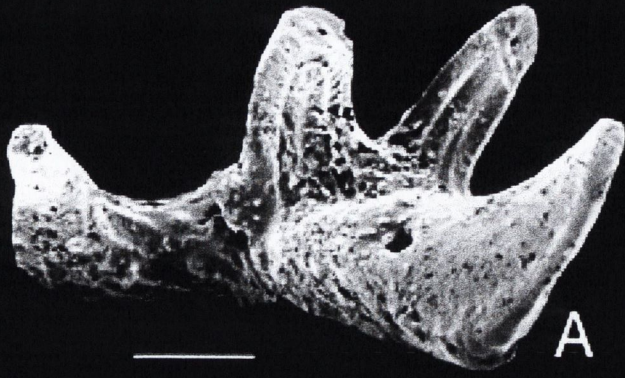


Plate 7

Thrinacodus incurvus ferox morphotype

Figures A-D Kilbride TCD 36801

A - Dorsal view; B - Dorsal view; C - Lateral view;
D - Labial view

Robust end member with principal cusp to the left. Note the less delicate cusps and base compared to the delicate end member specimens.

(scale bar: A-D 200µm)



A



B



C



D

Plate 8

Thrinacodus incurvus ferox morphotype

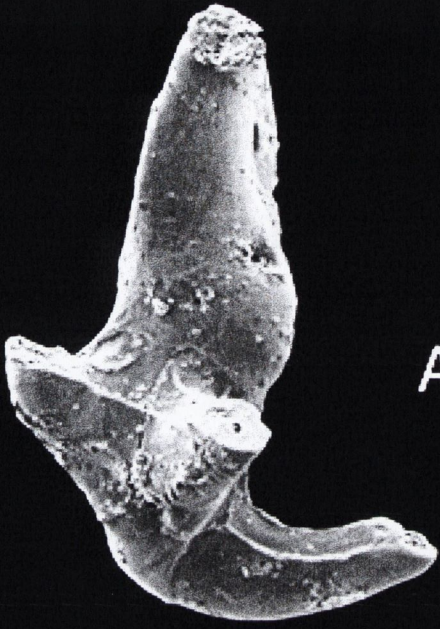
Figures A-D

Lyraun Cove TCD 36803

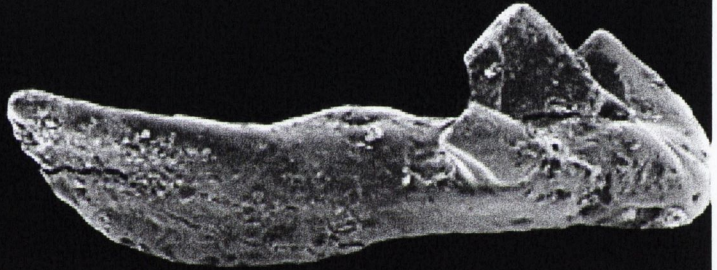
A - Dorsal view; B - Lateral view; C - Latero-lingual view;
D - Labial view

Intermediate morphology with principal cups to right.

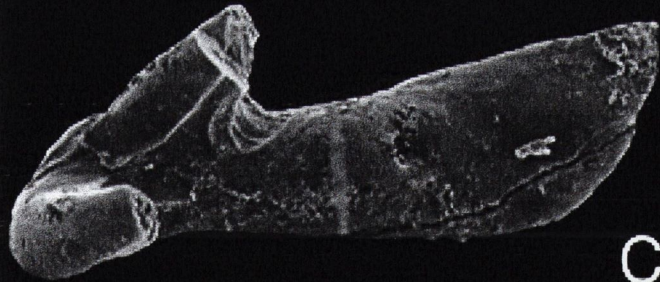
(scale bar: A-C 200 μ m; D 100 μ m)



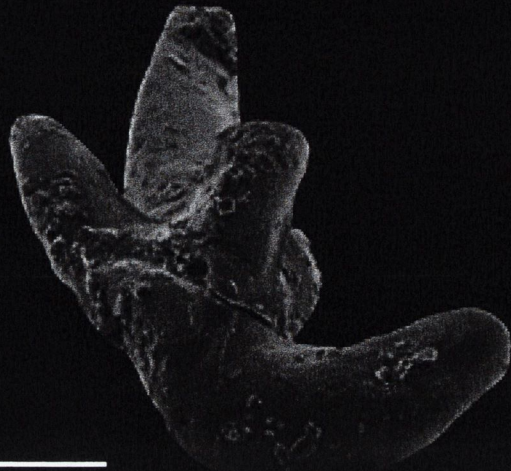
A



B



C



D

Plate 9

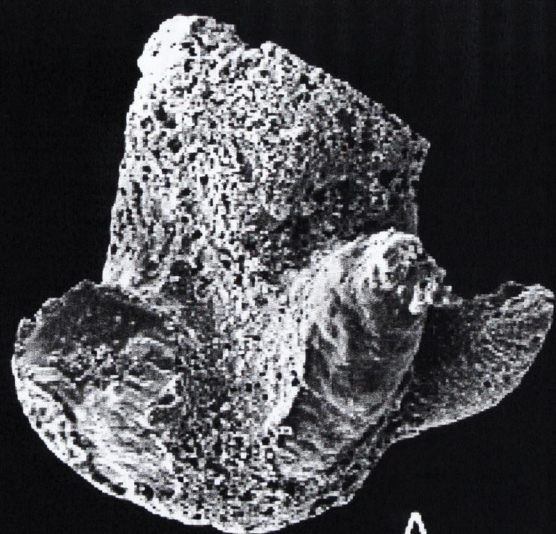
Thrinacodus incurvus ferox morphotype

Figures A-E Urlingford TCD 36804

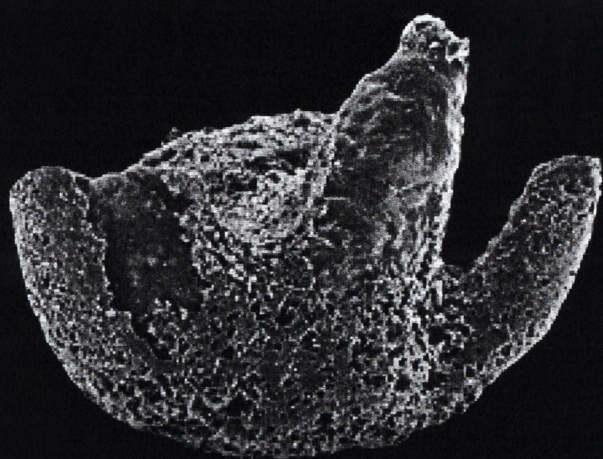
A - Dorsal view; B - Ventral view; C - Lateral view; D - Lingual view;
E - Lateral view

Although badly worn this is probably similar to the robust end
member with the principal cusp to the left.

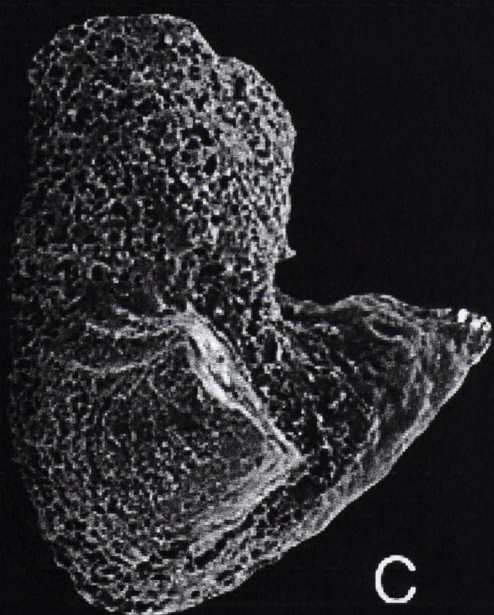
(scale bar: A-E 200µm)



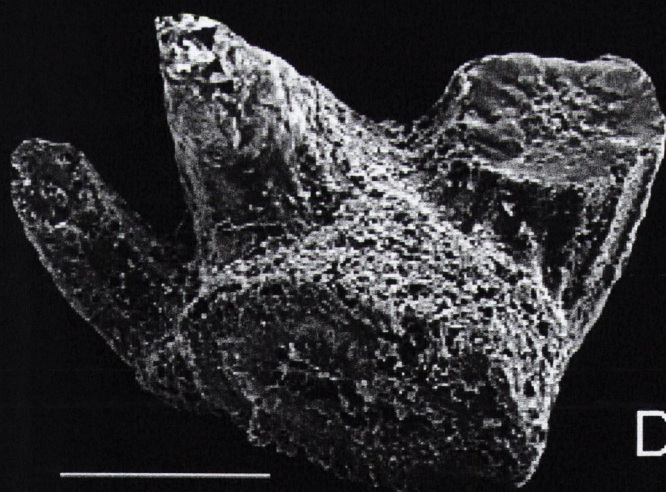
A



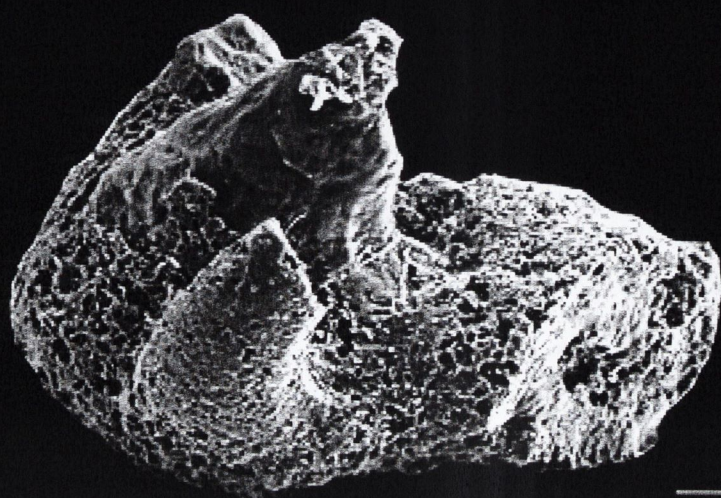
B



C



D



E

Plate 10

Thrinacodus incurvus ferox morphotype

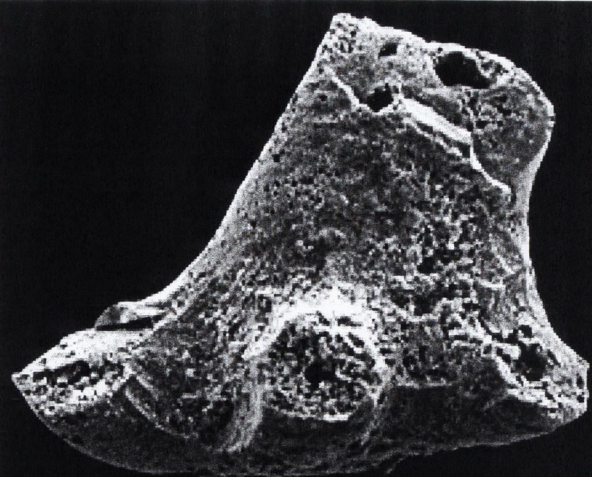
Figures A-E

Urlingford TCD 36805

A - Dorsal view; B - Lingual view; C - Lateral view; D - Labial view;
E - Lateral view

Intermediate morphology, note the central cavity in the broken
base in view A-C and the possible smaller base canals.

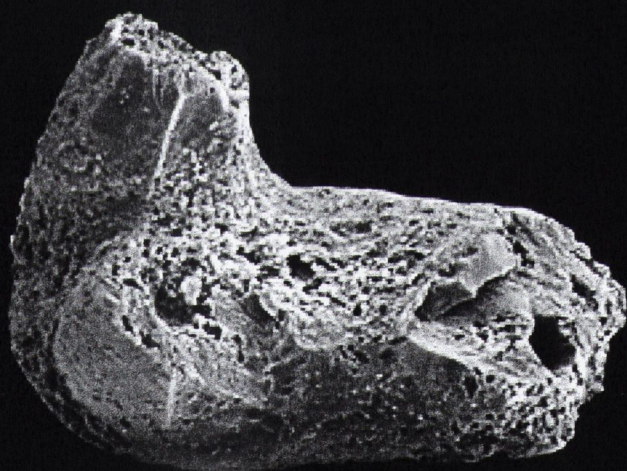
(scale bar: A-E 200 μ m)



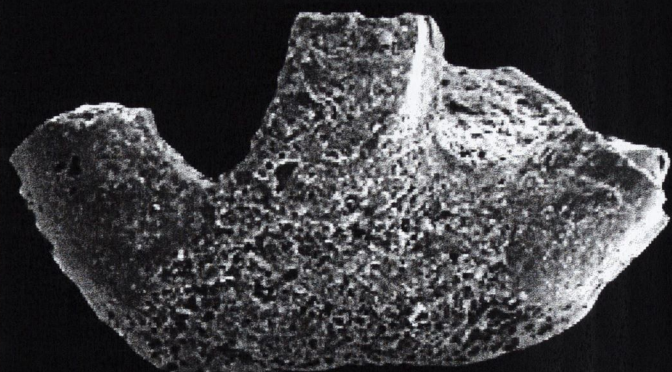
— A



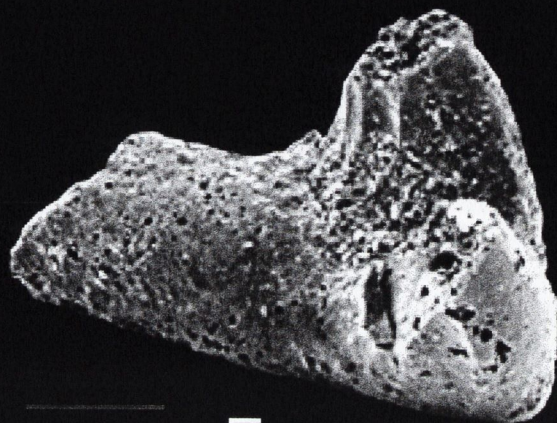
— B



— C



— D



— E

Plate 11

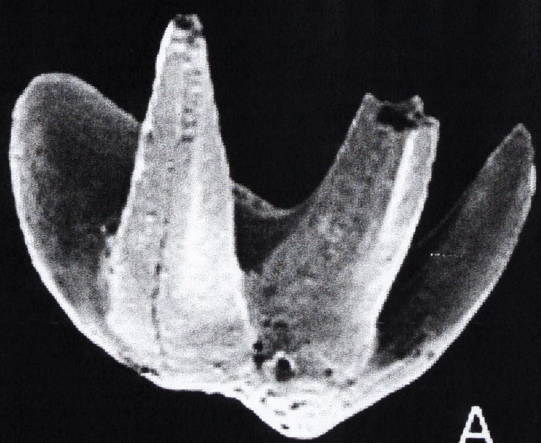
Thrinacodus incurvus nanus morphotype

Figures A-E Kilbride TCD 36802

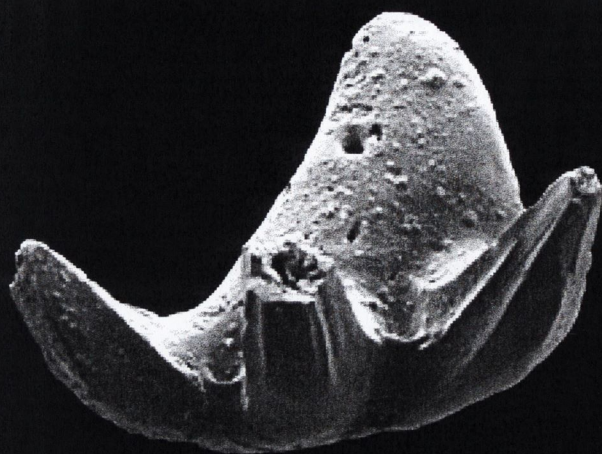
A - Labio-lateral view; B - Dorso-labial view; C - Lingual view;
D - Labial view; E - Lateral view

Note the near overall symmetry and the near linear alignment of the cusps compared to those of *Thrinacodus incurvus ferox* morphotype.

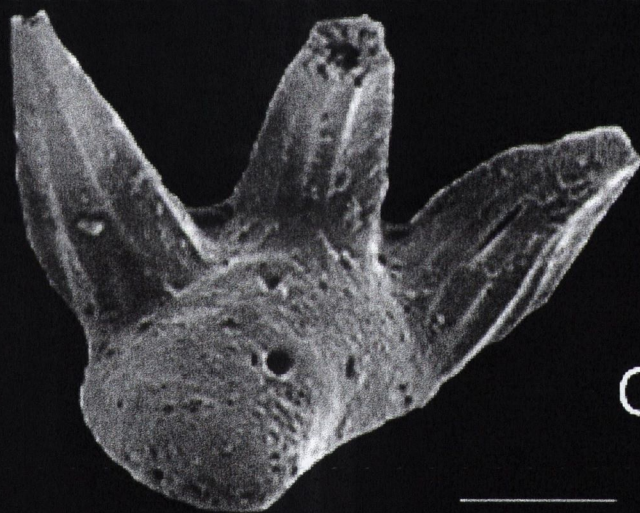
(scale bar: A 500µm; B-E 200 µm)



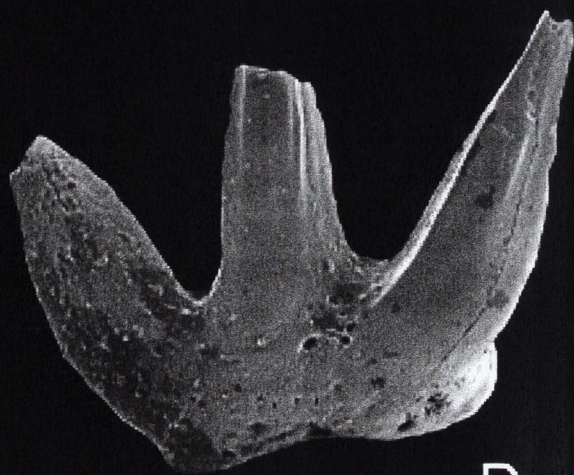
A



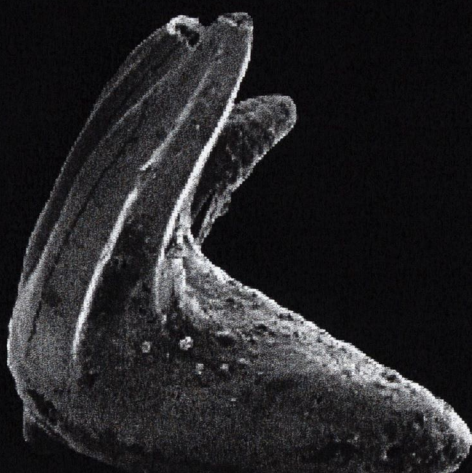
B



C



D



E

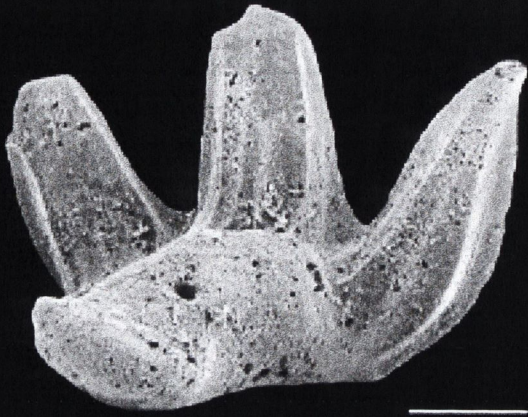
Plate 12

Thrinacodus incurvus nanus morphotype

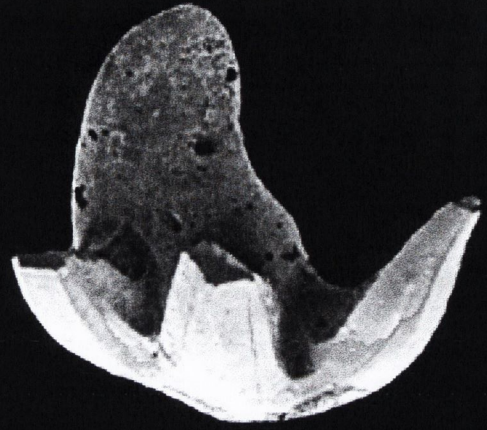
Figures A-F **Kilbride TCD 36808**

A - Lingual view; B - Dorso-labial view; C - Dorso-labial view;
D - Dorso-lingual view; E - Labial view; F - Lateral view
Similar to TCD 36802 (Plate 11) but here the base shows
more asymmetry.

(scale bar: A, C-F 200µm; B 500µm)



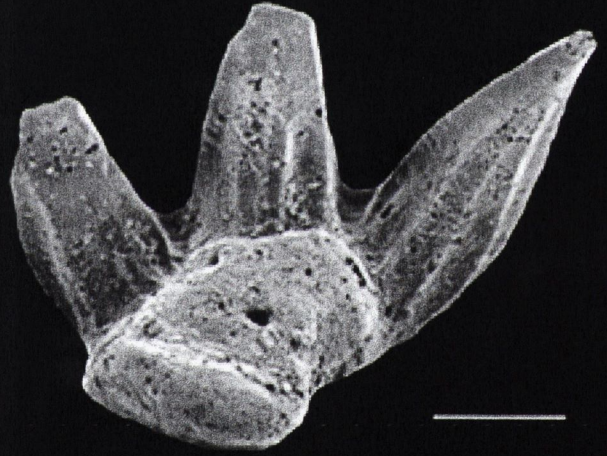
A



B



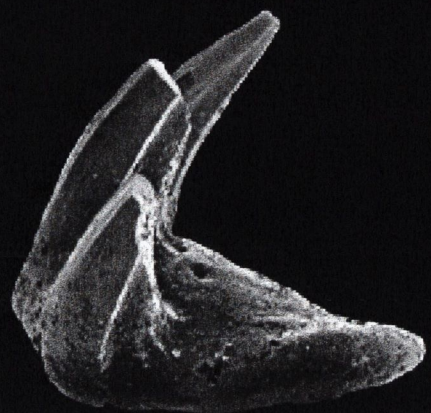
C



D



E



F

Plate 13

Lissodus Morphotype 1

Figures A-D Kilbride TCD 36752

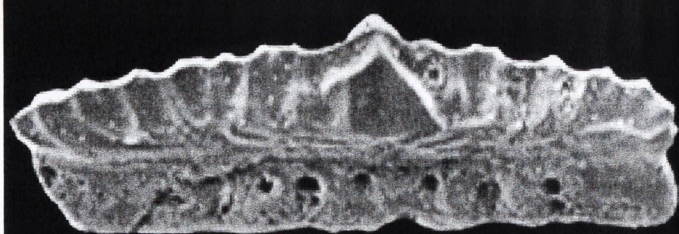
A - Lingual view/semi-dorsal view; B - Lingual view; C - Labial view;
D - Lateral view

Figures E-H Kilbride TCD 36753

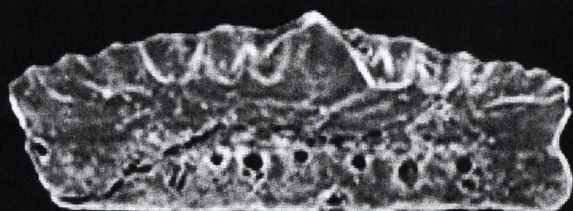
E - Lingual view/semi-dorsal view; F - Lingual view; G - Labial view;
H - Lateral view

Note the fine median crest and curving ridges descending to the crown-base interface; prominent labial buttress; minor lingual buttress and the expanded pits or foramen on the lingual base.

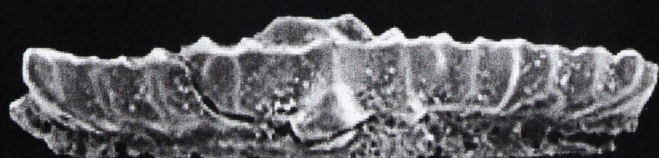
(scale bar: A & C 500µm; D 100µm; B, E-H 200µm)



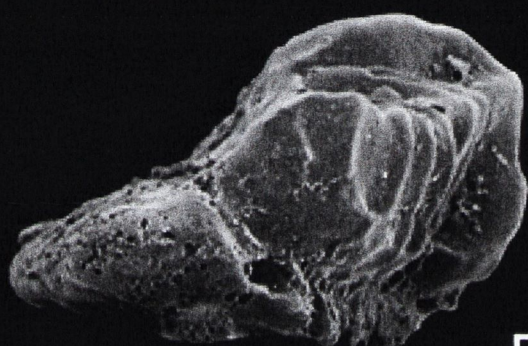
— A



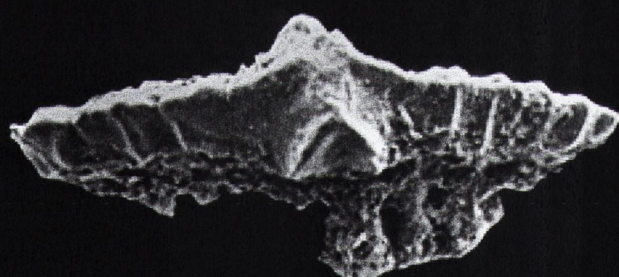
— B



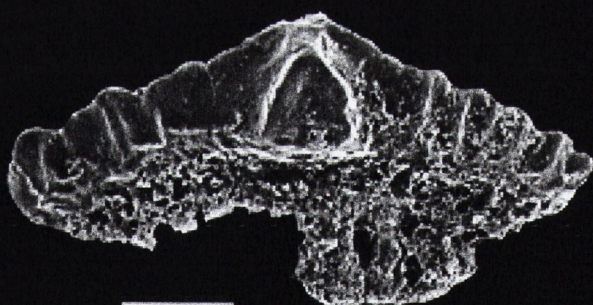
— C



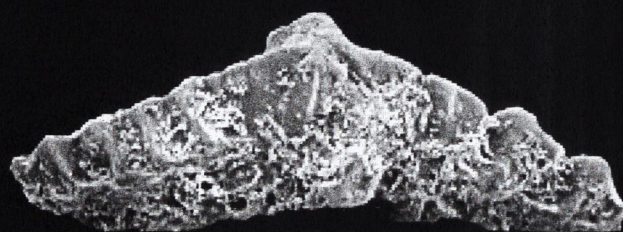
— D



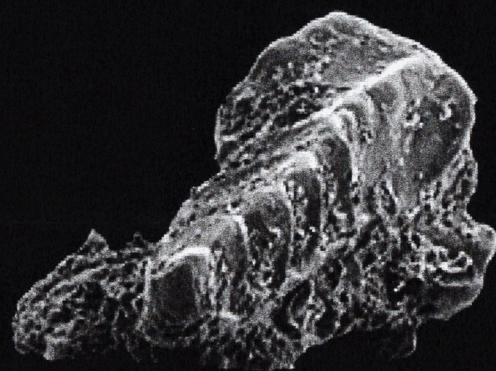
— E



— F



— G



— H

Plate 14

***Lissodus* Morphotype 1**

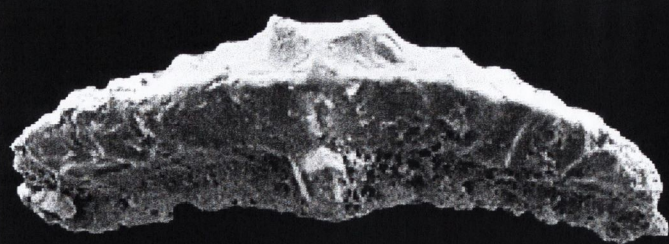
Figures A-D **Kilbride TCD 36754**

A - Dorsal view; B - Labial view; C - Lingual view; D - Lateral view

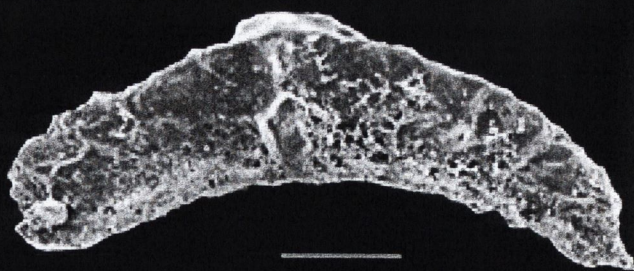
Figures E-G **Kilbride TCD 36755**

E - Dorso-lingual view; F - Lingual view; G - Labial view

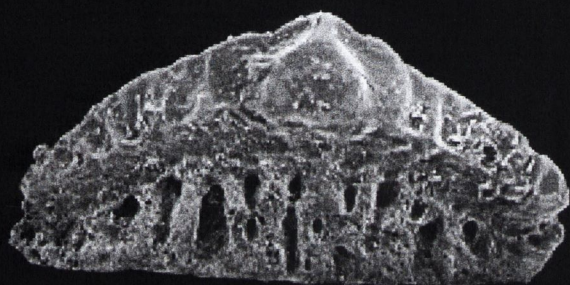
(scale bar: A-G 200µm)



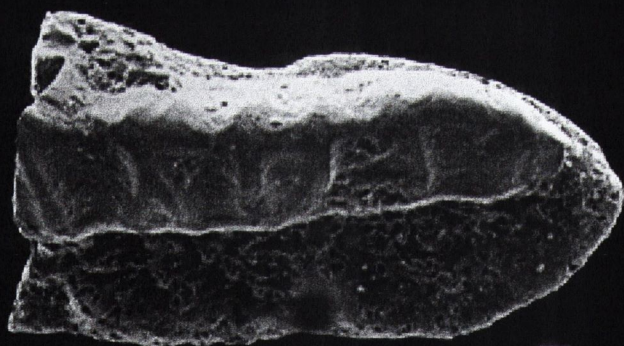
A



B



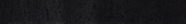
C



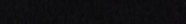
E



D



F



G

Plate 15

Lissodus Morphotype 1

Figures A-D **Kilbride TCD 36756**

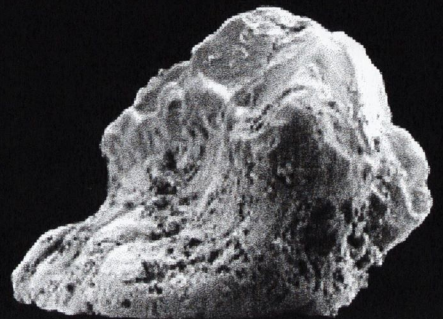
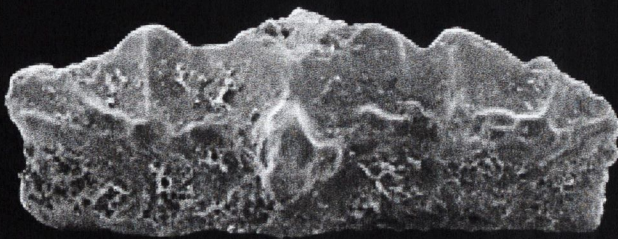
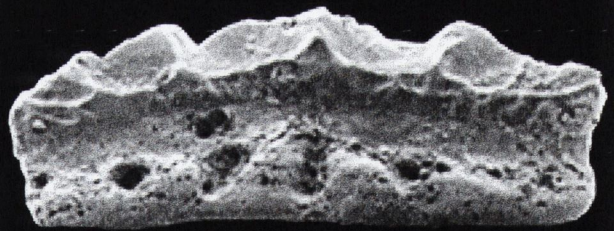
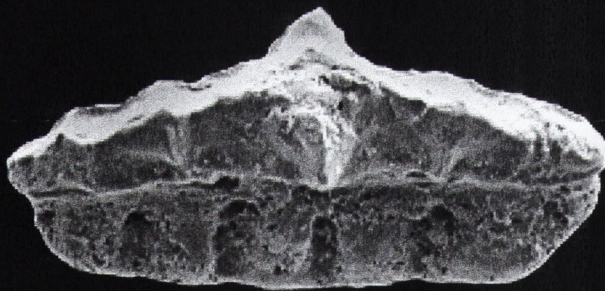
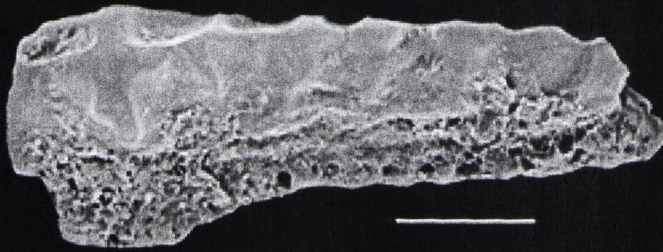
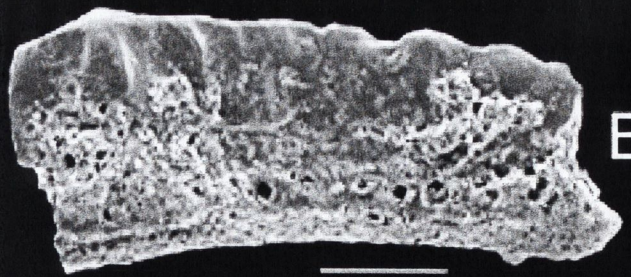
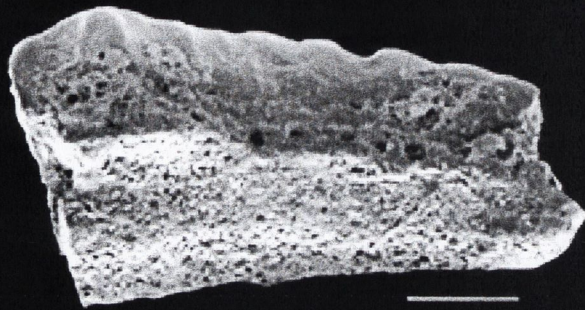
A - Lingual view; B Labial view; C Dorsal view; D Lateral view

Figures E-H **Kilbride TCD 36757**

E Dorso-lingual view; F Lingual view; G Labial view;
H Lateral view

Figures G & H show the prominent labial buttress and
labial nodes on the crown-base interface.

(scale bar: A-H 200µm)



A

B

C

D

E

F

G

H

Plate 16

Lissodus Morphotype 1

Figures A-D Kilbride TCD 36758

A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

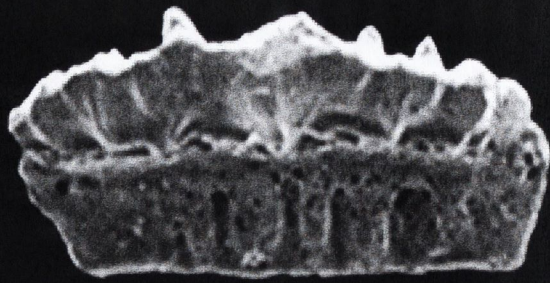
A, C & D show examples of prominent labial nodes, while
A & B clearly shows the crown-base interface structure.

Figures E-G Kilbride TCD 36759

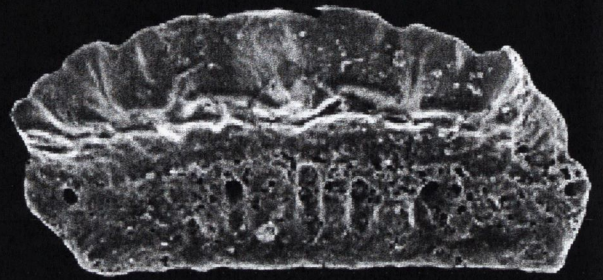
E Dorso-lingual view; F - Lingual view; G - Lateral view

Very worn but still shows a likeness to Morphotype 1.

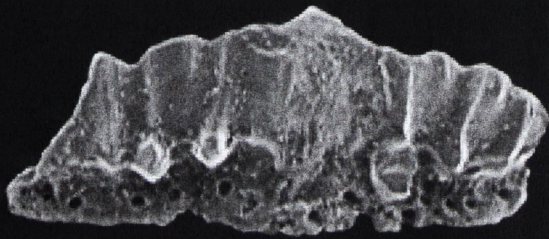
(scale bar: A-G 200µm; G 100µm)



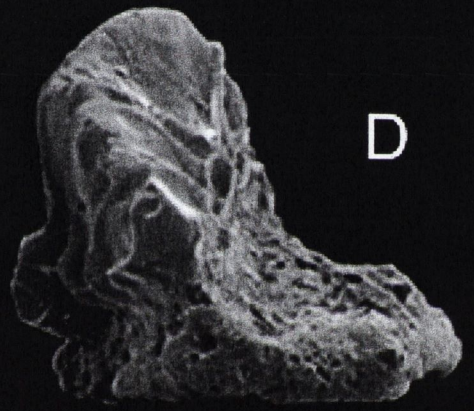
A



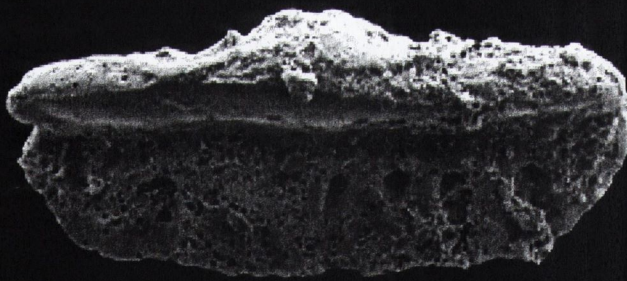
B



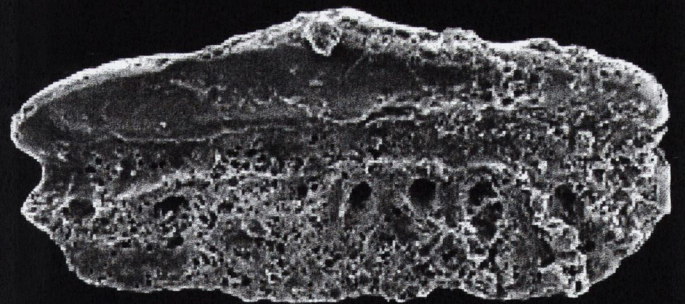
C



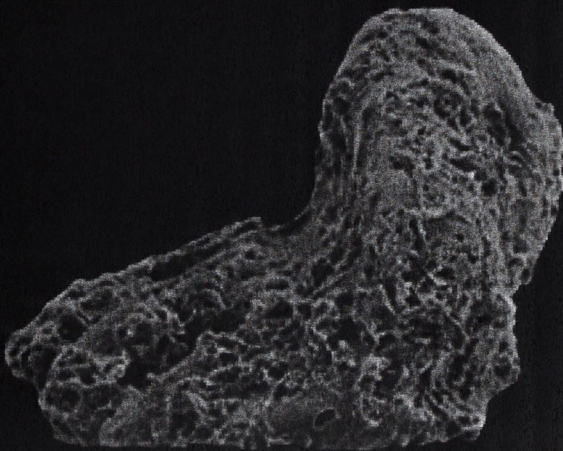
D



E



F



G



Plate 17

Lissodus Morphotype 1

Figures A-D Kilbride TCD 36760

A - Dorsal view; B - Dorsal view; D - Lateral view

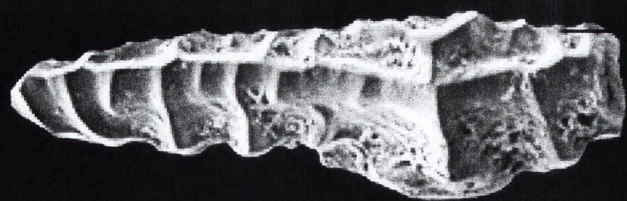
A-D highlight the distinct curved to vertical ribs from the obvious median crest towards the crown-base interface. D shows a horizontal hollow underneath the median crest not visible in H.

Figures E-H Kilbride TCD 36761

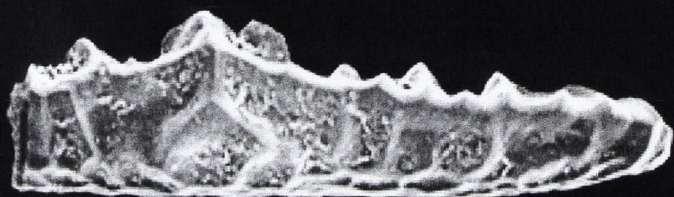
E - Dorso-lingual view; F - Lingual view; G - Labial view;

H - Lateral view

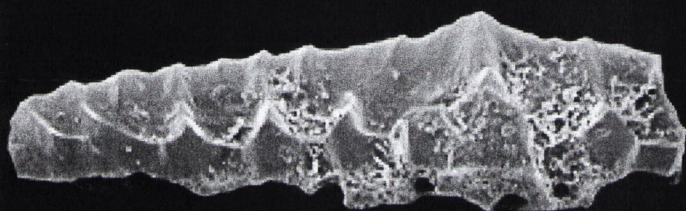
(scale bar: A-C & E-G 200 μ m; D & H 100 μ m)



A



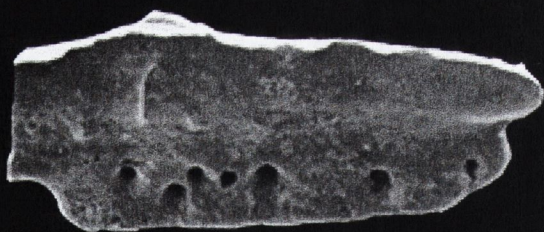
B



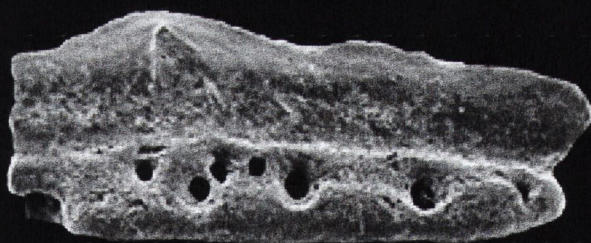
C



D



E



F



G



H

Plate 18

Lissodus Morphotype 1

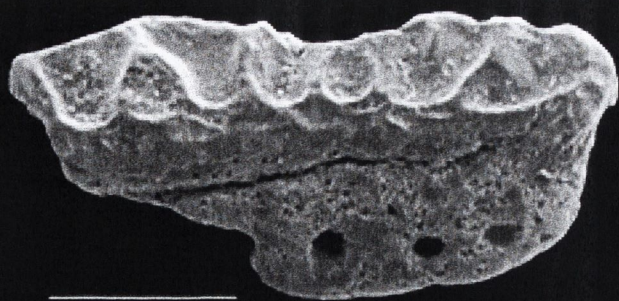
Figures A-D **Kilbride TCD 36762**

A -Lingual view; B - Ventro-lingual view; C - Lateral view;
D - Dorsal view

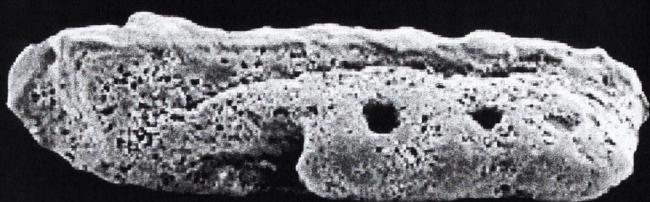
Figures E-H **Kilbride TCD 36763**

E - Lingual view; F - Ventro-lingual view; G - Dorsal view;
H - Lateral view

(scale bar: A-G 200µm; H 100µm)



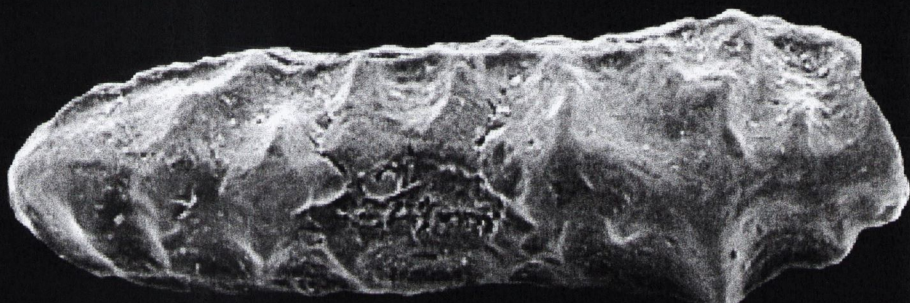
A



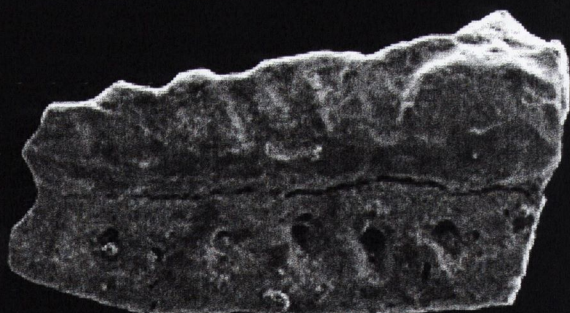
B



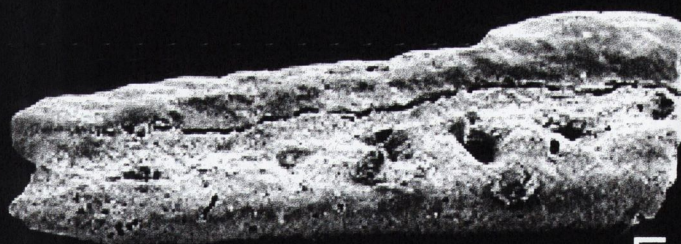
C



D



E



F



G



H

Plate 19

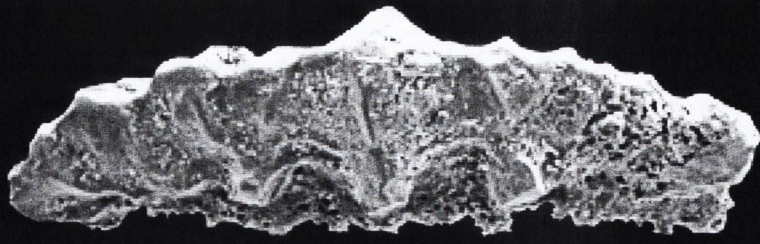
Lissodus Morphotype 1

Figures A-D Urlingford TCD 36764

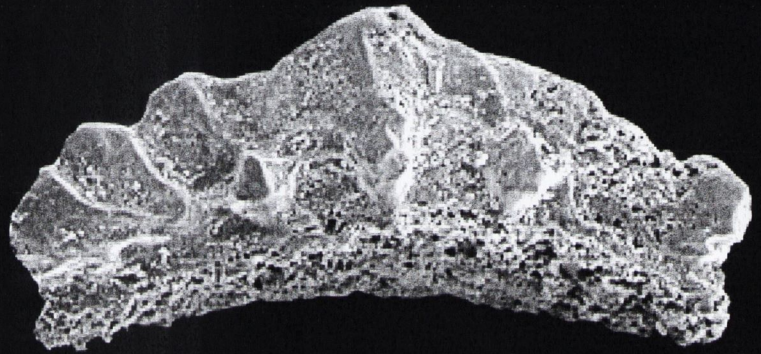
A -Dorso-labial view; B - Labial view; C - Lingual view;
D - Lateral view

Although worn this specimen still shows the labial buttress,
labial nodes and minor lingual buttress. The median crest
is more arcuate than in some specimens.

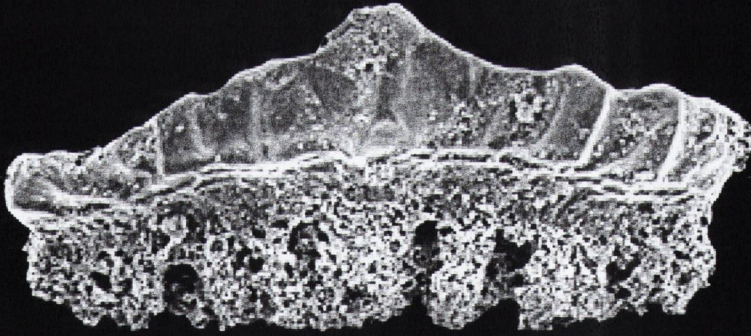
(scale bar: A-D 200µm)



A



B



C



D



Plate 20

Lissodus Morphotype 2

Figures A-C **Kilbride TCD 36765**

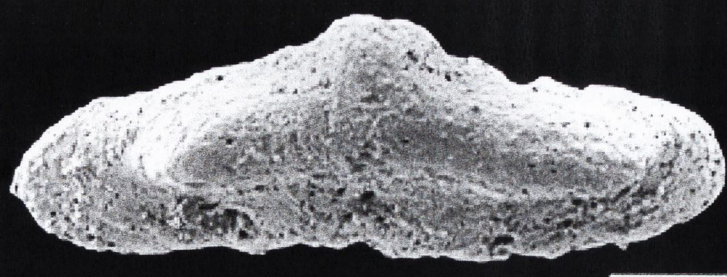
A - Dorsal view; B - Lingual view; C - Lingual view

Figures D-E **Kilbride TCD 36766**

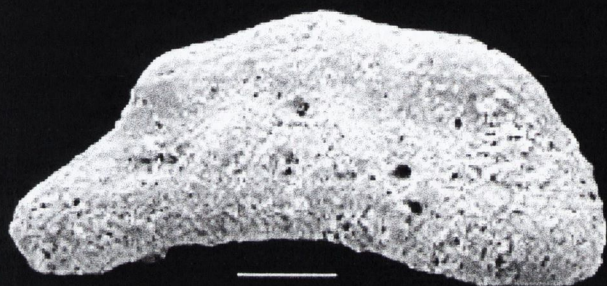
D - Dorsal view; E - Lateral view

Note the shorter median crest relative to the length of the base
and prominent labial buttress.

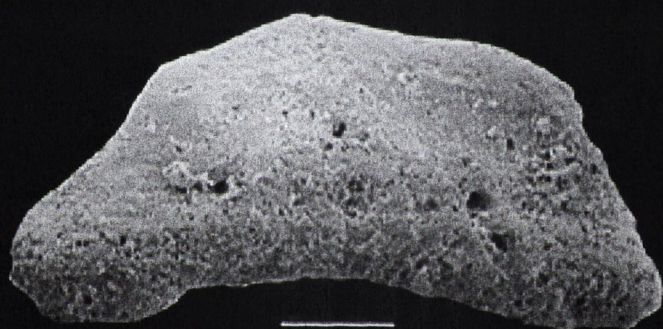
(scale bar: A-E 200µm)



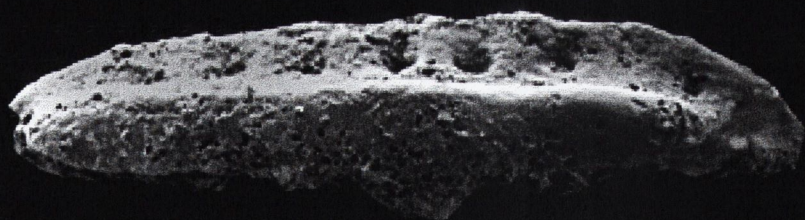
A



B



C



D



E

Plate 21

Lissodus Morphotype 3

Figures A-C **Kilbride TCD 36767**

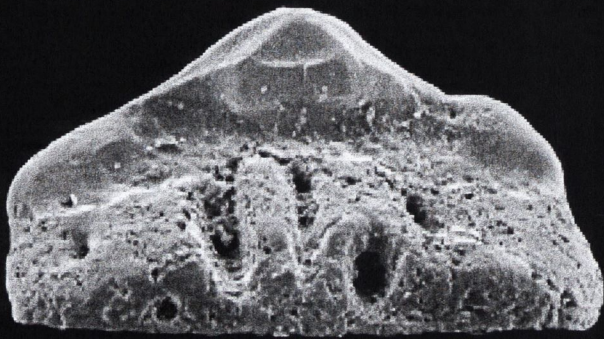
A - Lingual view; B - Lateral view; C - Labial view

Figures D-F **Kilbride TCD 36768**

D - Dorso-lingual view; E - Labial view; F - Lingual view

Note the triangular nature of the teeth compared to other specimens with a very prominent labial buttress extending into the base. A-C appears to have three non-differentiated cusps while D-F is more asymmetric but still maintains the triangular shape.

(scale bar: A-F 200 μ m)



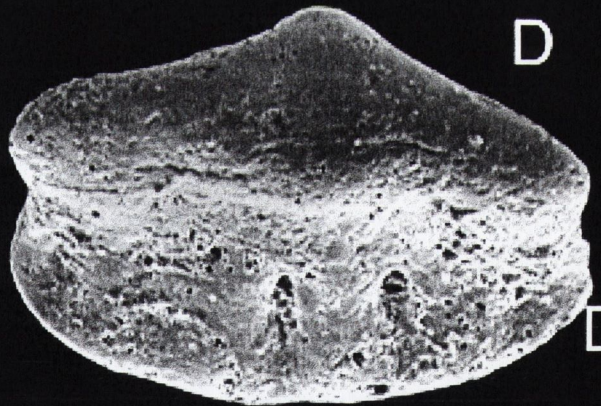
A



B



C

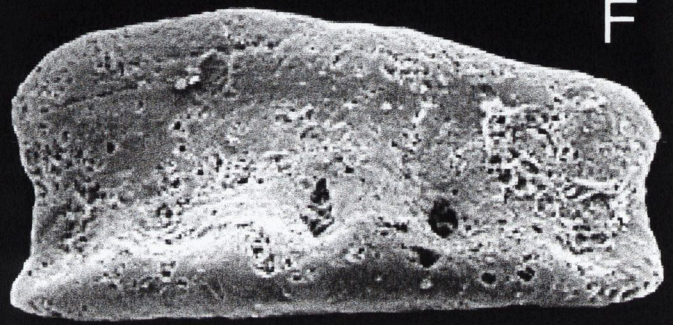


D

D



E



F

Plate 22

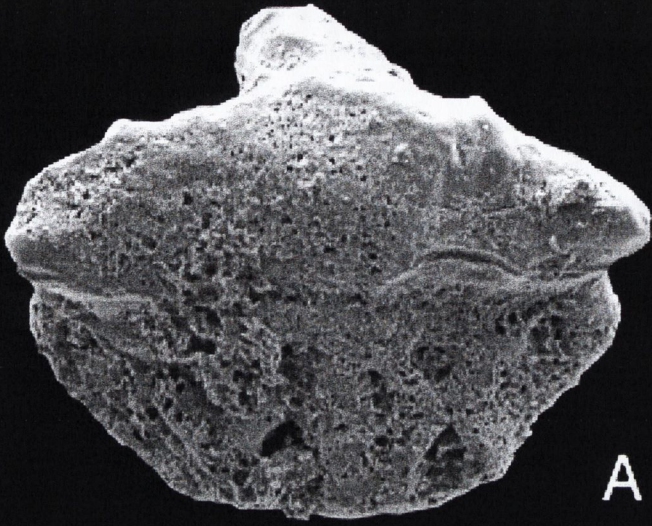
Lissodus Morphotype 3

Figures A-D **Kilbride TCD 36769**

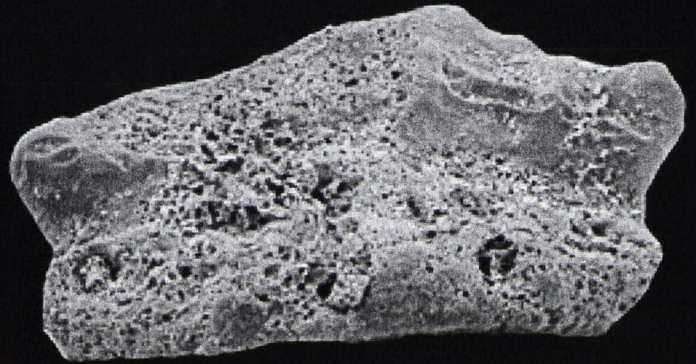
A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

Note the strong triangular shape and very prominent labial
buttress.

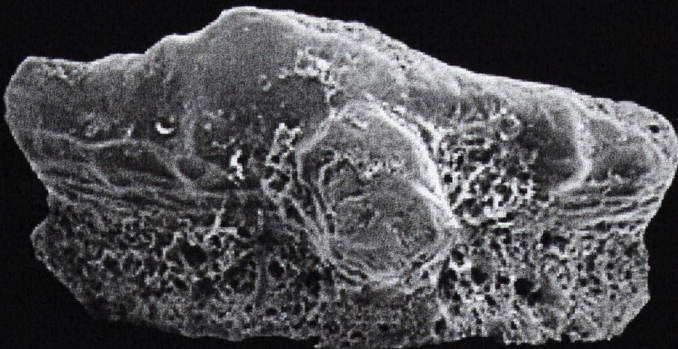
(scale bar: A-D 200µm)



A



B



C



D

Plate 23

Lissodus Morphotype 4

Figures A-D **Kilbride TCD 36770**

A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

Figures E-H **Kilbride TCD 36771**

E - Ventro-labial F - Ventral view; G - Dorsal view; H - Lateral view

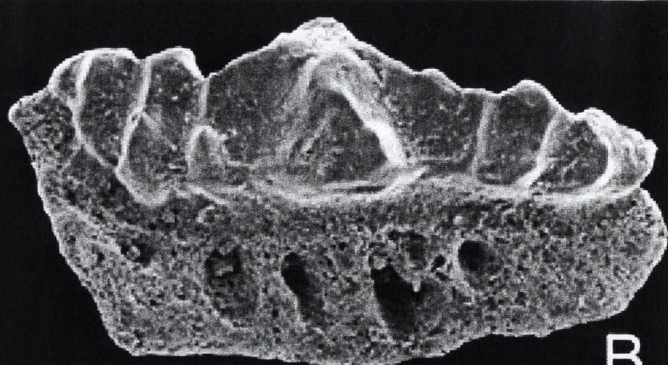
Although similar to specimens assigned to Morphotype 1, these teeth tend to be more triangular than elongate.

TCD 36770 shows a curved median crest; while TCD 36771 E & F show a deeply incised ventral foramen along the labial surface especially under the labial buttress.

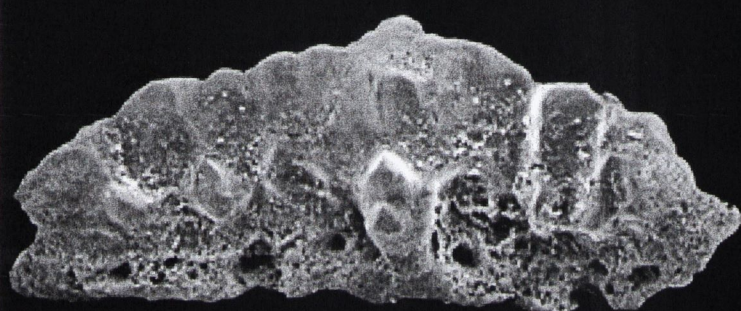
(scale bar: A-G 200µm; H 100µm)



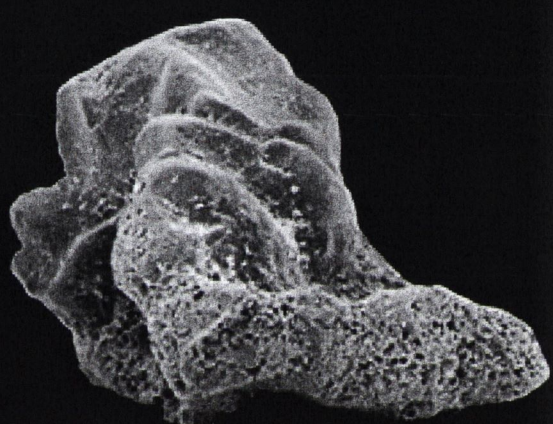
A



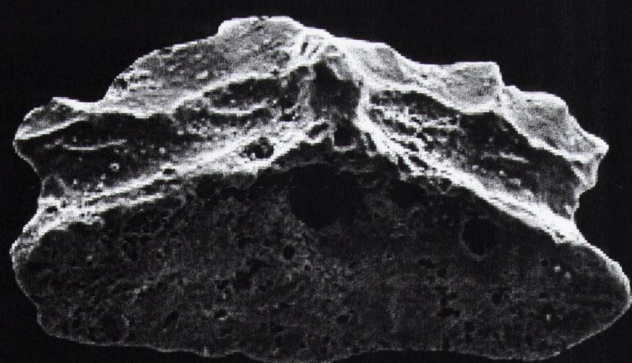
B



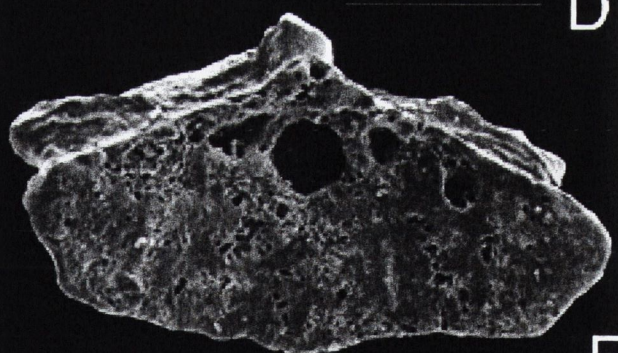
C



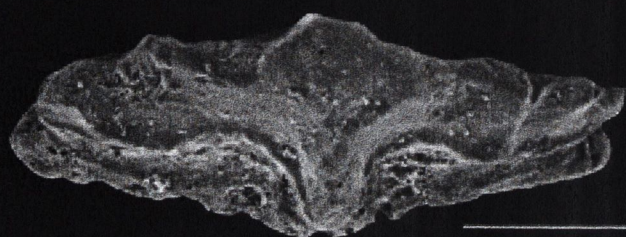
D



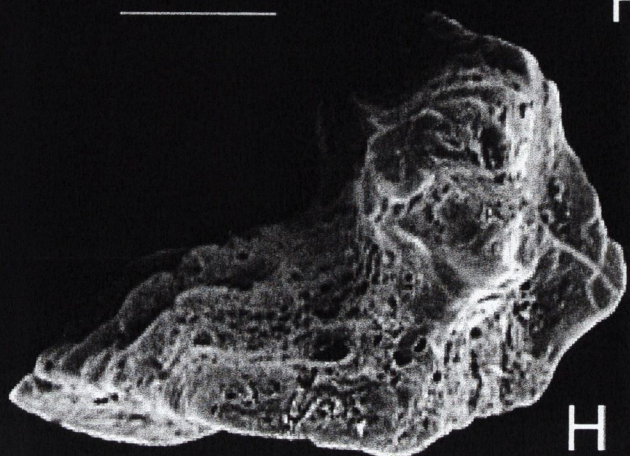
E



F



G



H

Plate 24

***Lissodus* Morphotype 4**

Figures A-D Kilbride TCD 36772

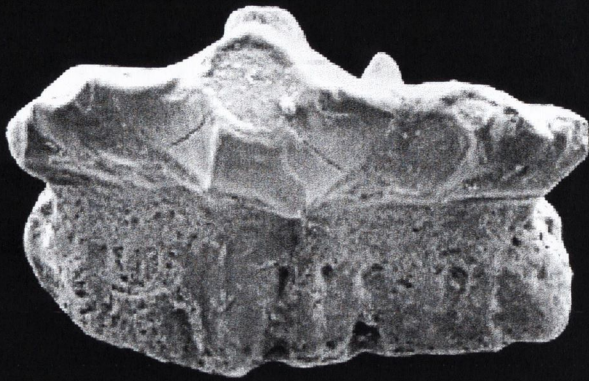
A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

Figures E-F Kilbride TCD 36773

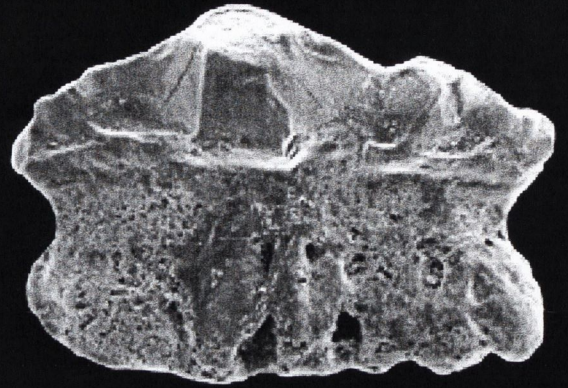
E - Dorsal view; F - Semi-dorso-lingual view

Note the labial buttress and labial nodes.

(scale bar: A-F 200µm)



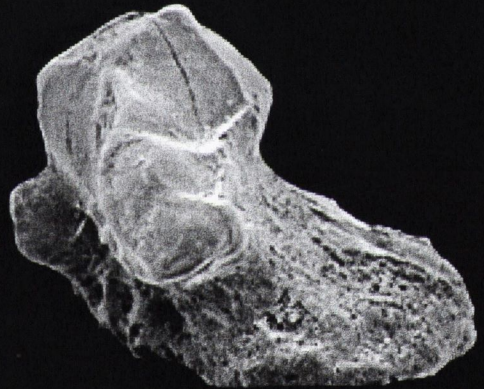
— A



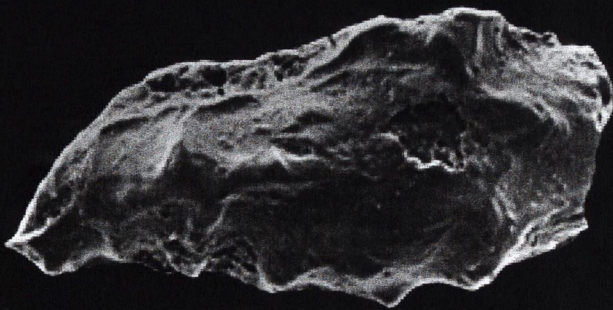
— B



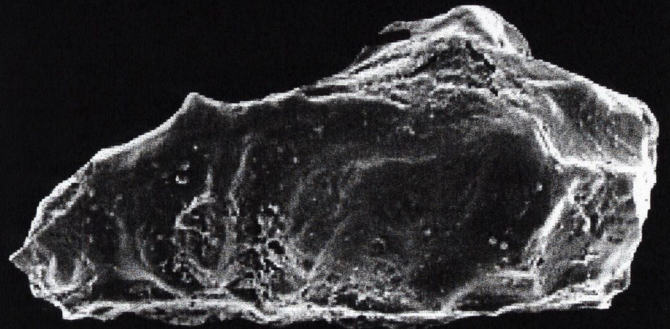
— C



— D



— E



— F

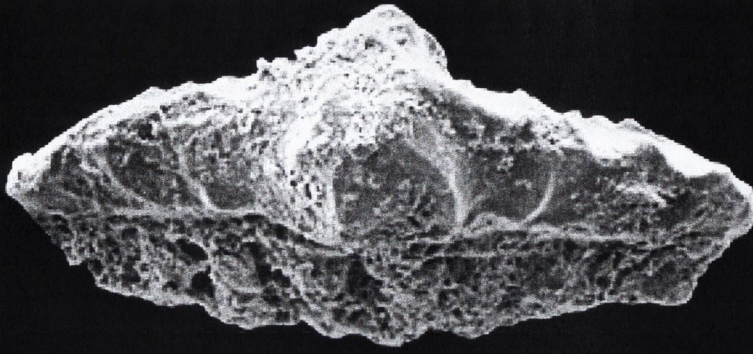
Plate 25

Lissodus Morphotype 4

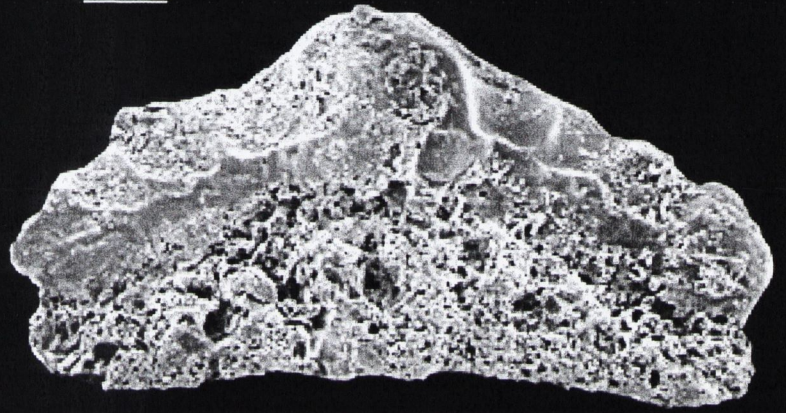
Figures A-D Kilbride TCD 36774

A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

(scale bar: A-D 200 μ m)



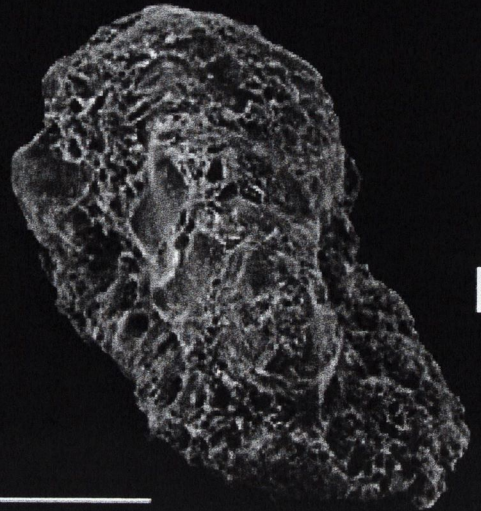
A



B



C



D

Plate 26

Lissodus Morphotype 5

Figures A-D **Kilbride TCD 36775**

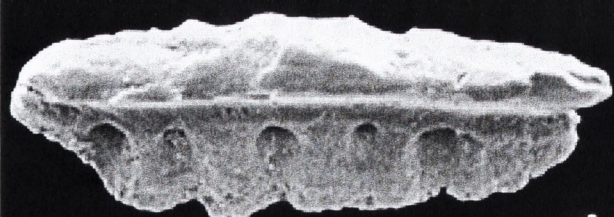
A - Dorsal view; B - Lingual view; C - Labial view;
D - Lateral view

Note the smoother, less ribbed crown and the shallow buttress.

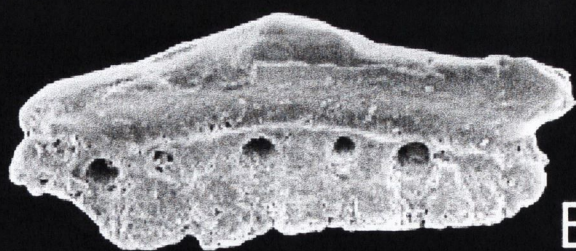
Figures E-H **Kilbride TCD 36776**

E - Dorsal view; F - Lingual view; G - Labial view; H - Lateral view
Shows some ornamentation with labial buttress and nodes.

(scale bar: A-C & E-G 200µm; D & H 100µm)



A



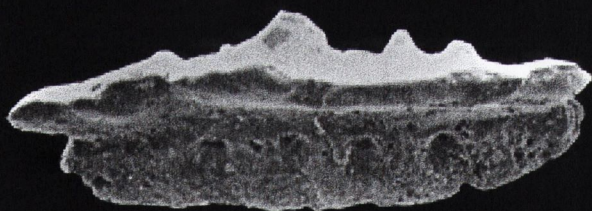
B



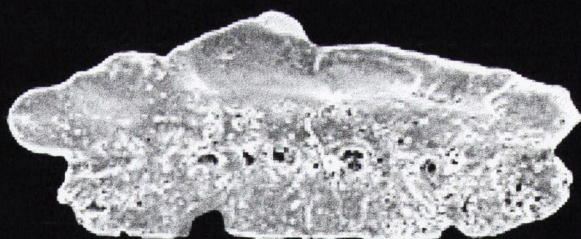
C



D



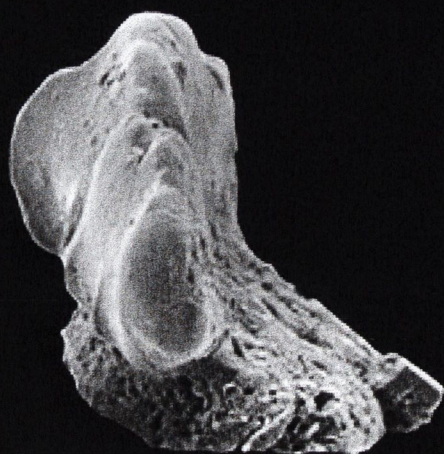
E



F



G



H

Plate 27

Lissodus Morphotype 5

Figures A-D **Kilbride TCD 36777**

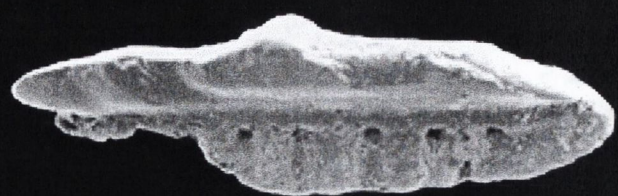
A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E-H **Kilbride TCD 36778**

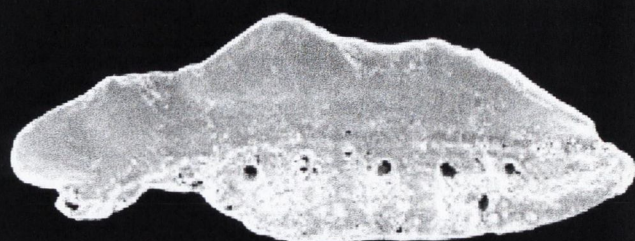
E - Dorsal view; F - Lingual view; G - Labial view; H - Lateral view

These specimens slight ornamentation with minor labial buttress, and the deep expanded foramen.

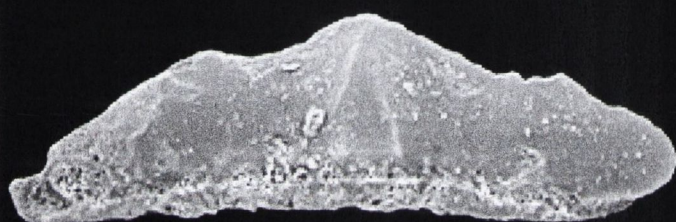
(scale bar: A-C 500 μ m; D-G 200 μ m; H 100 μ m)



A



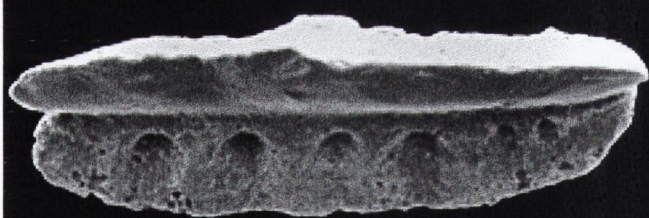
B



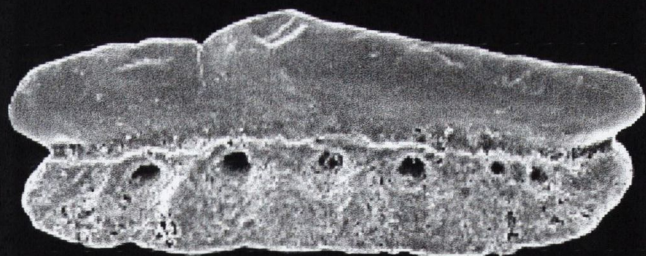
C



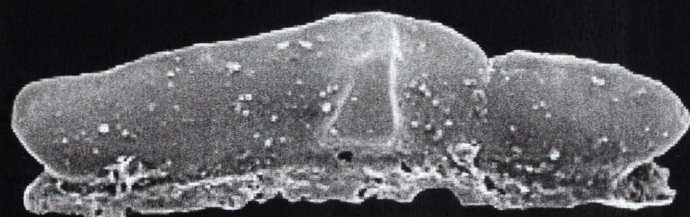
D



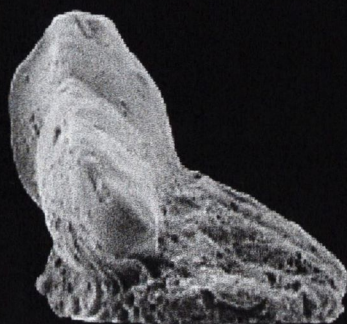
E



F



G



H

Plate 28

Lissodus Morphotype 5

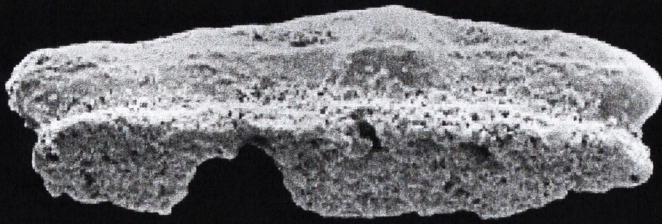
Figures A-C **Kilbride TCD 36779**

A - Ventro-labial view; B - Ventral view; C - Dorsal view
Worn but still shows subdued ornamentation.

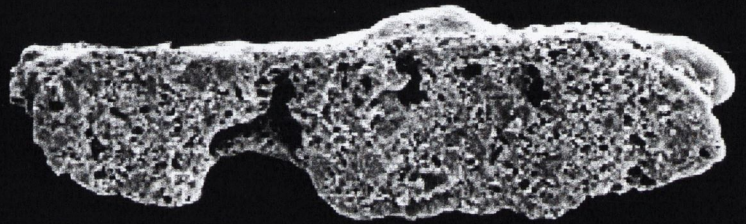
Figures D-F **Kilbride TCD 36780**

D - Dorsal view; E - Lingual view; F - Lateral view

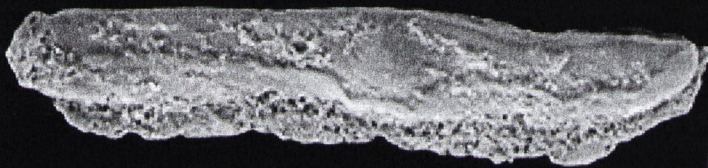
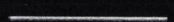
(scale bar: A-C & F 200µm; D-E 500µm)



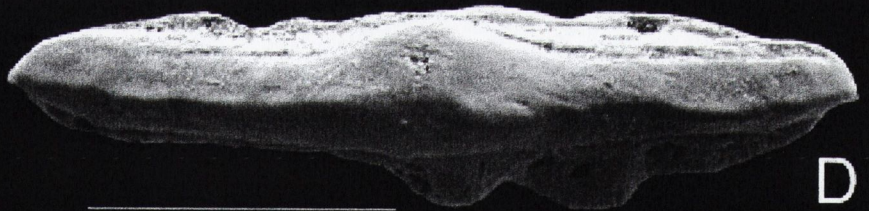
A



B



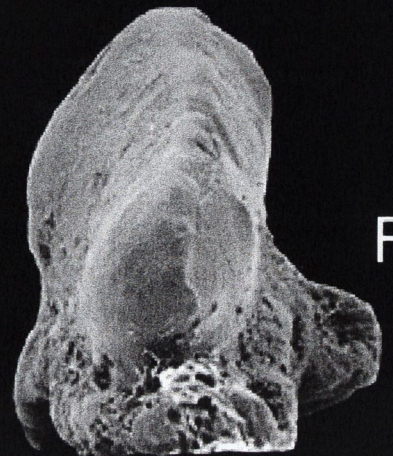
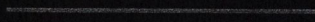
C



D



E



F



Plate 29

Lissodus Morphotype 1

Figures A-D **Kilbride TCD 36781**

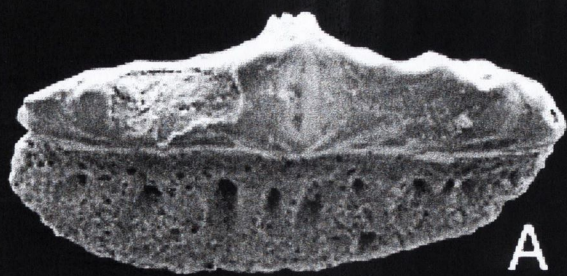
A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E-H **Kilbride TCD 36782**

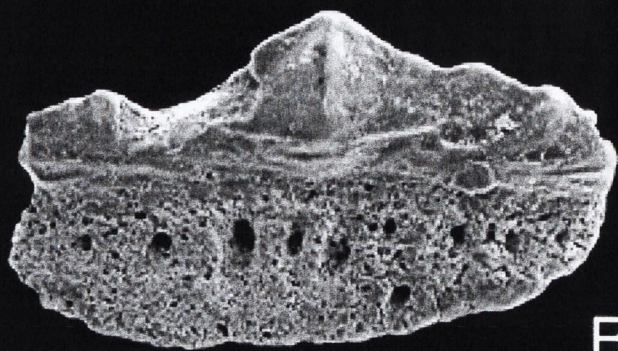
E - Dorso-lingual view; F - Lingual view; G - Labial view;
H - Lateral view

Note the labial buttress, the minor lingual buttress and the curved ribs from the median crest to the crown-base interface.

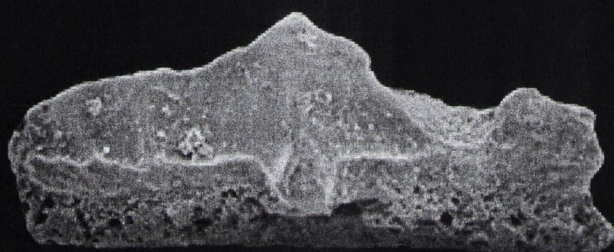
(scale bar: A-H 200µm)



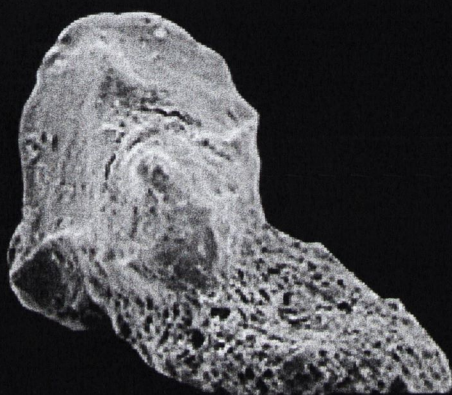
A



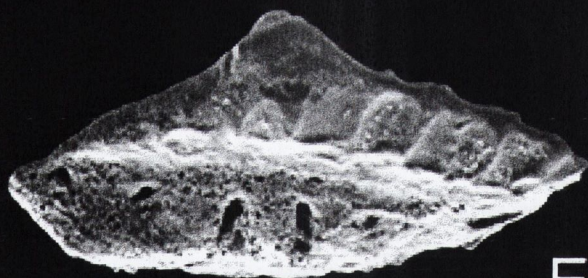
B



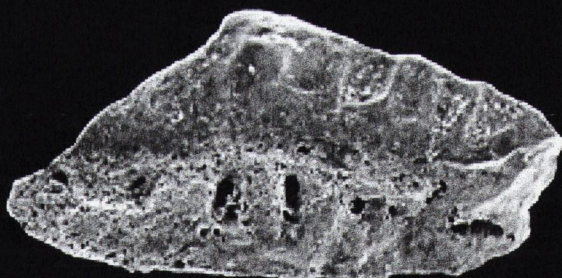
C



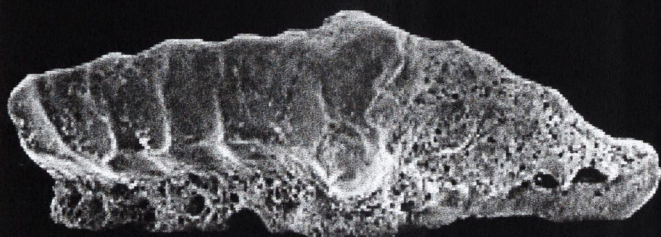
D



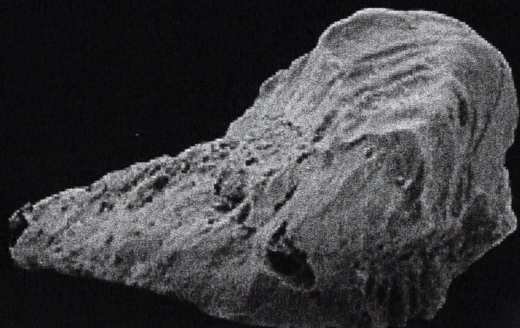
E



F



G



H

Plate 30

Lissodus Morphotype 5

Figures A-D **Kilbride TCD 36783**

A - Dorso-lingual view; B - Labial view; C - Lingual view;
D - Lateral view

Figures E-H **Kilbride TCD 36784**

E - Dorsal view; F - Lingual view; G - Labial view; H - Lateral view

Note near absence of ornamentation and minor labial buttress.

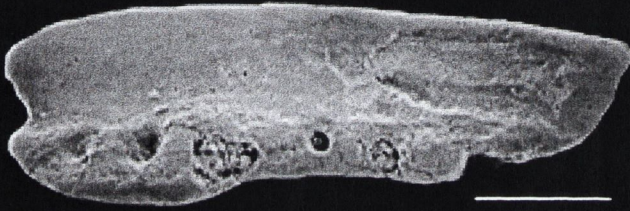
(scale bar: A-C & E-H 200µm; D 100µm)



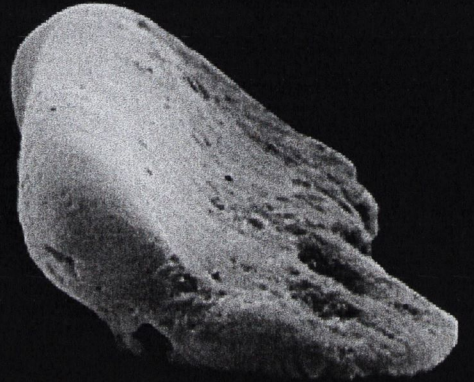
A



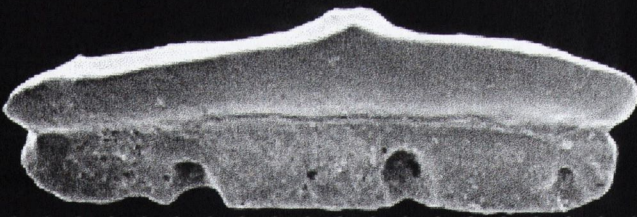
B



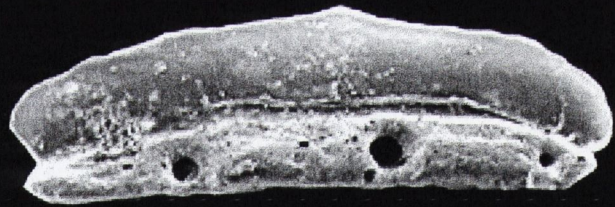
C



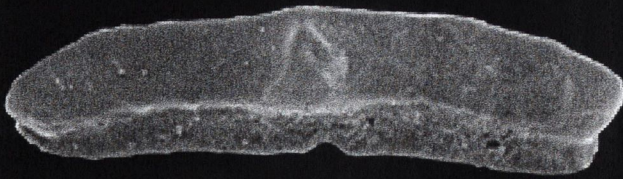
D



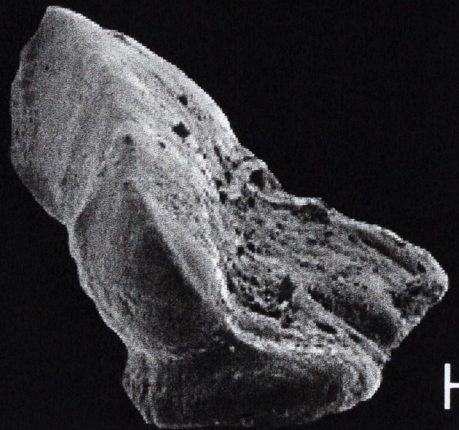
E



F



G



H

Plate 31

Lissodus Morphotype 5

Figures A-D **Kilbride TCD 36785**

A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

Figures E-H **Kilbride TCD 36786**

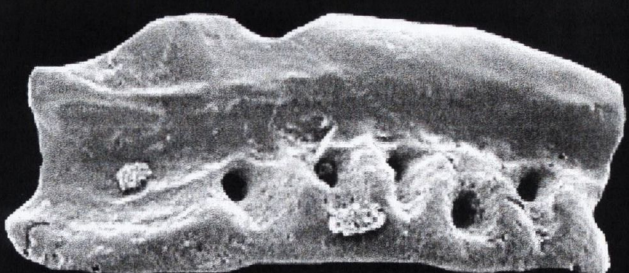
E - Dorso-lingual view; F - Lingual view; G - Lateral view;
H - Labial view

Note the absence of ornamentation and reduced buttress compared to Morphotype 1.

(scale bar: A-C & G 200 μ m; D 100 μ m; E-F & H 500 μ m)



A



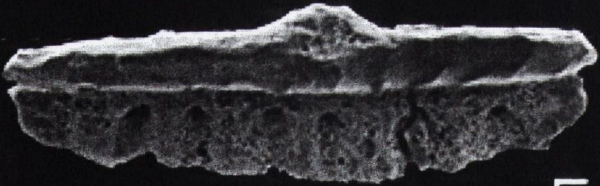
B



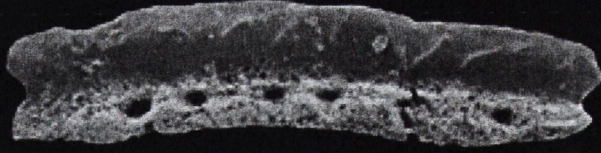
C



D



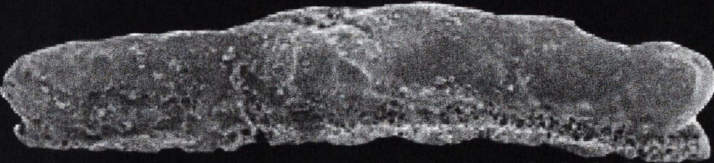
E



F



G



H

Plate 32

Lissodus Morphotype 5

Figures A-D **Kilbride TCD 36787**

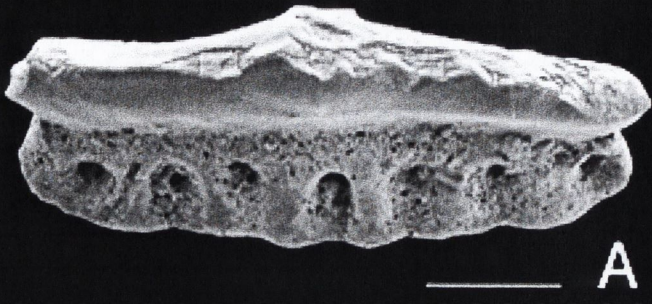
A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

Figures E-H **Kilbride TCD 36788**

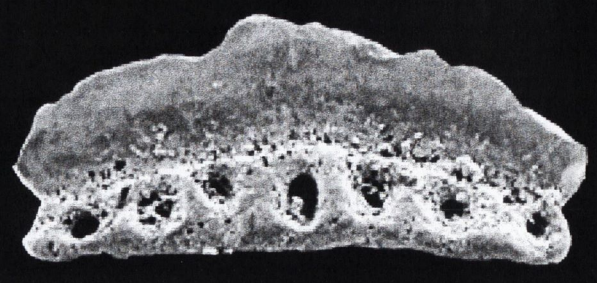
E - Dorsal view; F - Lingual view; G - Labial view; H - Lateral view

These specimens show reduced ornamentation, labial buttresses
and labial nodes together with discernible lingual buttresses.

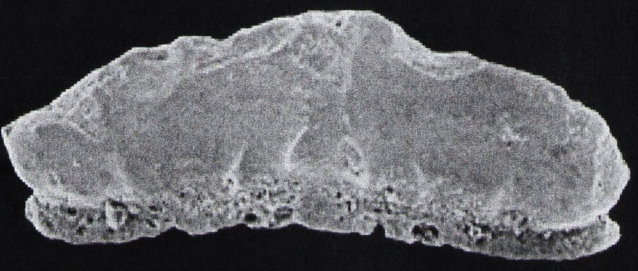
(scale bar: A-H 200µm)



A



B



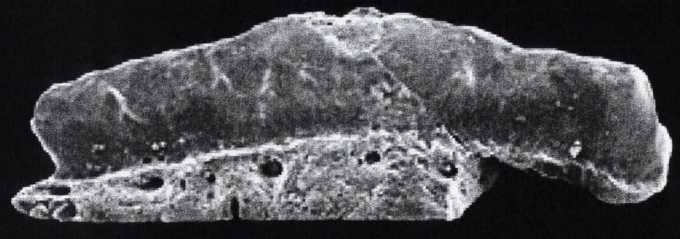
C



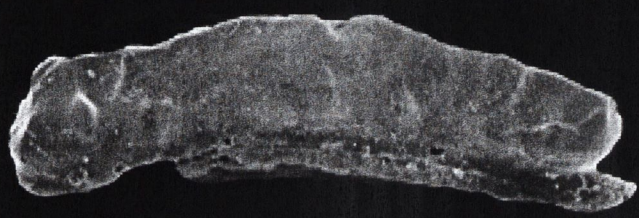
D



E



F



G



H

Plate 33

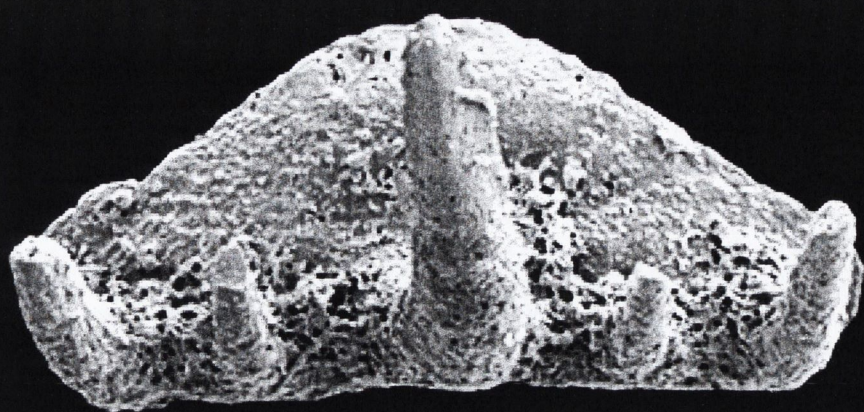
cf. *Denaea*

Figures A-D **Kilbride TCD 36744**

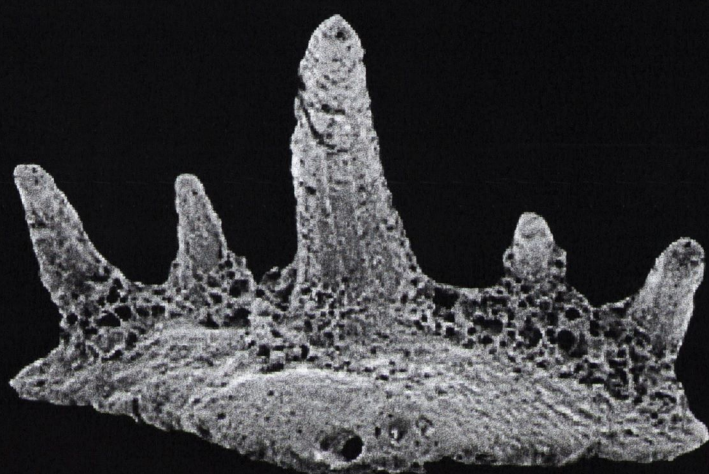
A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Note the linear orientation of the cusps along the labial edge of the base; the pentagonal to hexagonal shape of the base; the basal foramen along the lower linguo-dorsal margin; the undulating labio-ventral margin with arches beneath the secondary cusps. There is no pronounced apical button.

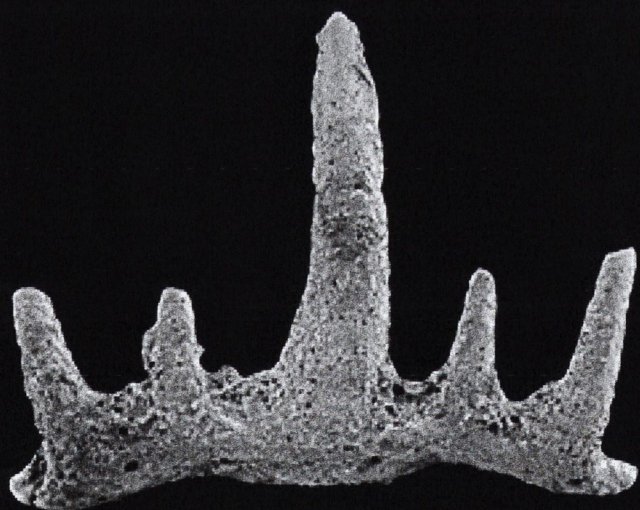
(scale bar: A-B & D 200 μ m; C 500 μ m)



A



B



C



D

Plate 34

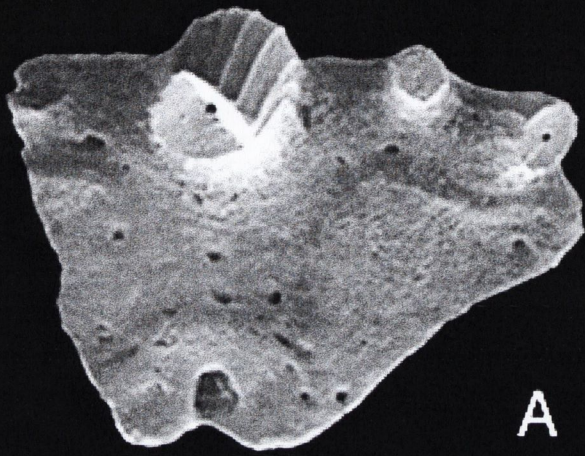
cf. Denaea

Figures A-F **Kilbride TCD 36745**

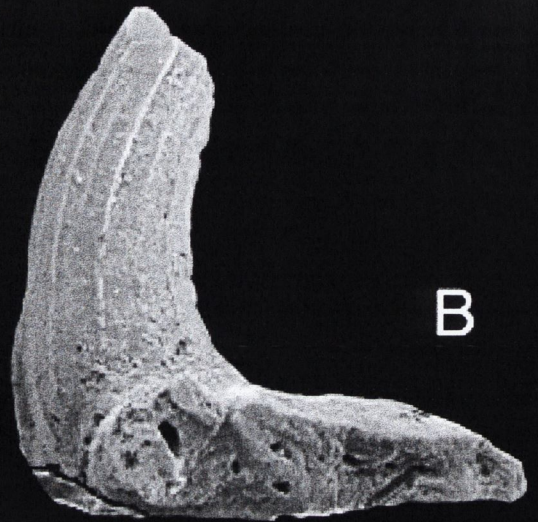
A - Dorsal view; B - Lateral view; C - Dorsal view; D - Lingual view;
E - Labial view; F - Lateral view

Although broken, the lack of pronounced apical button and the basal canal low on the linguo-dorsal margin area are clear.

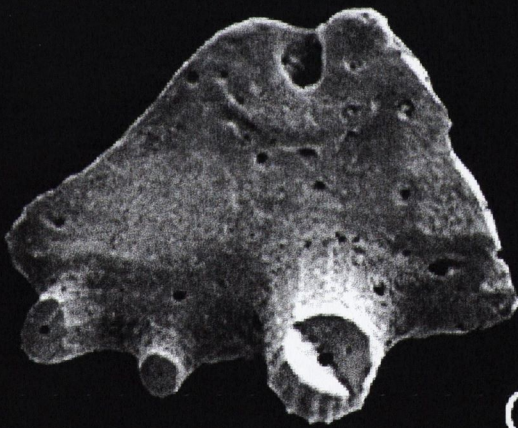
(scale bar: A-D & F 500µm; E 200µm)



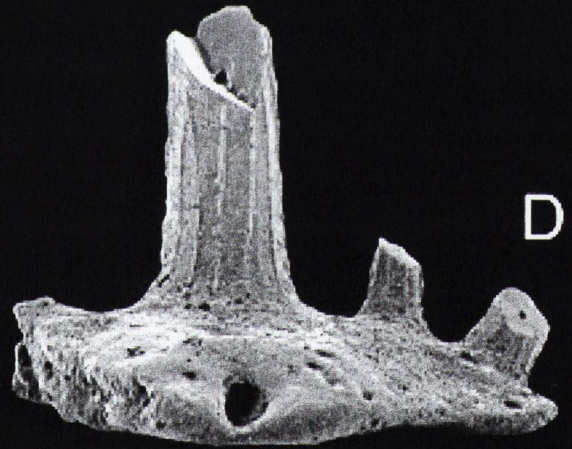
A



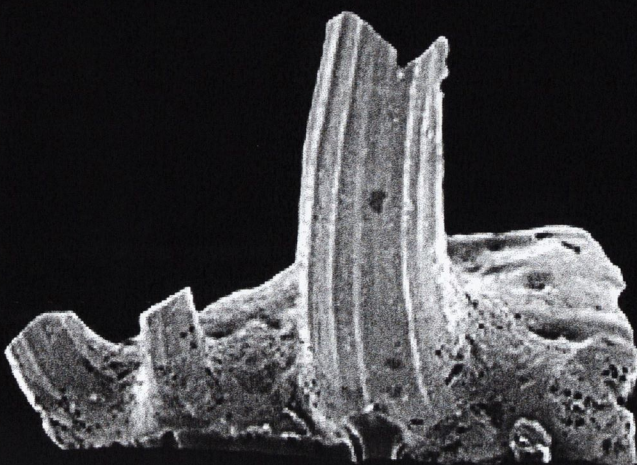
B



C



D



E



F

Plate 35

cf. Denaea

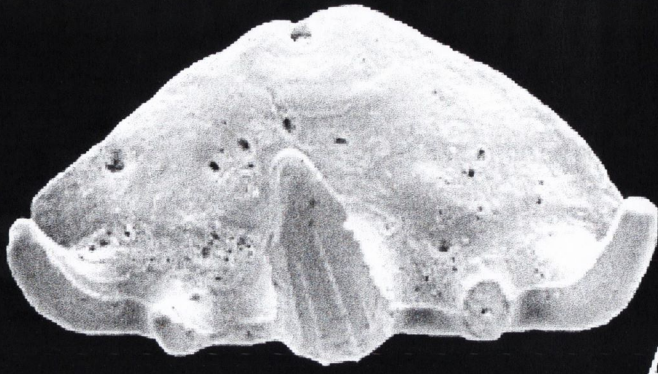
Figures A-E **Kilbride TCD 36746**

A - Dorsal view; B - Oblique labial view; C - Dorsal view;

D - Labial view; E - Lateral view

Similar to TCD 36744 but shows less lingual curvature of the principal and tertiary cusps compared to the secondary cusps.

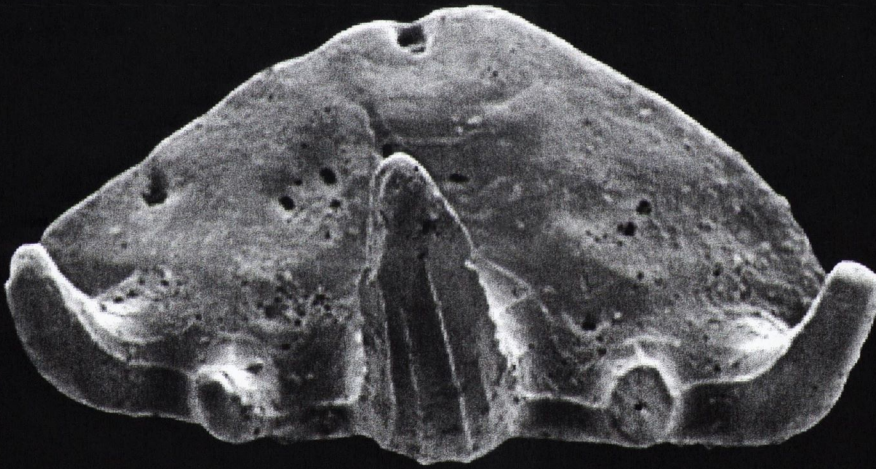
(scale bar: A & C 200µm; B, D-E 500µm)



A



B



C



D



E

Plate 36

cf. *Denaea*

Figures A-D **Kilbride TCD 36747**

A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Shows a pair of broken secondary auxiliary cusps.

(scale bar: A-C 500µm; D 200µm)

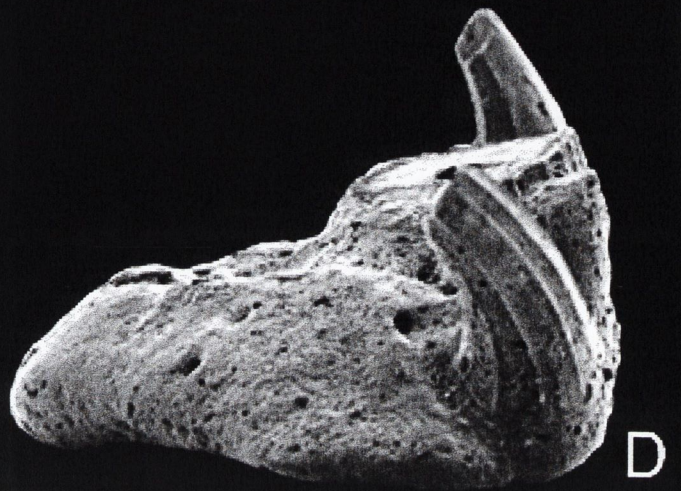
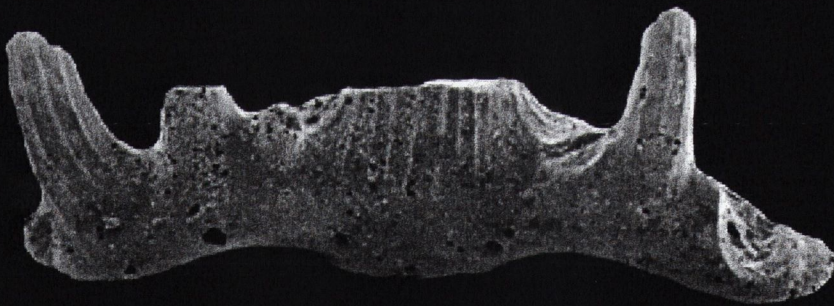
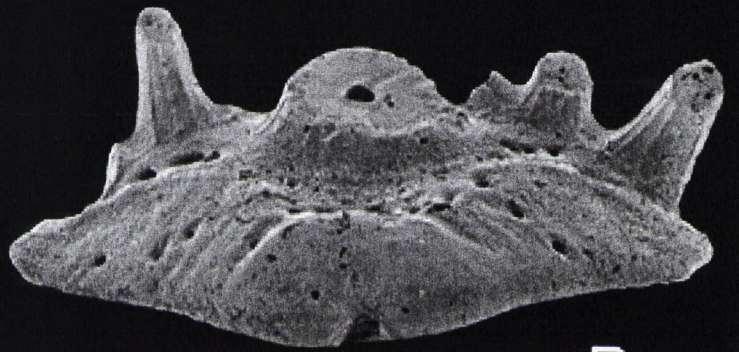
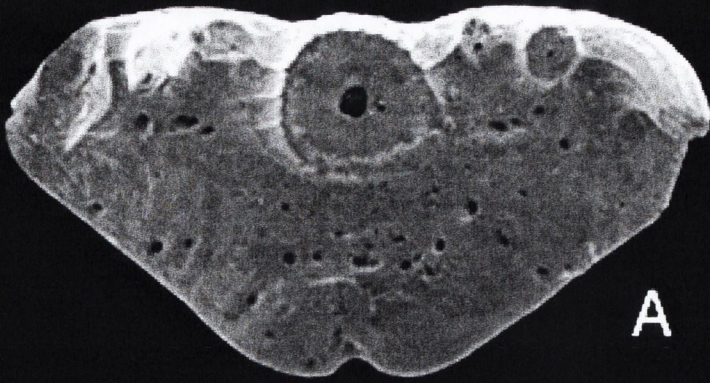


Plate 37

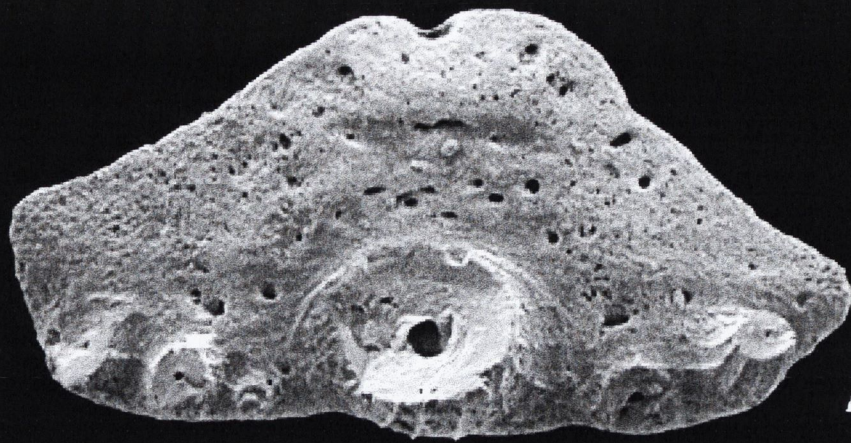
cf. Denaea

Figures A-D Kilbride TCD 36748

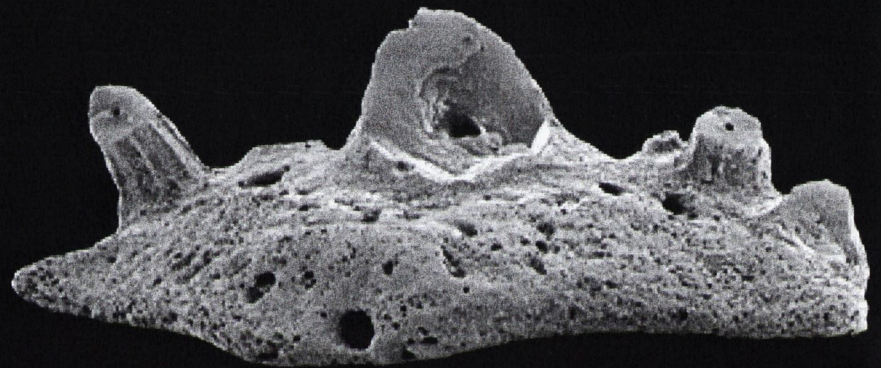
A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Note the single broken secondary auxiliary cusp.

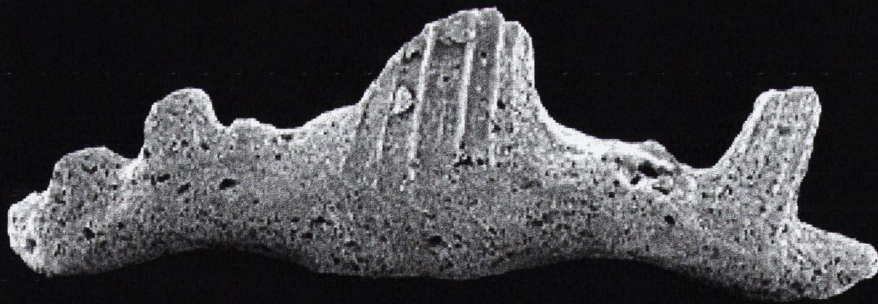
(scale bar: A-C 500µm; D 200µm)



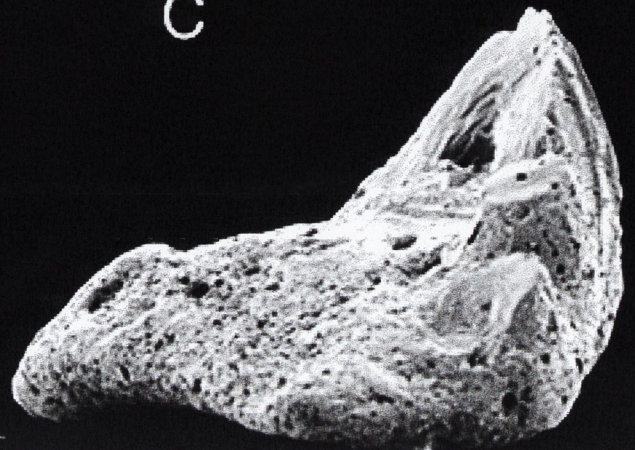
A



B



C



D

Plate 38

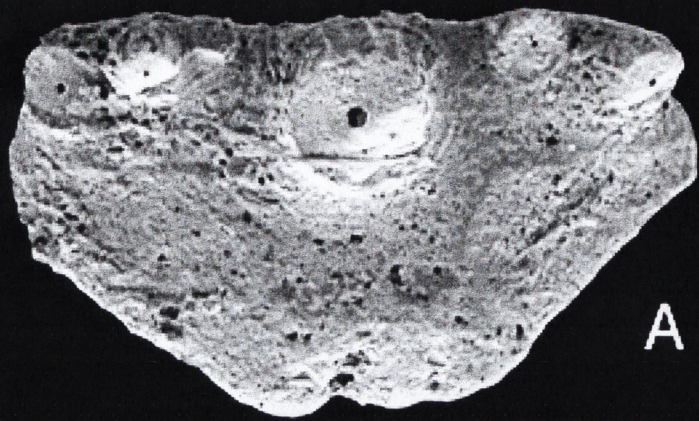
cf. *Denaea*

Figures A-D **Kilbride TCD 36749**

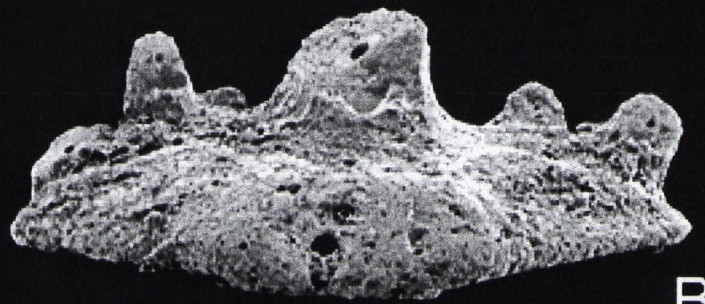
A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

More worn than other specimens but still shows similar gross morphology.

(scale bar: A-C 500 μ ; D 200 μ m)



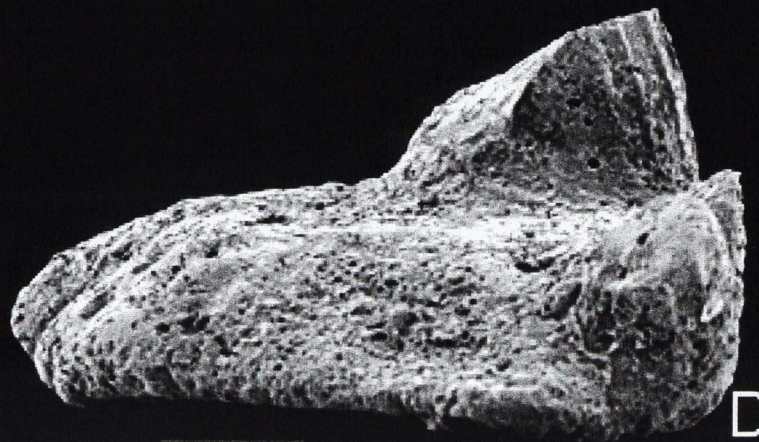
A



B



C



D

Plate 39

cf. *Danaea*

Figures A-F **Kilbride TCD 36750**

A -Dorsal view; B -Lingual view; C - Labial view; D - Lateral view;

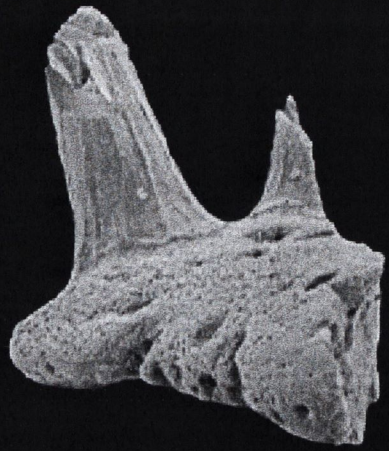
E - Dorsal view; F - Lingual view

Note the broken cross-section in lateral view (D & F) of the base and the secondary cusp.

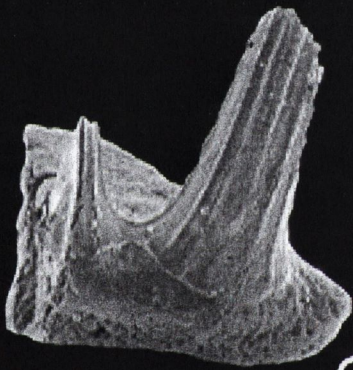
(scale bar: A & E 500 μ m; B-D & F 200 μ m)



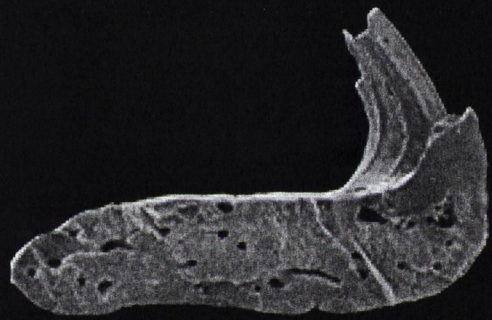
A



B



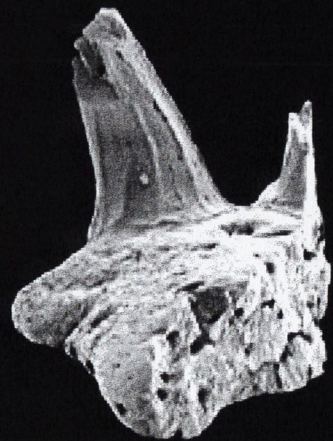
C



D



E



F

Plate 40

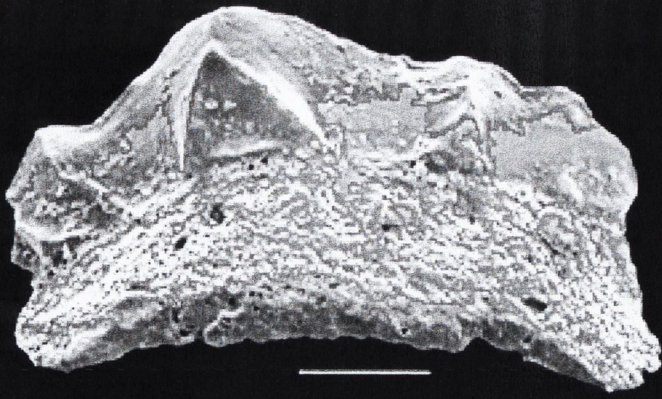
Protacrodus Morphotype 1

Figures A-B Kilbride TCD 36789
A - Lingual view; B - Dorsal view

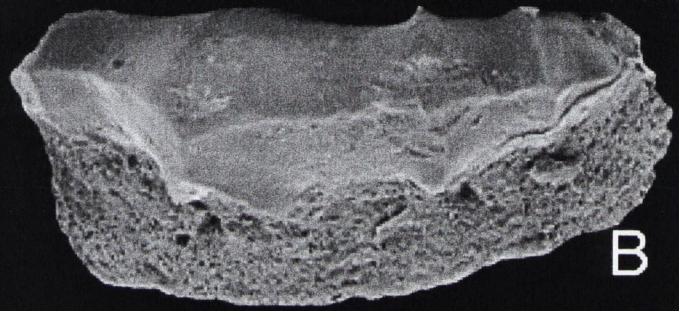
Protacrodus Morphotype 2

Figures C-E Kilbride TCD 36790
C - Lingual view; D - Vento-lingual view; E - Dorsal view
Note the labio-laterally compressed cusps whose apices are
lingually angled and the curved ribs on both surfaces of the crown.

(scale bar: A-E 200µm)



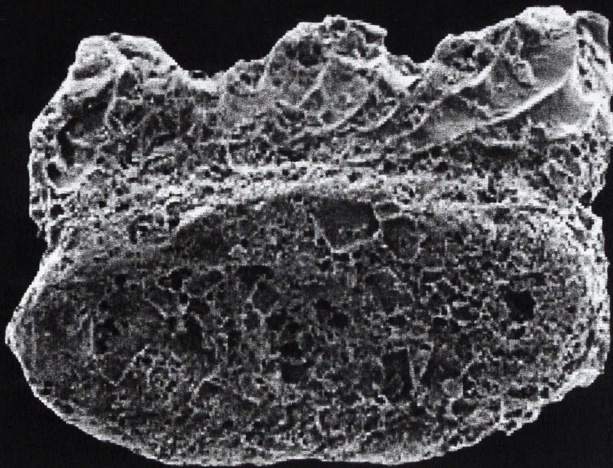
A



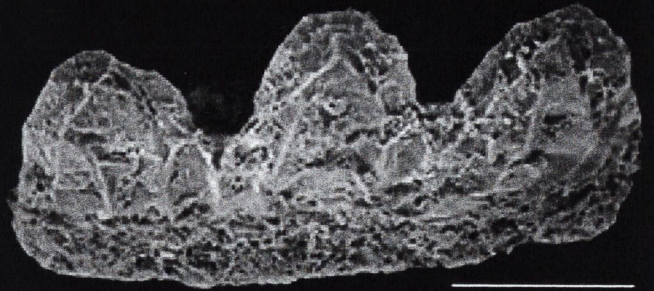
B



C



D



E

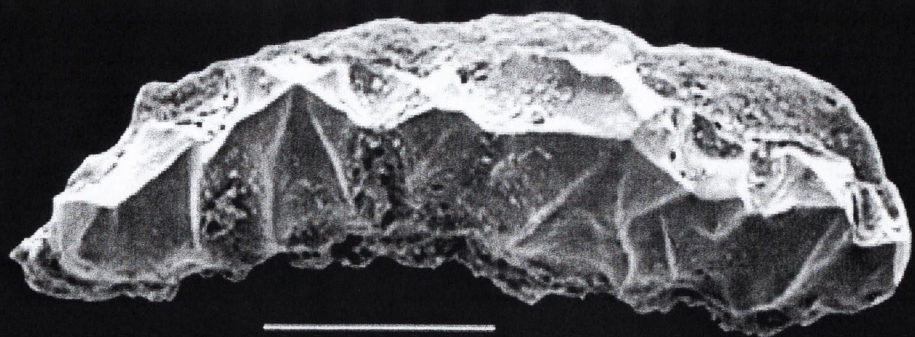
Plate 41

Protacrodus Morphotype 3

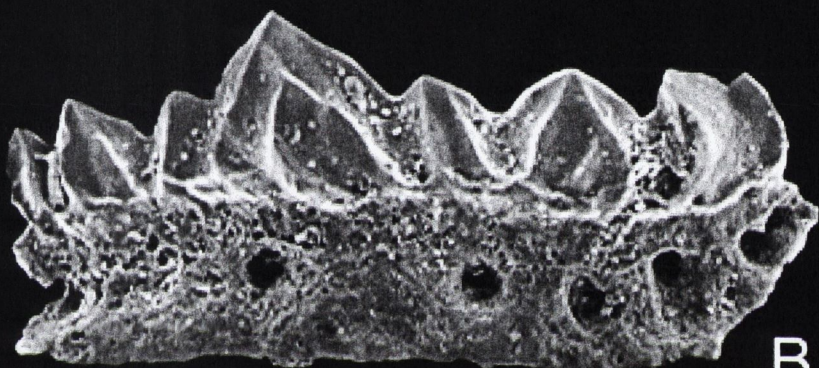
Figures A-D **Urlingford TCD 36791**

A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view
Note in particular the pointed apices and the repeatedly bifurcating
ribs together with the numerous basal foramina.

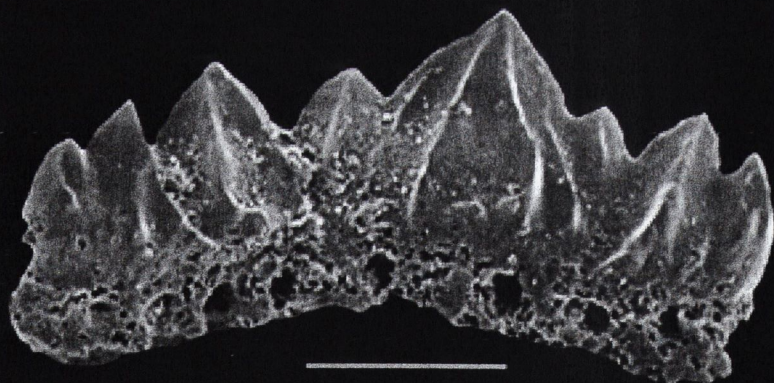
(scale bar: A-D 200µm)



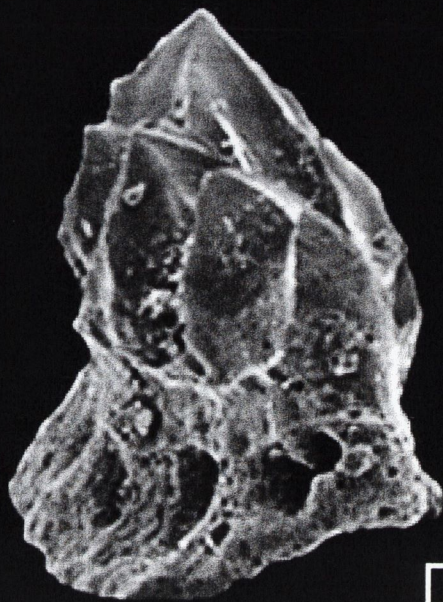
A



B



C



D

Plate 42

Lissodus Morphotype 2

Figures A-C Kilbride TCD 36765

A - Dorsal view; B - Lingual view; C - Lingual view

Lissodus Morphotype 3

Figures D-F Kilbride TCD 36768

D - Dorso-lingual view; E - Labial view; F - Lingual view

Tricuspid Tooth

Figures G-I Kilbride TCD 36809

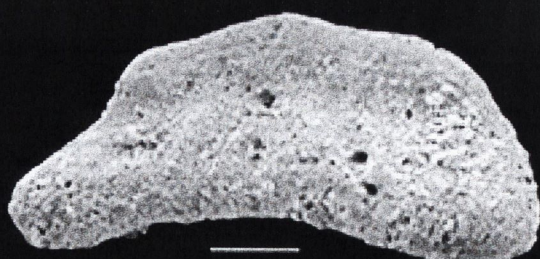
G - Lingual view; H - Dorsal view; I - Oblique Lingual view

Three cusps are in an arc along the labial margins with the central cusps higher than the others; note the extension of the central cusp into a labial buttress which runs into the base.

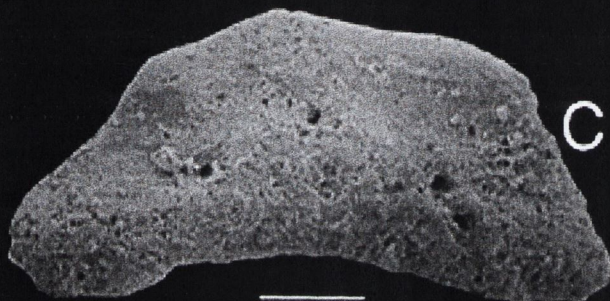
(scale bar: A-I 200µm)



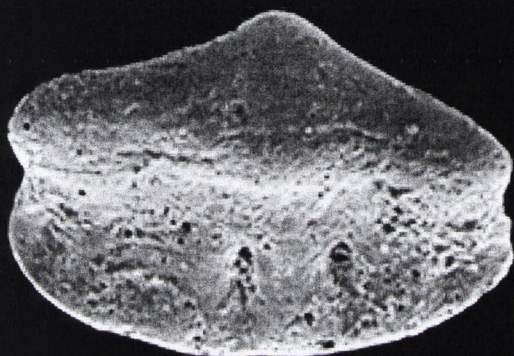
A



B



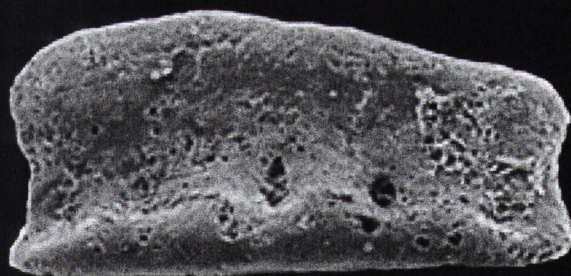
C



D



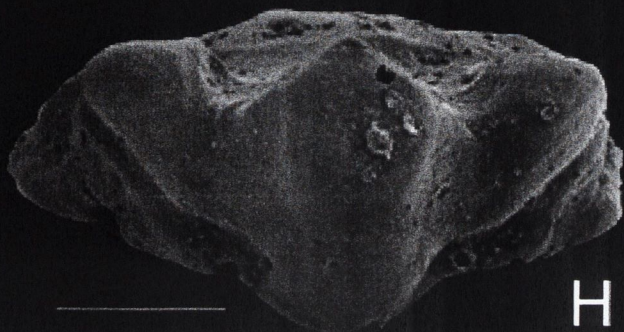
E



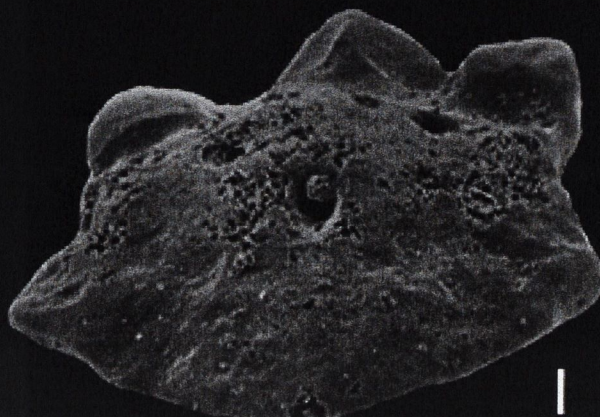
F



G



H



I

Plate 43

Chondrichthyan Pavement Dentition Morphotype 1

Figures A-C **Kilbride TCD 36731**

A - Dorsal view; B - Lingual view; C - Labial view

Figures D-F **Kilbride TCD 36732**

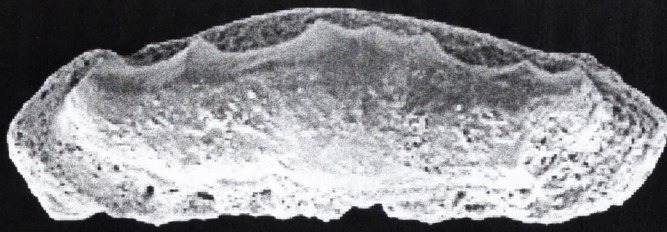
D - Dorsal view; E - Lingual view; F - Labial view

Figures G-I **Kilbride TCD 36733**

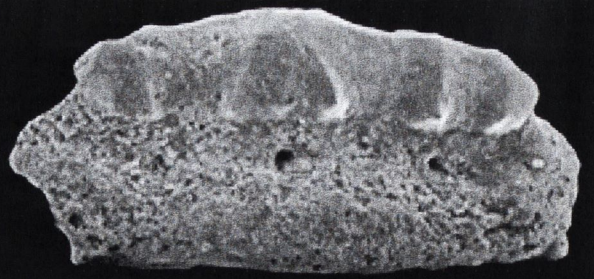
G - Dorsal view; H - Labial view; I - Lingual view

Note how the base exceeds the crown on lingual, labial and lateral surfaces - this is more pronounced in TCD 36731 and 36732 than in TCD 36733.

(scale bar: A, B, E & F 500 μ m; C 100 μ m; D, G-I 200 μ m)



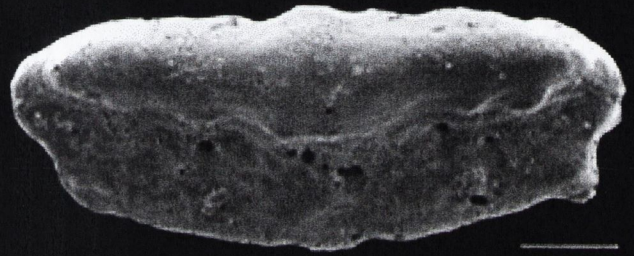
A



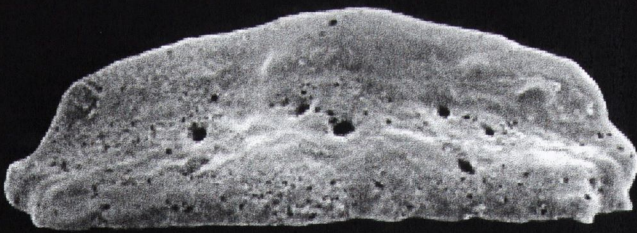
B



C



D



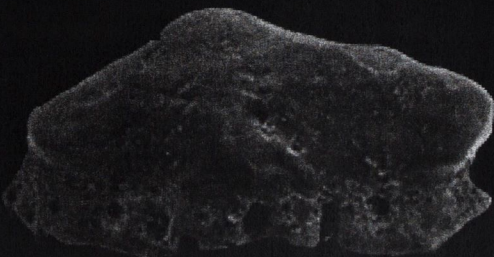
E



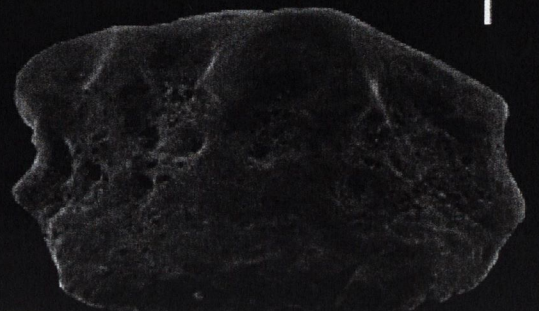
F



G



H



I

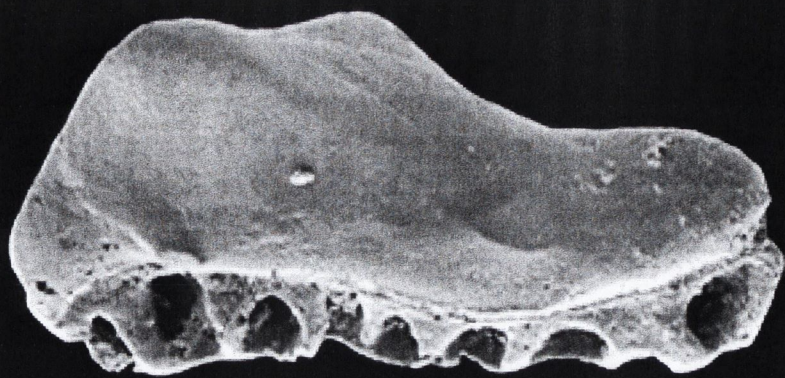
Plate 44

Chondrichthyan Pavement Dentition 2

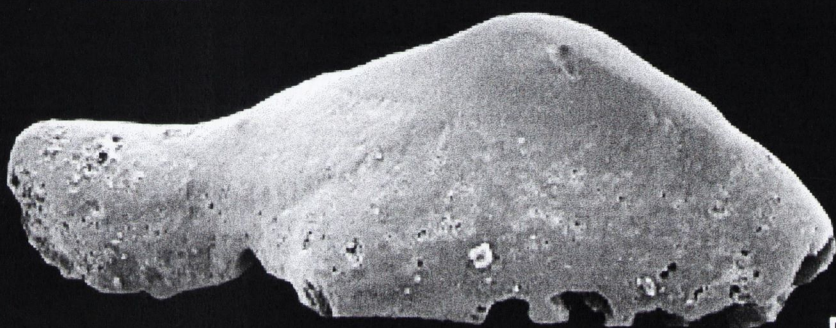
Figures A-D Kilbride TCD 36734

A - Dorsal view; B - Labial view; C - Lingual view; D - Lateral view
Note the strong asymmetry especially of the crown and lack of
ornamentation together with the deeply incised expanded basal
foramen.

(scale bar: A-D 200µm)



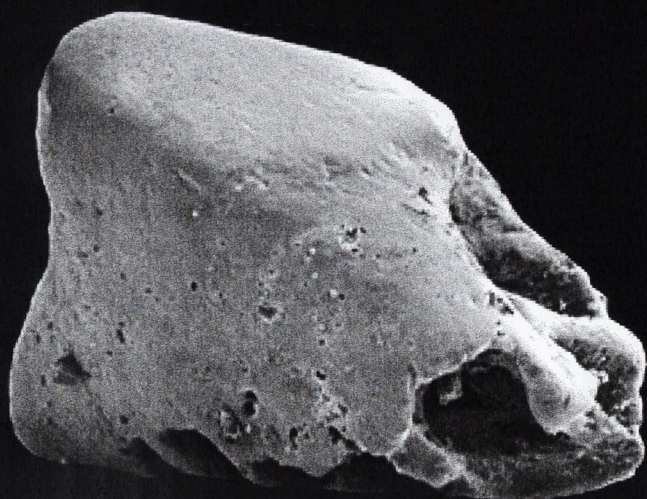
A



B



C



D

Plate 45

Chondrichthyan Pavement Dentition Morphotype 3

Figures A-D **Kilbride TCD 36735**

A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E **Lyraun Cove TCD 36736**

E - Lingual view

Figures F-H **Lyraun Cove TCD 36737**

F - Lingual view; G - Lingual view; H - Labial view

Note that all the basal foramina have slanted furrows.

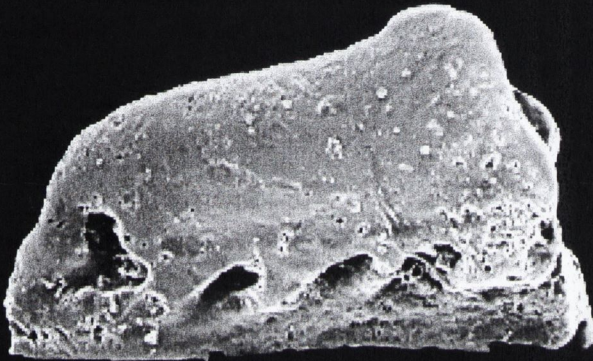
(scale bar: A-D 200 μ m; E-H 500 μ m)



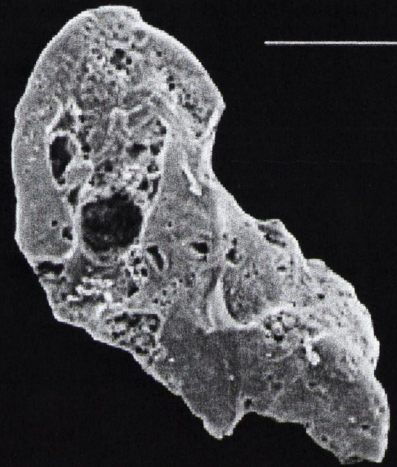
A



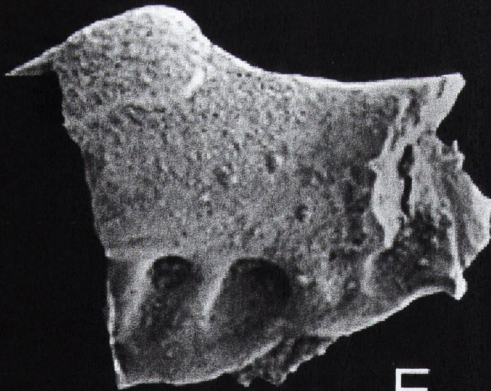
B



C



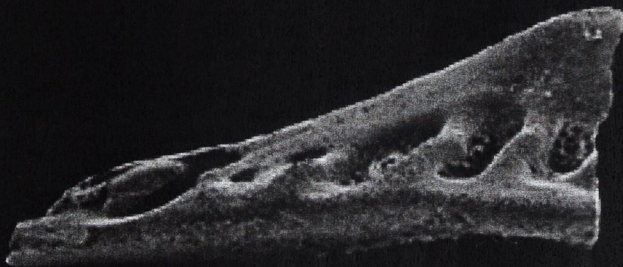
D



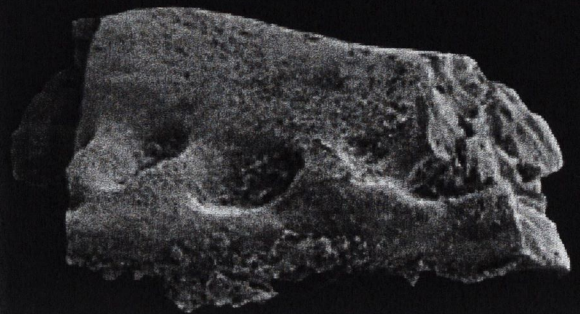
E



F



G



H

Plate 46

Chondrichthyan Pavement Dentition Morphotype 4

Figures A-C Kilbride TCD 36738

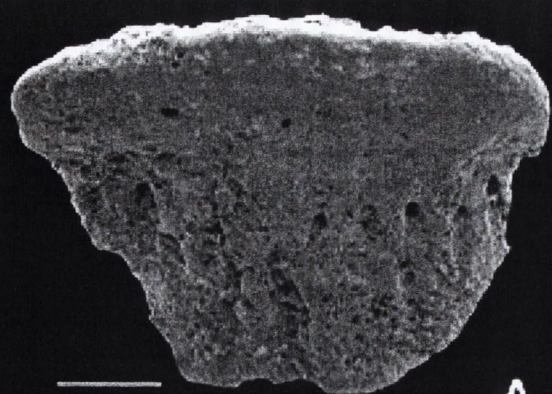
A - Dorso-lingual view; B - Lingual view; C - Lateral view

Figures D-G Kilbride TCD 36739

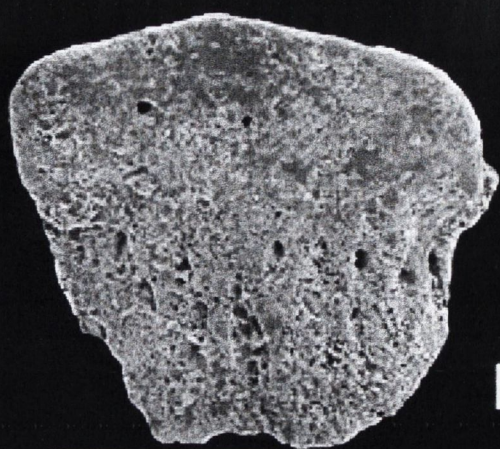
D - Dorso-lingual view; E - Lingual view; F - Labial view;
G - Lateral view

Note the long sloping lingual surface of the base and the overhanging crown at both lateral edges.

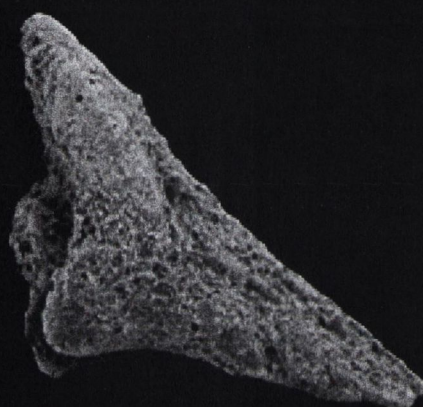
(scale bar: A, C-G 200 μ m; B 500 μ m)



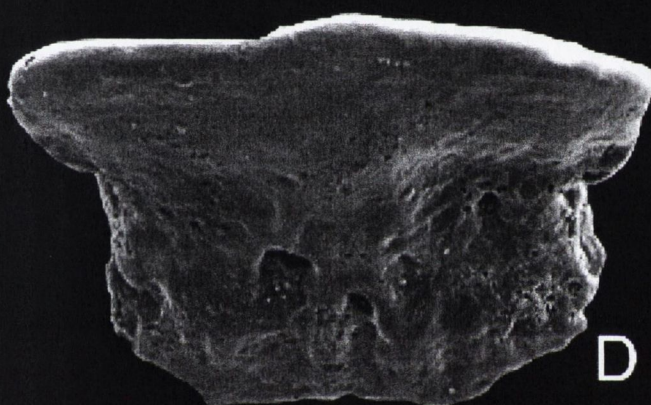
A



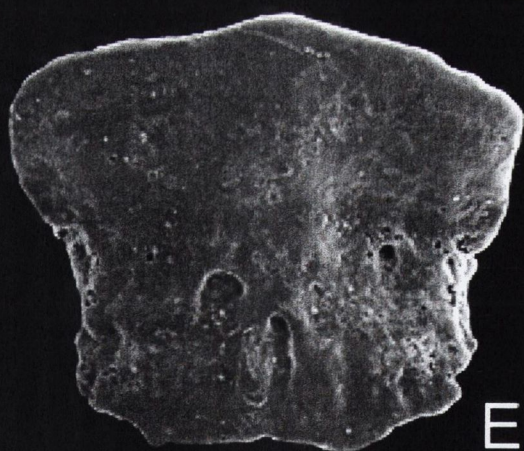
B



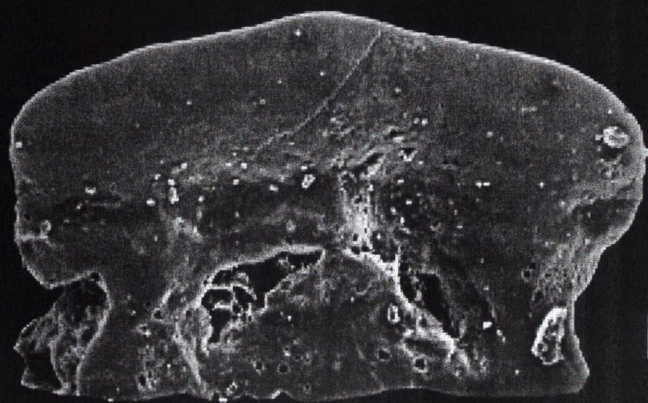
C



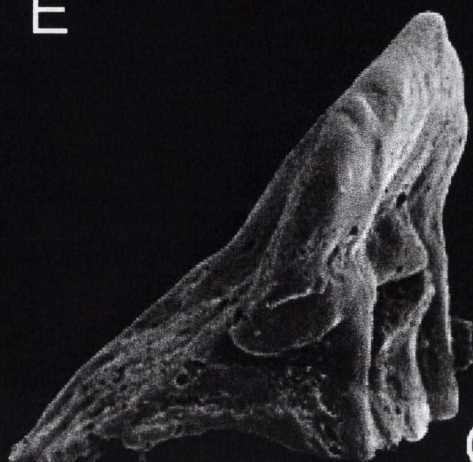
D



E



F



G

Plate 47

Chondrichthyan Pavement Dentition Morphotype 4

Figures A-D Urlingford TCD 36740

A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

(scale bar: A-D 200µm)



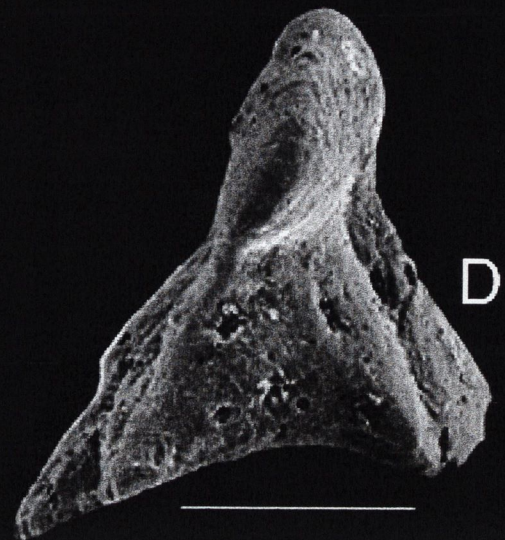
A



B



C



D

Plate 48

Chondrichthyan Pavement Dentition Morphotype 5

Figures A-D **Kilbride TCD 36741**

A - Dorsal view; B - Labial view; C - Lingual view; D - Oblique lateral
view

Joined pair from a pavement

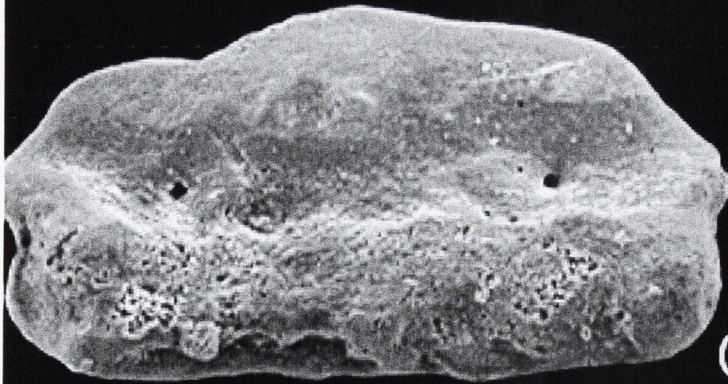
(scale bar: A 500 μ m; B-D 200 μ m)



A



B



C



D



Plate 49

Chondrichthyan Pavement Dentition Morphotype 6

Figures A-D Kilbride TCD 36742

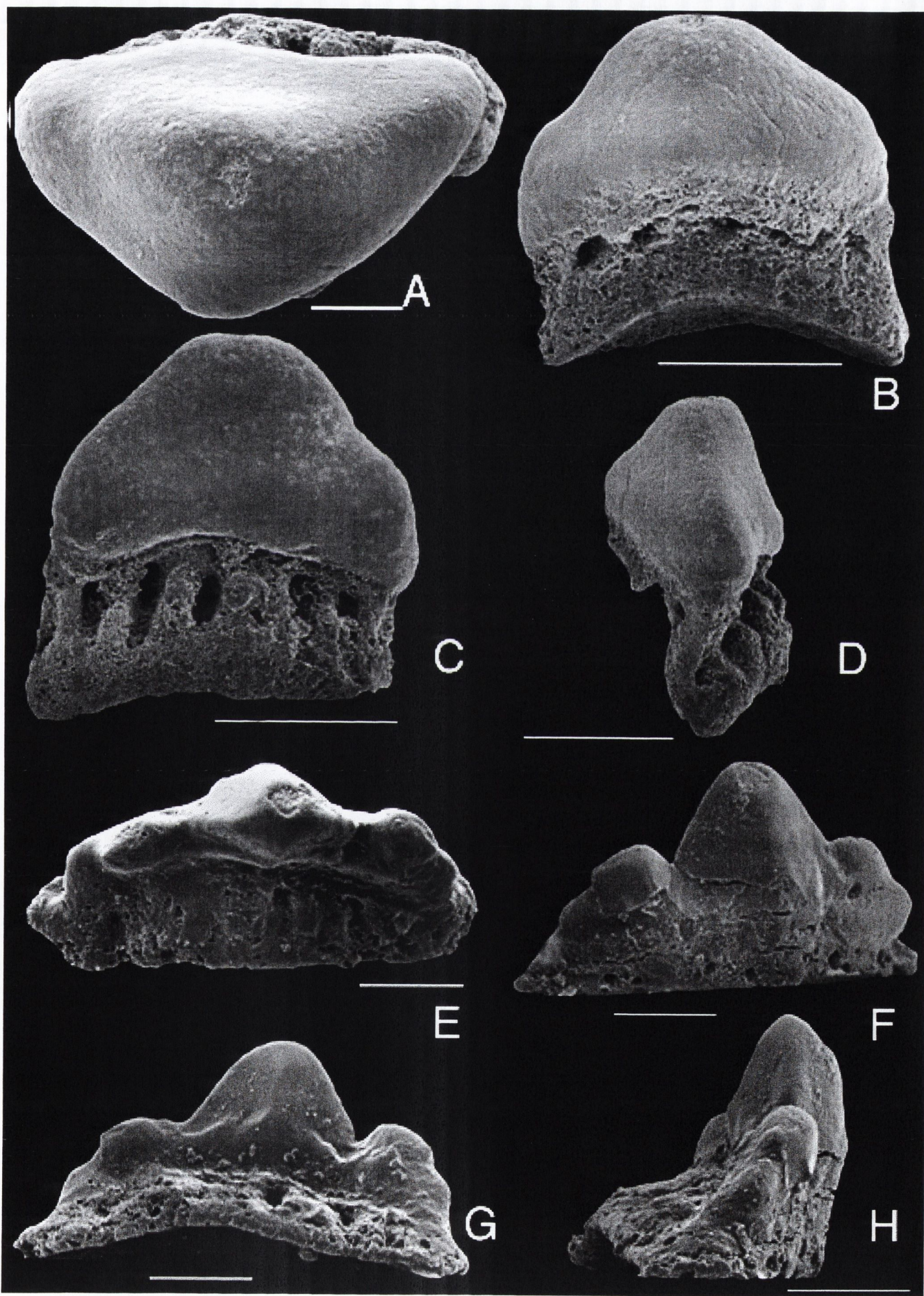
A - Dorsal view; B - Labial view; C - Lingual view; D - Lateral view
Note the triangular nature of the crown in dorsal and lingual or labial view and the long lingual base with deeply incised furrows.

Chondrichthyan Pavement Dentition Morphotype 7

Figures E-H Kilbride TCD 36743

E - Dorsal view; F - Labial view; G - Lingual view; H - Lateral view
Note the five pyramidal cusps on the labial margin of a sub-triangular base.

(scale bar: A, E-H 200 μ m; B-D 500 μ m)



DENTICLES AND SCALES

The following Plates, 50 to 71, show examples of the scales and denticles recovered from the acid insoluble residues used for this study. As these scales and denticles have not been examined in great detail, they are illustrated to demonstrate the variation and diversity recovered. They would require further study to refine their taxonomy, body position, etc.

Plate 50

Actinopterygian scales

Figures A-C **Lyraun Cove TCD 36872**

A & B - Upper surface
Detail of upper surface

Figures D-E **Urlingford TCD 36874**

D - Upper surface
E is a side view

Figure F **Urlingford TCD 36875**

Upper surface

Figures G **Urlingford TCD 36876**

Upper surface

Figure H **Urlingford TCD 36877**

Upper surface

(scale bar: A & B 1000 μ m; C 100 μ m; D-H 200 μ m)



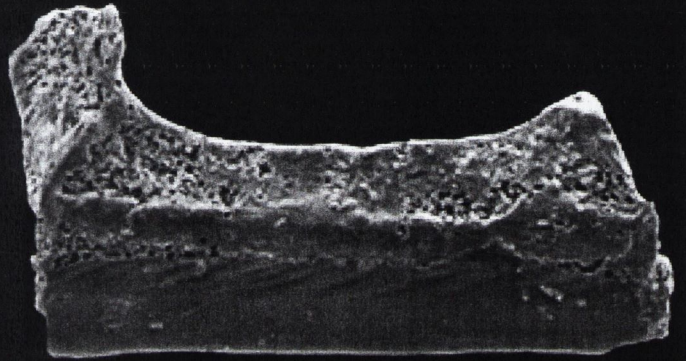
A



B



C



D



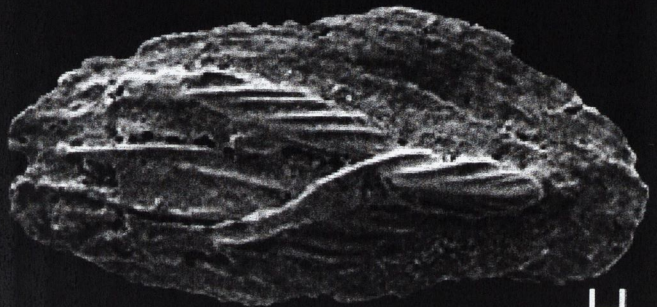
E



F



G



H

Plate 51

Actinopterygian scales

Figure A	Kilbride TCD 36859
Figure B	Kilbride TCD 36860
Figure C	Kilbride TCD 36861
Figure D	Kilbride TCD 36864
Figure E	Kilbride TCD 36865
Figure F	Kilbride TCD 36867
Figure G	Kilbride TCD 36868
Figure H	Kilbride TCD 36869
Figure I	Kilbride TCD 36870
Figure J	Kilbride TCD 36871

A-J - Upper surfaces

(scale bar: A-D & G 500µm; E-F & H-J 200µm)

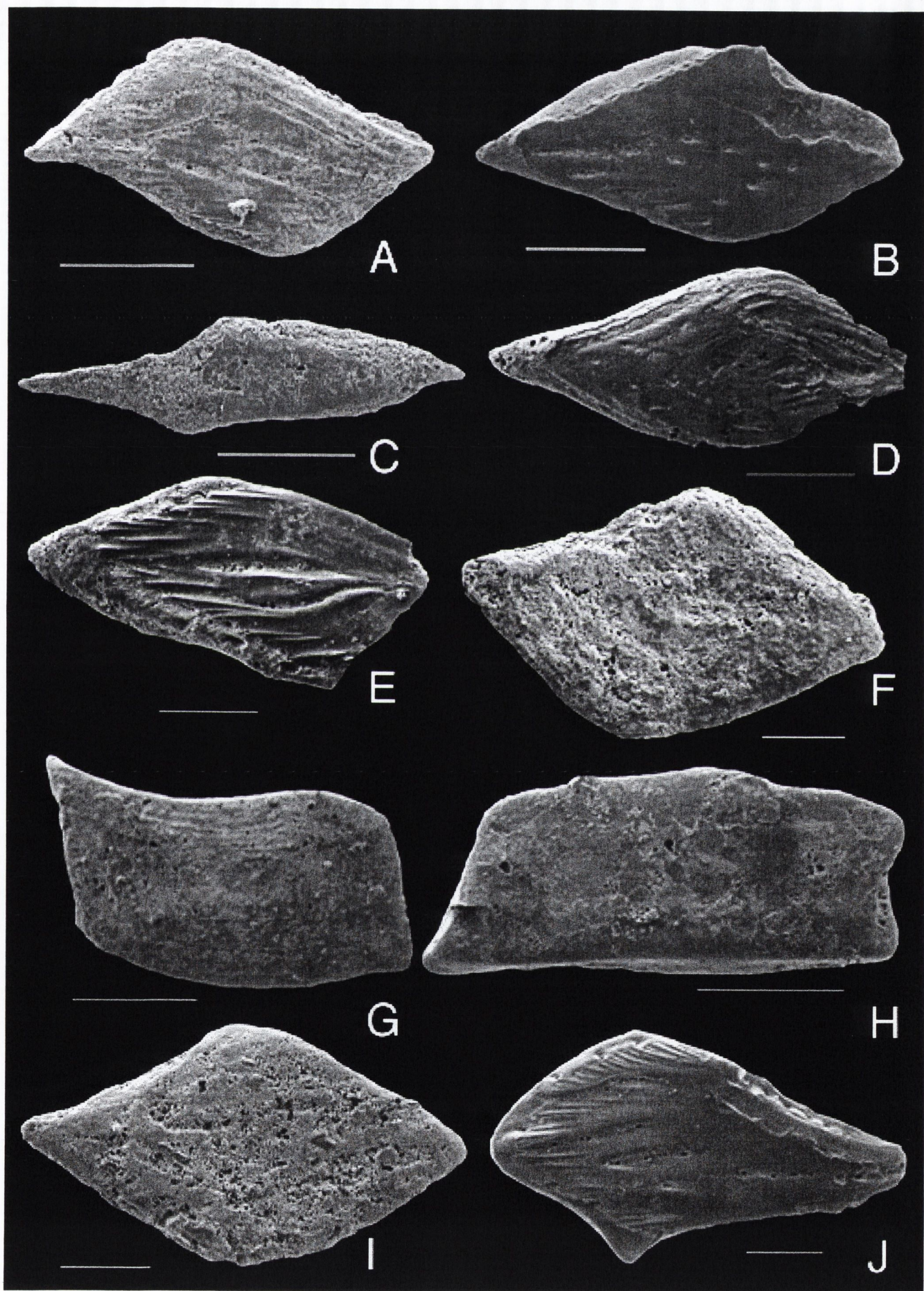


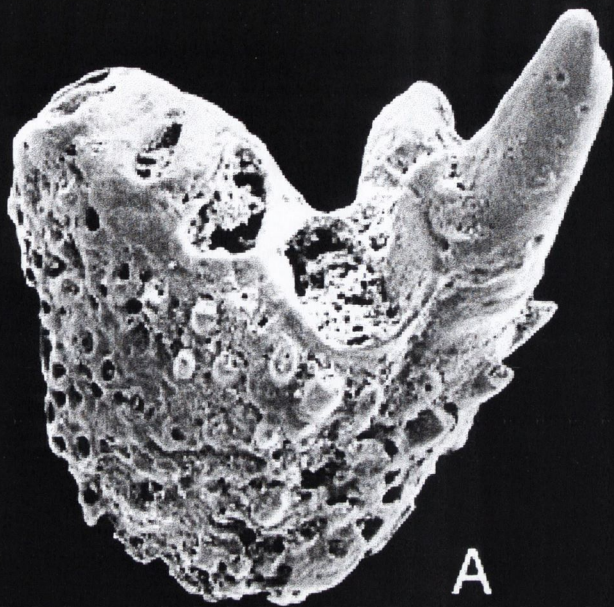
Plate 52

Actinopterygian tooth plate/jaw

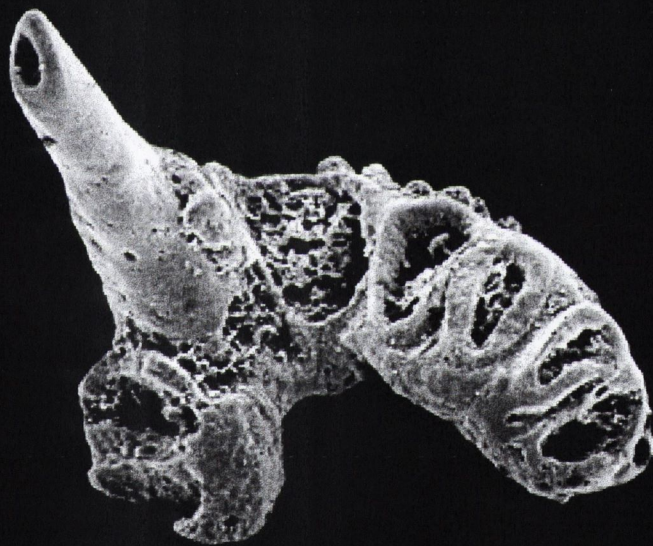
Figures A-C

Kilbride TCD 36883

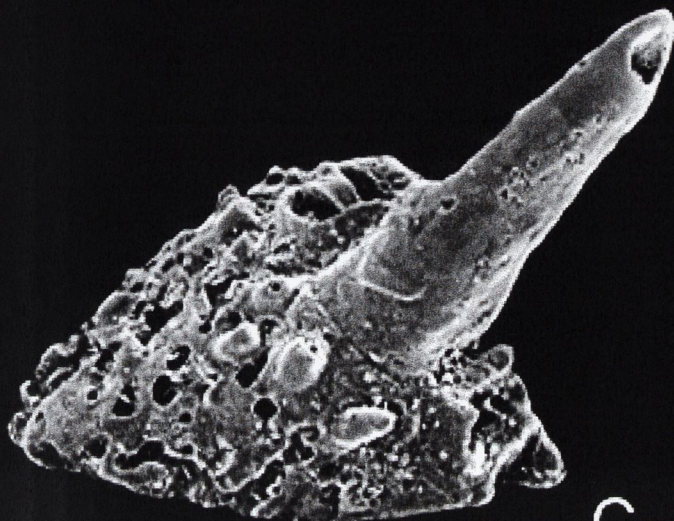
(scale bar: A-C 200 μ m)



A



B



C

Plate 53

Unknown - possible gill rakers or spines

Figures A-C Kilbride (TCD 36878)

Figures D-E Kilbride (TCD 36879)

Figures F-H Kilbride (TCD 36880)

F is a view looking down from the broken upper surface

Figures I-J Kilbride (TCD 36881)

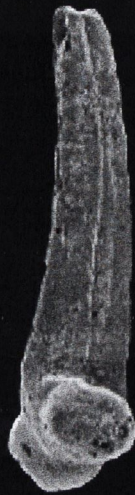
(scale bar: A-C & G-H 500 μ m; D-F & I-J 200 μ m)



A



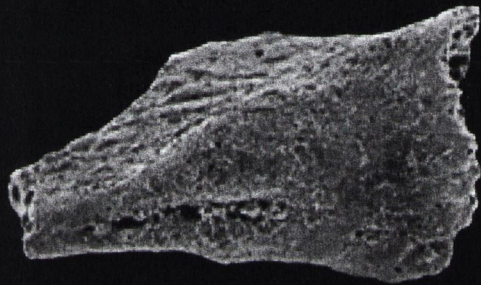
B



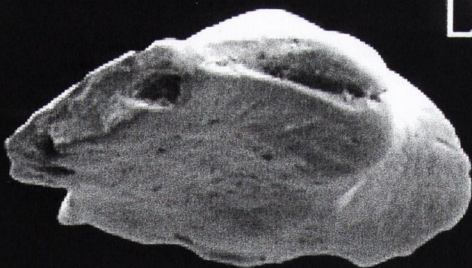
C



D



E



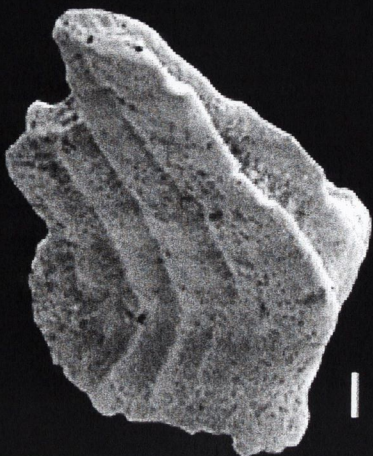
F



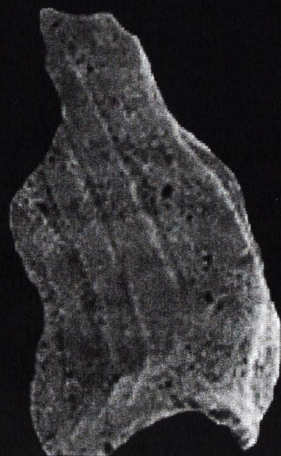
G



H



I



J

Plate 54

**Non-classified denticles
1 Handle Bar Moustache**

Figure A **Kilbride TCD 36882**

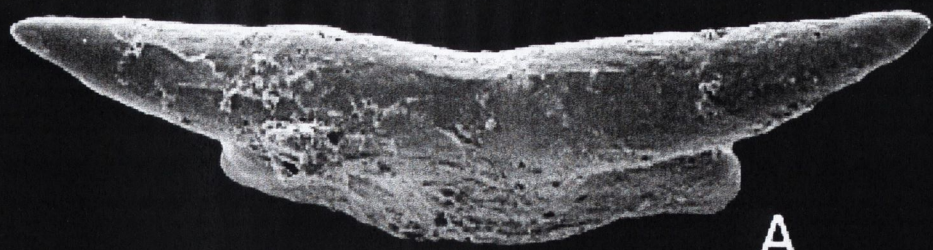
**Non-classified denticles
2 Possible chondrichthyan denticle**

Figures B-C **Kilbride TCD 36827**
A - Upper surface
B - Lateral view

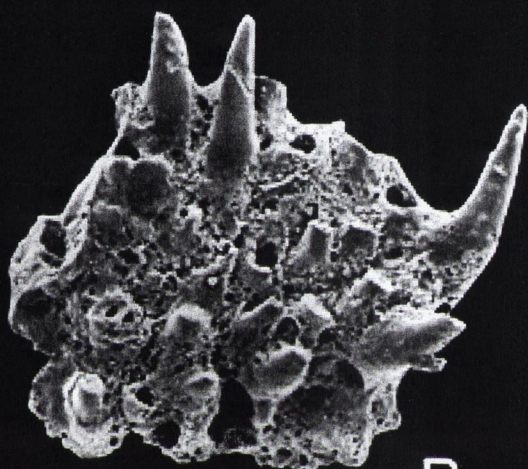
**Non-classified denticles
3 Possible chondrichthyan denticle**

Figures D-F **Urlingford TCD 36821**
D - Upper surface; E & F - Lateral views from
opposing sides

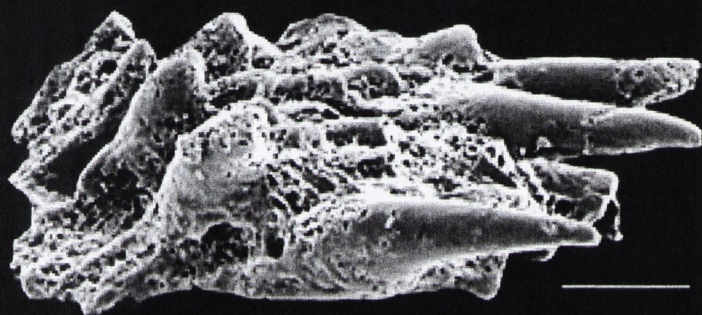
(scale bar: A-B & D-F 200µm; C 100µm)



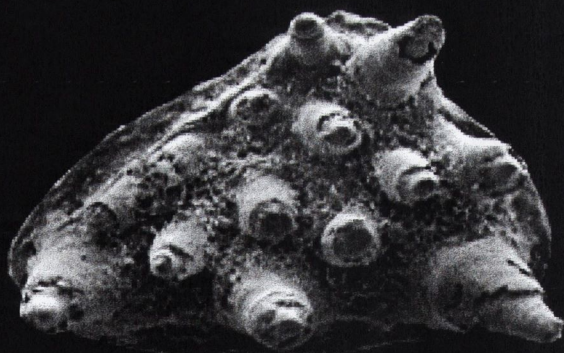
A



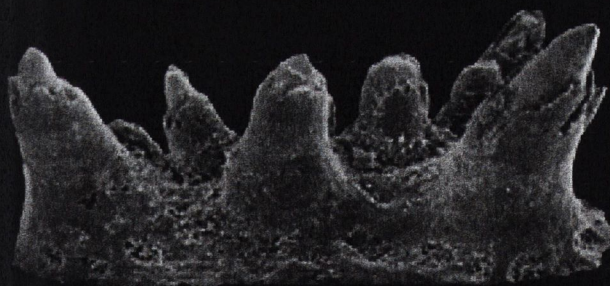
B



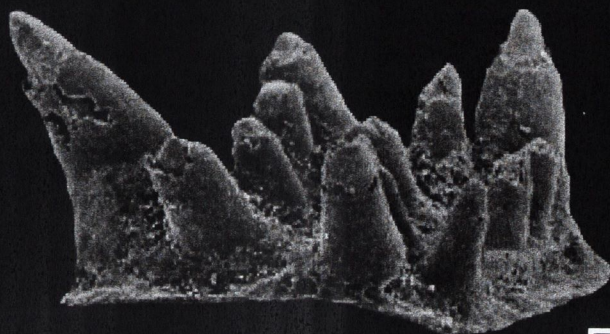
C



D



E



F

Plate 55

Chondrichthyan denticles/scales

Denticles Morphotype 1

Figures A-B

Kilbride TCD 36810

A - Upper surface; B - Lateral view

Denticles Morphotype 2

Figures C-E

Kilbride TCD 36811

C - Upper surface; D & E - Lateral views from opposing sides

Denticles Morphotype 3

Figure G

Kilbride TCD 36812

G - Upper surface

Denticles Morphotype 4

Figures H-I

Kilbride TCD 36818

H - Upper surface; I - Lateral view

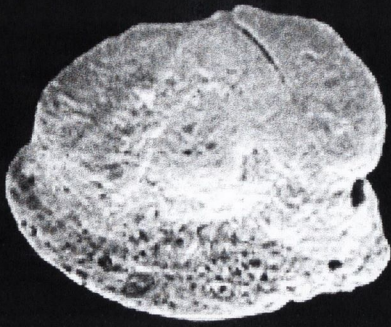
Denticles Morphotype 5

Figures J-L

Kilbride TCD 36820

J - Upper surface from the tip of the denticle;
K & L - Opposing lateral views

(scale bar: A-E, G & J-L 200µm; F 100µm; H-I 500µm)



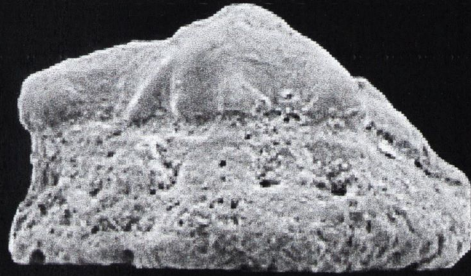
A



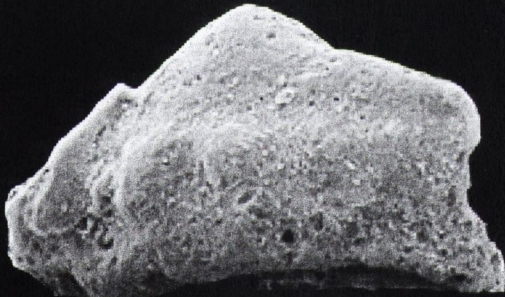
B



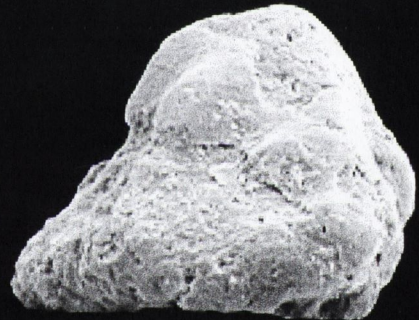
C



D



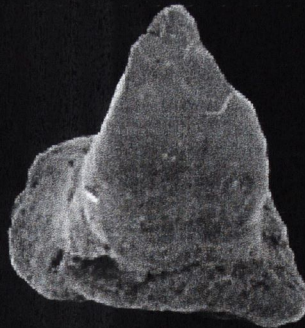
E



F



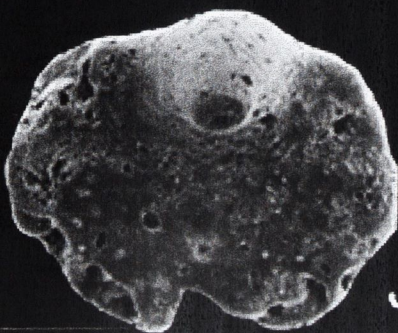
G



H



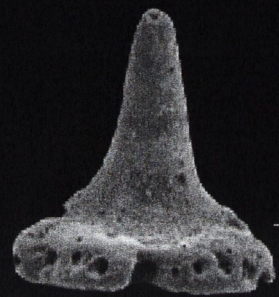
I



J



K



L

Plate 56

Chondrichthyan composite scales/denticles

Morphotype 1

Figures A-B

Kilbride TCD 36823

A - Upper surface; B - Lateral view

Morphotype 2

Figure C

Kilbride TCD 36826

C - Upper surface

Figures D-E

Urlingford TCD 36828

D - Upper surface; E - Lateral view

(Scale: A-C 500µm; D-E 200µm)



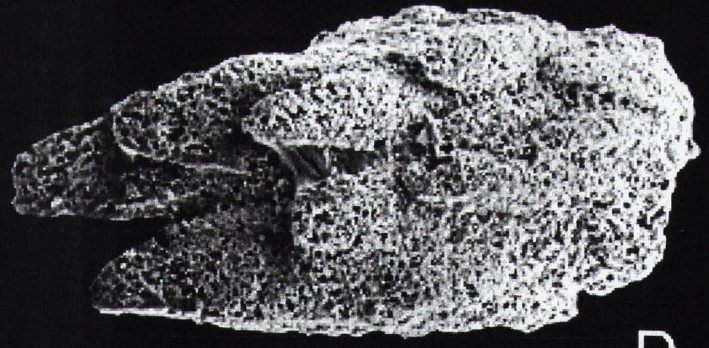
— A



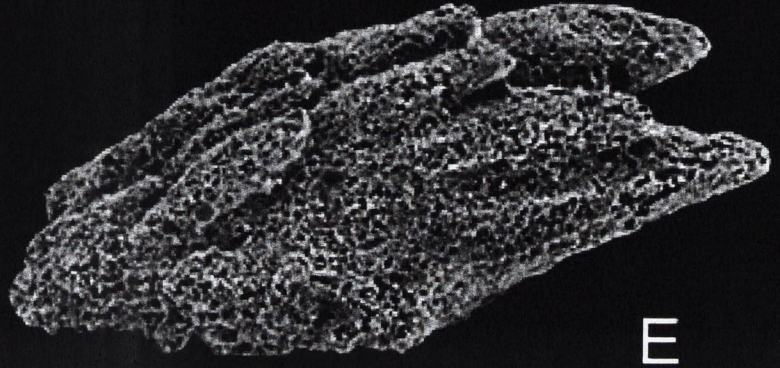
— B



— C



— D



— E

Plate 57

Chondrichthyan composite scales/denticles

“Ctenacanth-type”

Figures A-B

Kilbride TCD 36824

A - Upper surface; B - Lateral view

Figure C

Kilbride TCD 36825

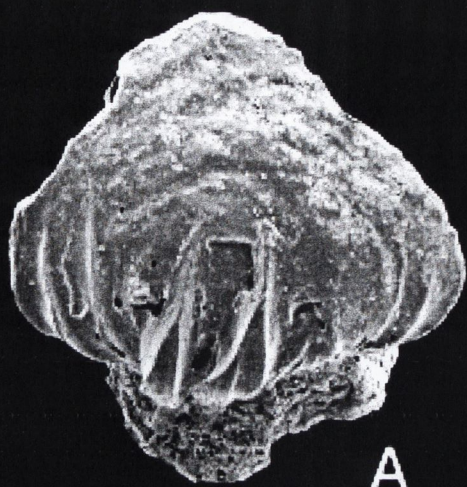
C - Upper surface

Figures D-F

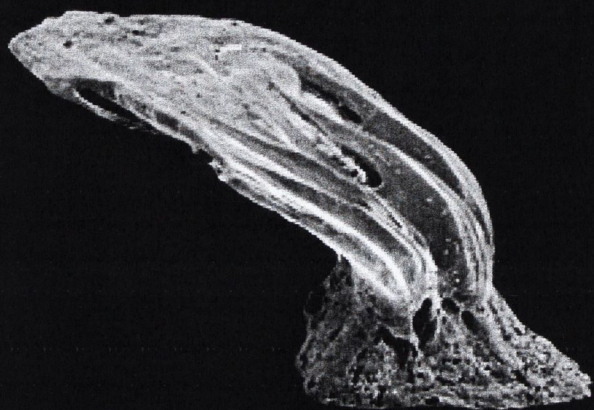
Urlingford TCD 36822

E - Lateral view; F - Opposing lateral view

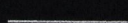
(Scale: A 500 μ m; B-F 200 μ m)



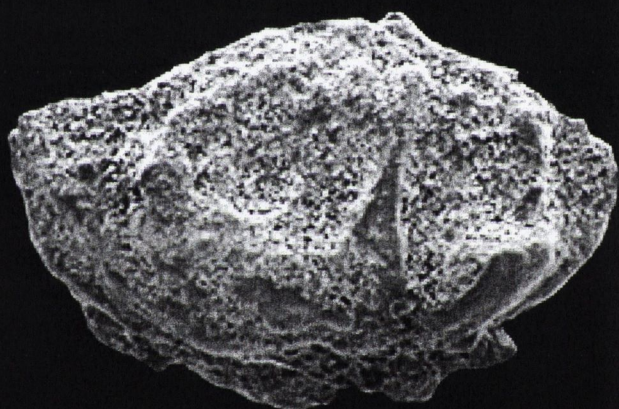
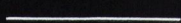
A



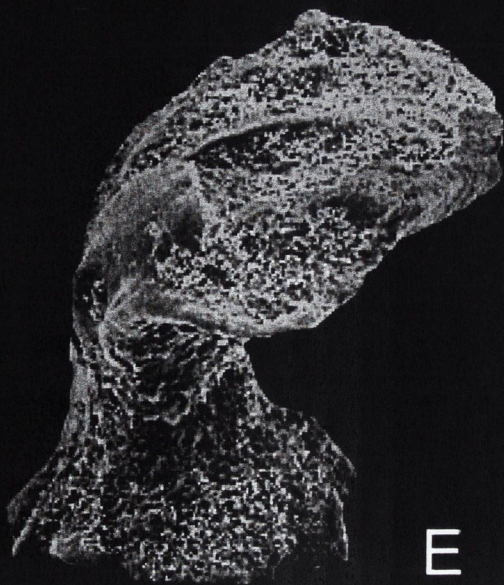
B



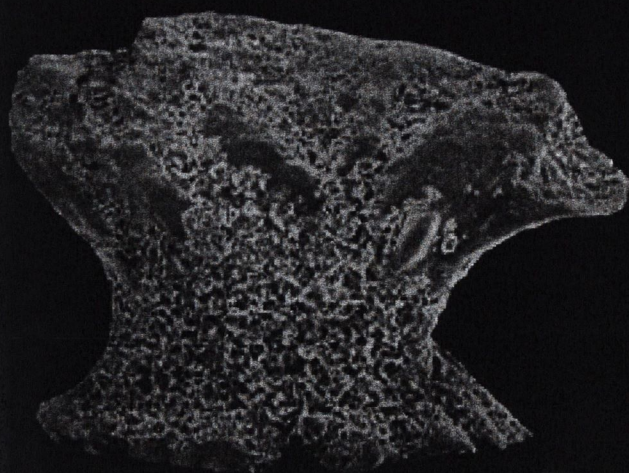
C



D



E



F

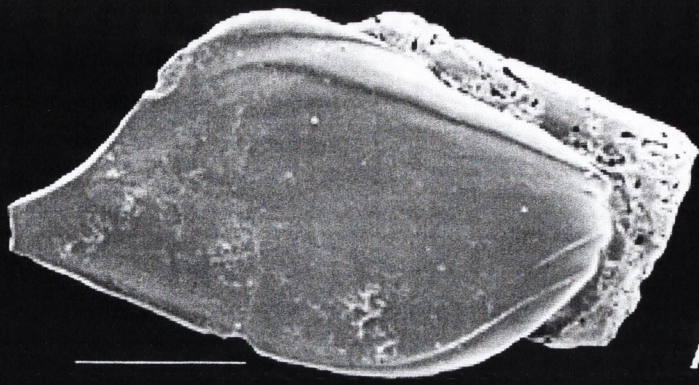


Plate 58

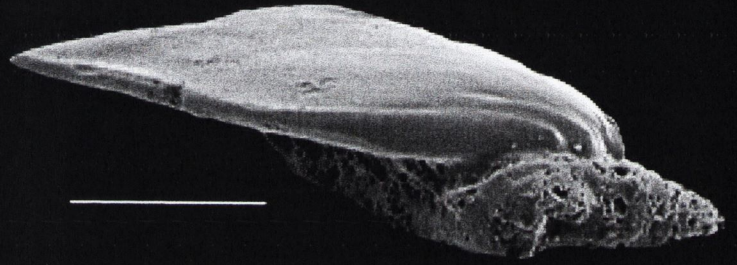
Actinopterygian flat scales

- Figures A-B** **Kilbride TCD 36833**
A - Upper surface; B - Lateral view
- Figure C** **Kilbride TCD 36834**
C - Upper surface
- Figure D** **Kilbride TCD 36835**
D - Upper surface
- Figure E** **Kilbride TCD 36836**
E - Upper surface

(Scale: A-C 200µm; D-E 500µm)



A



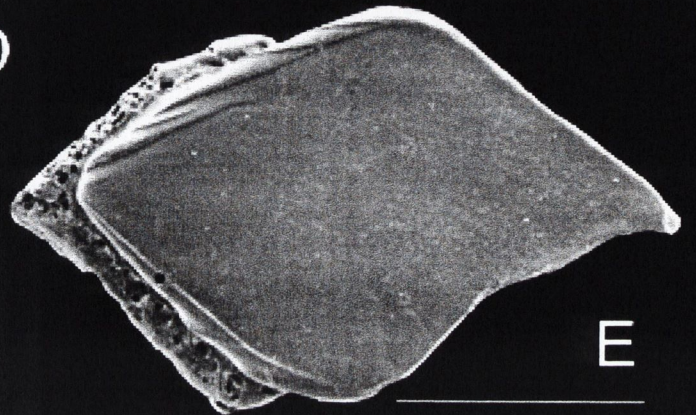
B



C



D



E

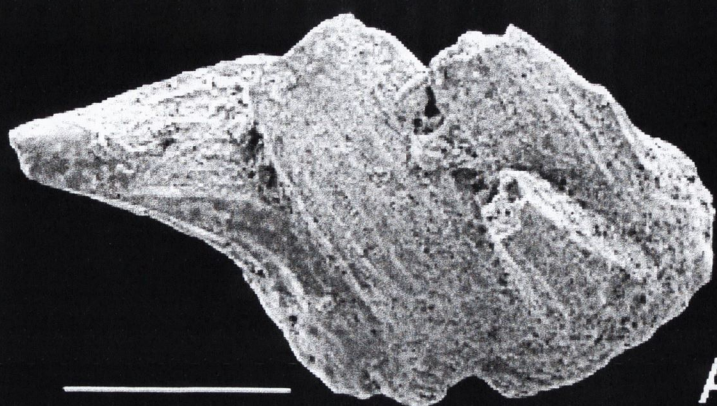
Plate 59

Chondrichthyan mucous membrane denticles Morphotype 1

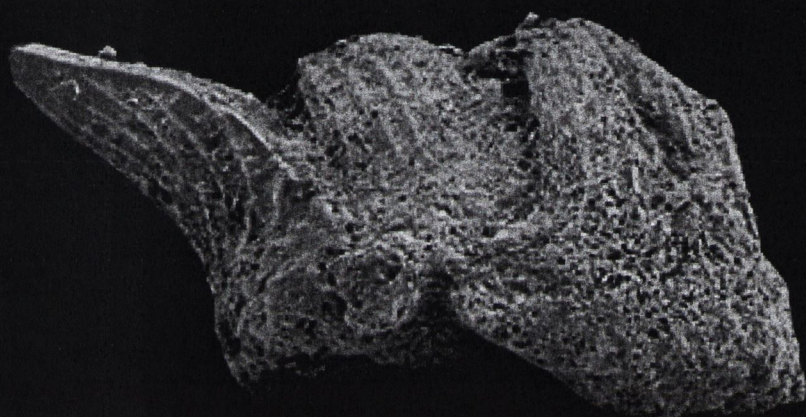
Figures A-B **Kilbride TCD 36829**
A - Upper surface; B - Lateral view

Figures C-D **Kilbride TCD 36832**
C - Upper surface; D - Lateral view

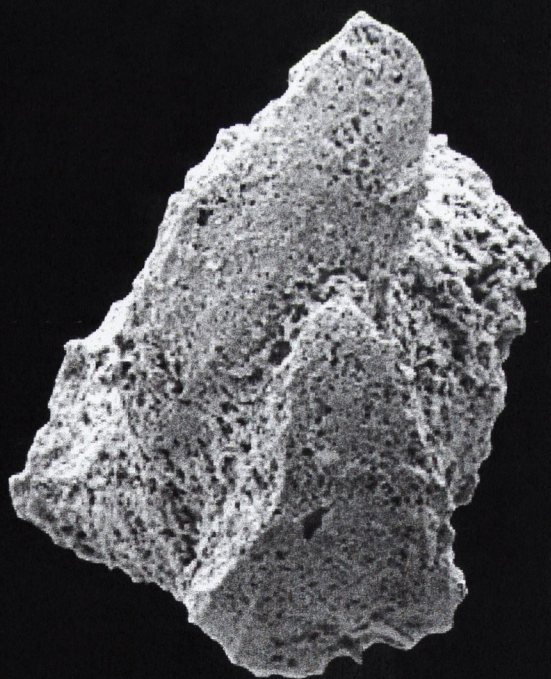
(Scale: A-B & D 500 μ m; C 200 μ m)



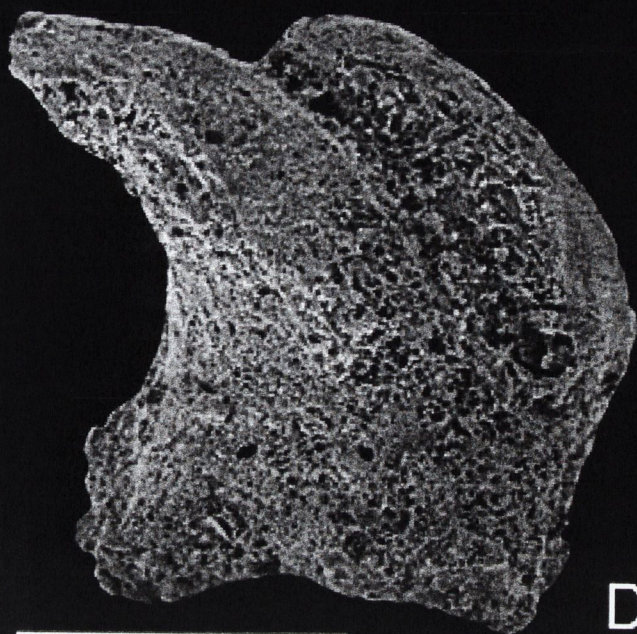
A



B



C



D

Plate 60

Chondrichthyan - mucous membrane denticles Morphotype 2

Figures A-B

Kilbride TCD 36830

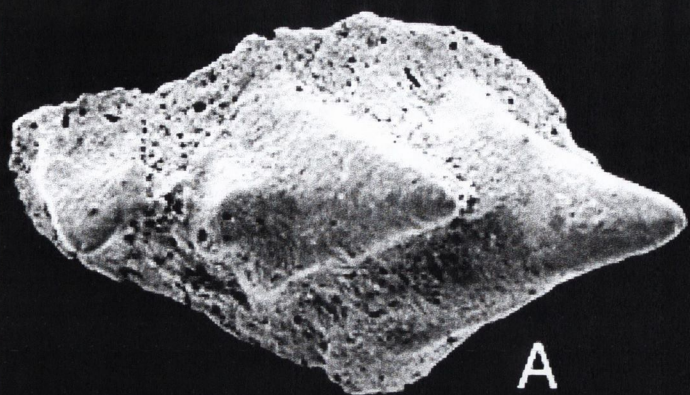
A - Upper surface; B - Lateral view

Figures C-F

Kilbride TCD 36831

C - Upper surface; D, E & F - Opposing lateral views

(Scale: A-F 200 μ m)



A



B



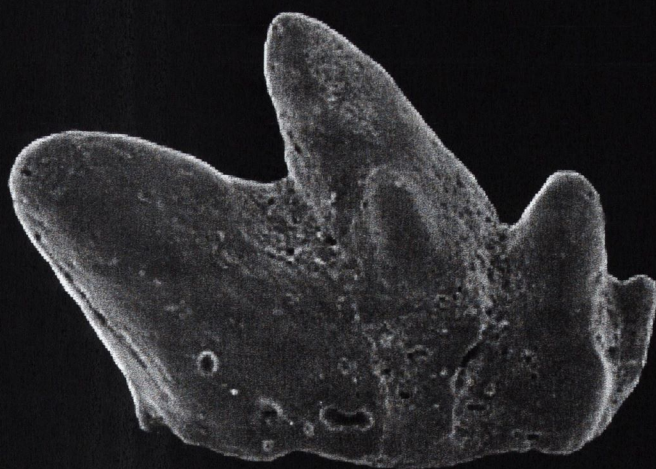
C



D



E



F

Plate 61

Chondrichthyan body scales

Figures A-D

Kilbride TCD 36837

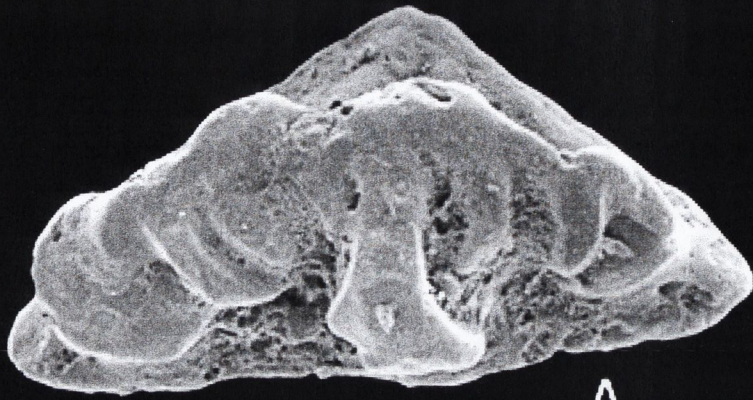
A - Upper surface; B, C & D - Opposing lateral views

Possible *Thrinacodus* denticle

Figures E-F

Kilbride TCD 36845

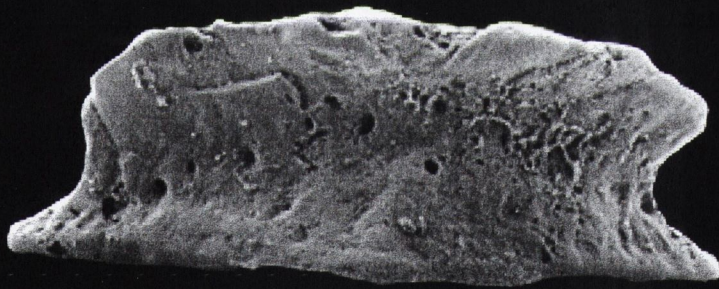
(Scale: A-F 200 μ m)



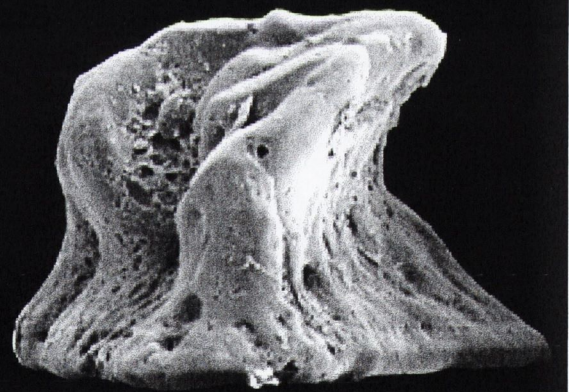
A



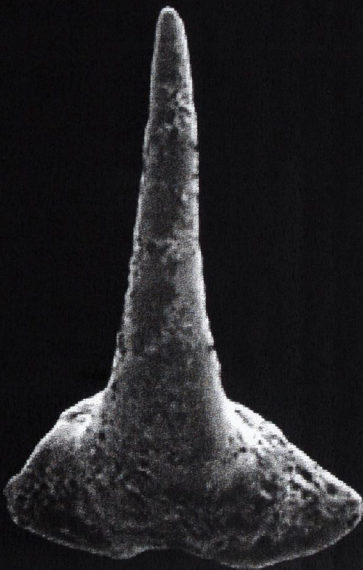
B



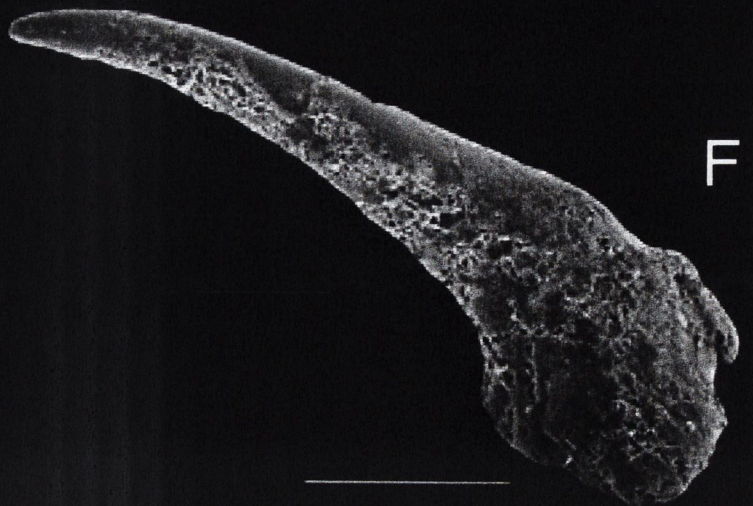
C



D



E



F

Plate 62

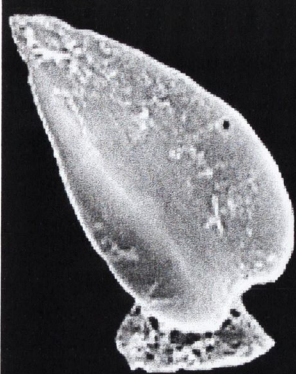
Hybodont placoid type scales

Morphotype 1 - heart shaped denticles

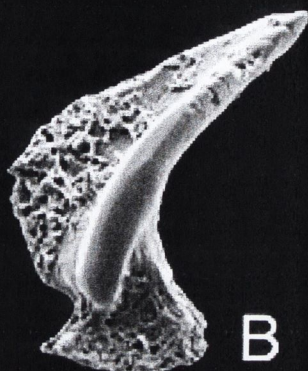
Figure A	Kilbride TCD 36838
Figures B-C	Kilbride TCD 36839
Figures D-E	Kilbride TCD 36840
Figures F-G	Kilbride TCD 36841
Figure H	Kilbride TCD 36842
Figure I	Kilbride TCD 35843
Figure J	Kilbride TCD 36944
Figure K	Kilbride TCD 36845

A, B, D, F, H & I are views from different angles of the upper surface of the denticles; C, E, J & K are views from different angles of the lower surface and of the base of the denticles; J shows a lateral view.

(Scale: A-B, D, H-K 200 μ m; C, E-G 100 μ m)



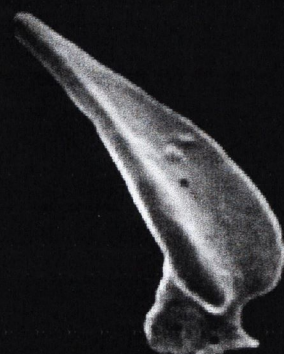
A



B



C



D



E



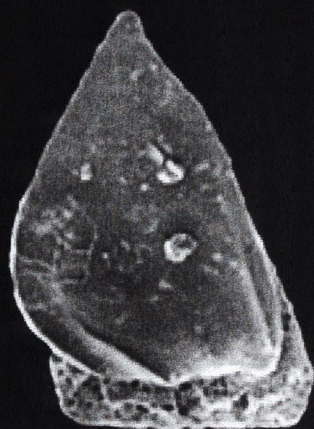
F



G



H



I



J



K

Plate 63

Hybodont - Morphotype 2 Raised button-like denticles

Figure A **Kilbride TCD 36846**

Figure B **Kilbride TCD 36813**

Figures C-D **Kilbride TCD 36817**

A & C - Upper surface; B & D - Lateral views

Hybodont - Morphotype 3 Thorn-like

Figure E **Kilbride TCD 36814**

Figures F-H **Kilbride TCD 36816**

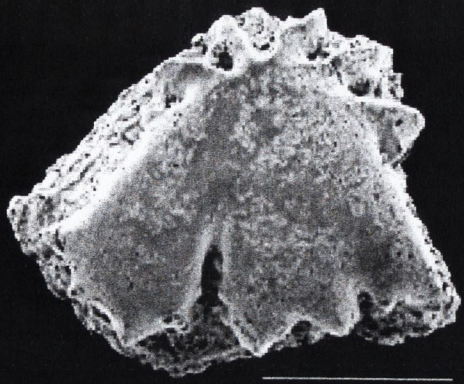
E & F - Upper surface; G & H - Lateral views

Hybodont - Morphotype 4 Thorn like

Figures I-J **Kilbride TCD 36819**

I - Upper surface; J - Lateral view

(Scale: A 500µm; E 100µm; C-D & F-J 200µm)



A



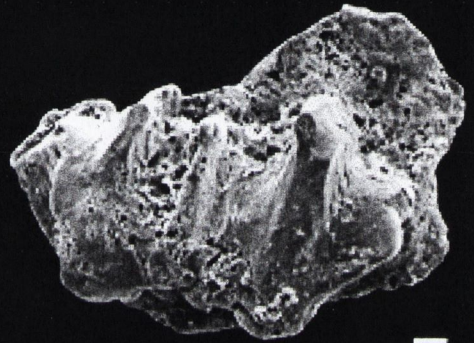
B



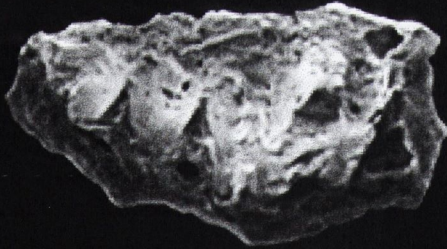
C



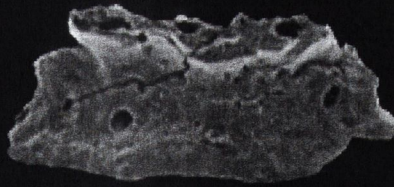
D



E



F



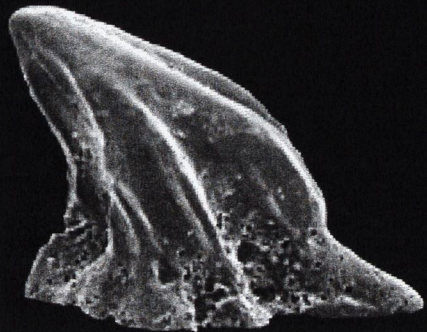
G



H



I



J

Plate 64

Acanthodian scales

Figure A Kilbride TCD 36847

Figure B Kilbride TCD 36848

Figure C Kilbride TCD 36849

Figures D-E Kilbride TCD 36850

Figure F Kilbride TCD 36851

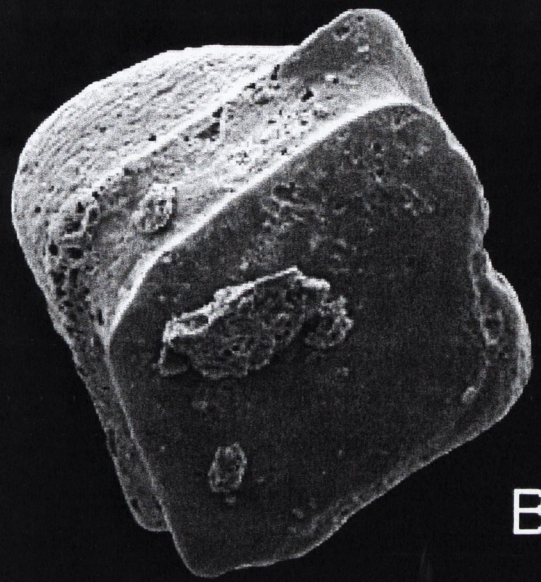
A, D, E & F - Lower surface;

B & C - oblique views of the upper surface of the scales

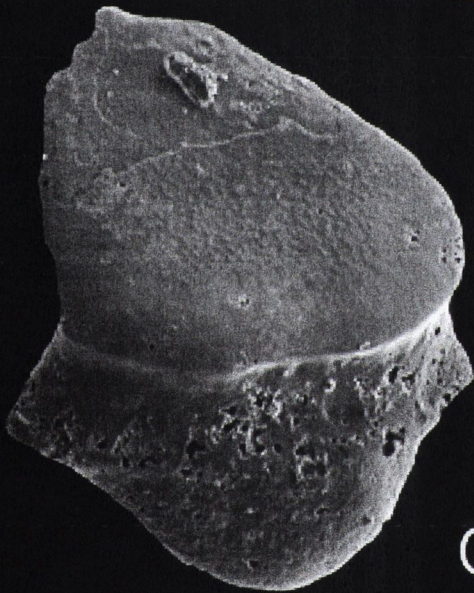
(Scale: A & F 100 μ m; B-E 200 μ m)



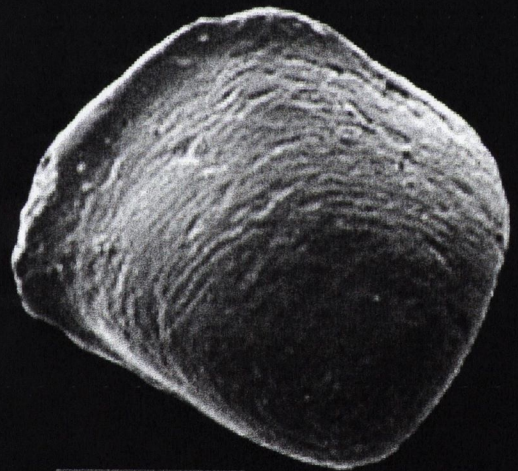
A



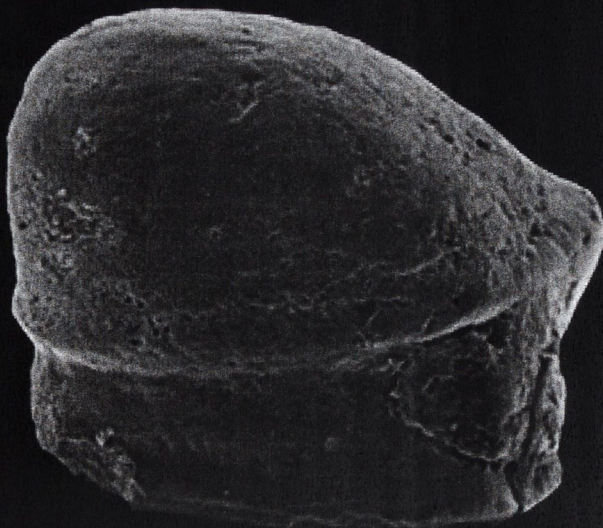
B



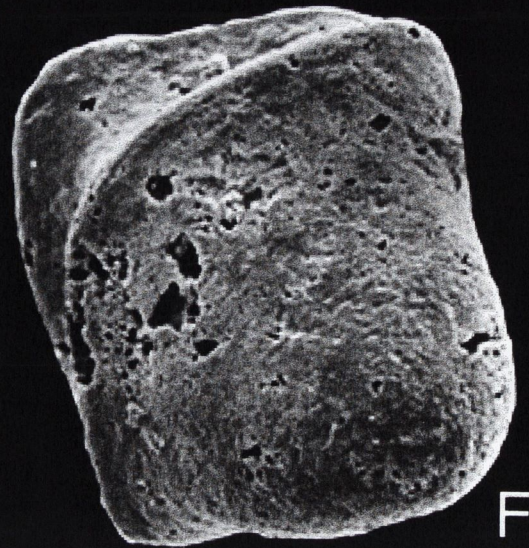
C



D



E



F

Plate 65

Acanthodian scales

Figures A-B **Lyraun Cove TCD 36853**

Figure C **Lyraun Cove TCD 36854**

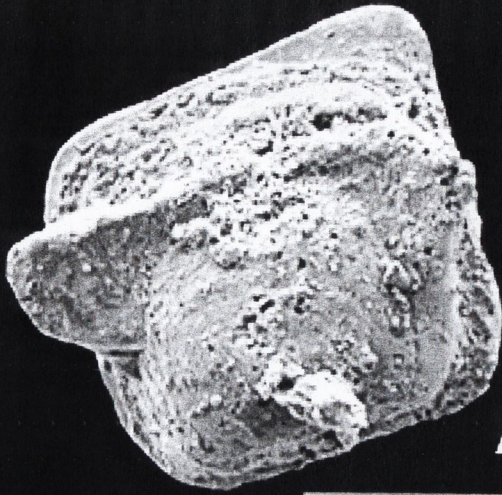
Figure D **Lyraun Cove TCD 36855**

Figures E-F **Urlingford TCD 36856**

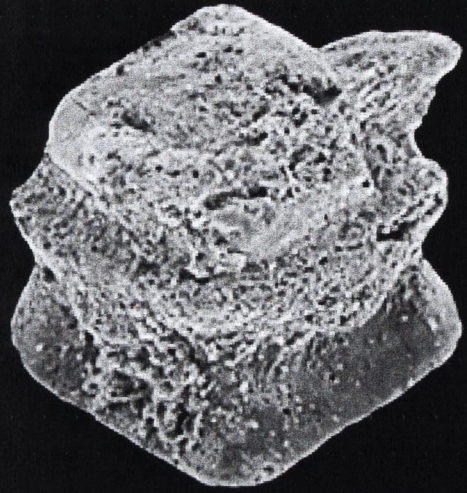
Figure G **Urlingford TCD 36857**

A - Lower surface; B & G - Lateral views with the lower surface uppermost; C, D & E - Upper surface; F - Lateral view with upper surface uppermost.

(Scale: A-D 200 μ m; E-G 100 μ m)



A



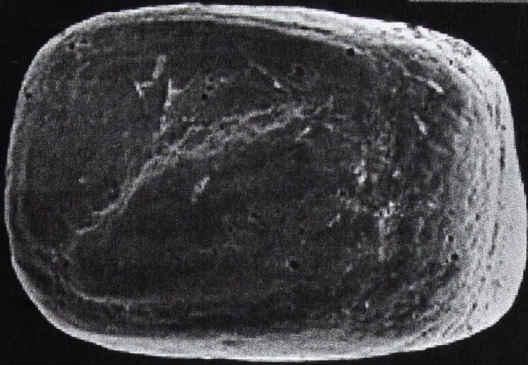
B



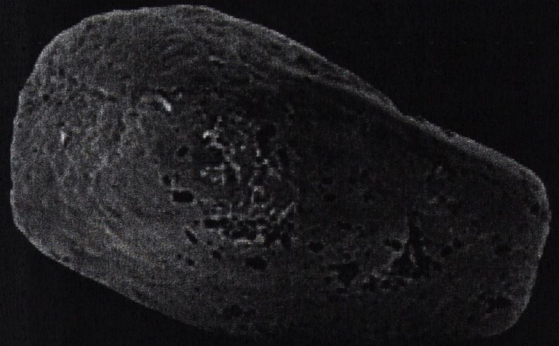
C



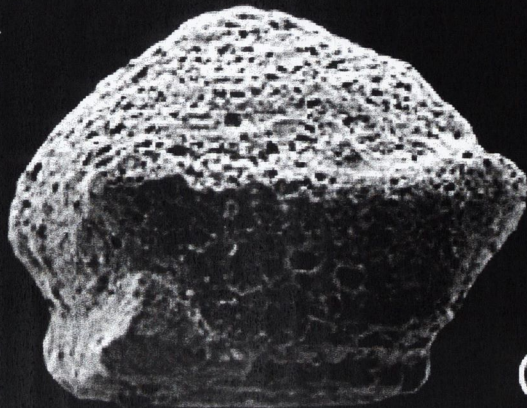
D



E



F



G

Plate 66

Actinopterygian scales

Figure A Moyola K28701

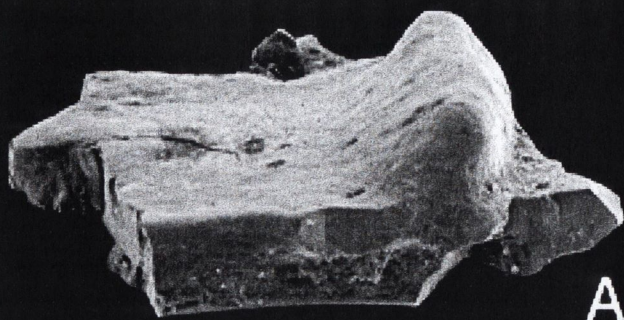
Figures B & D Moyola K28702

Figures C & E Moyola K28703

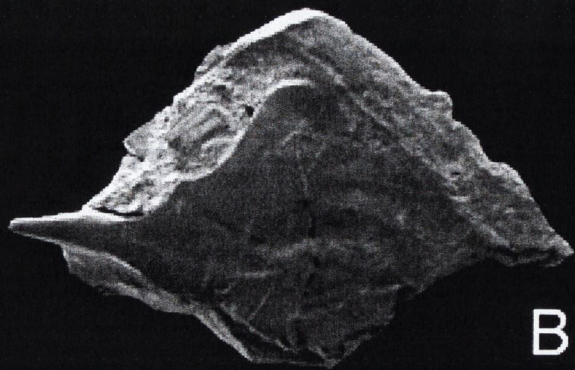
Figures F-H Moyola K28704

B, C, D, E & G - Upper surface; A & D - Lateral views;
H - Annealed upper surface of G

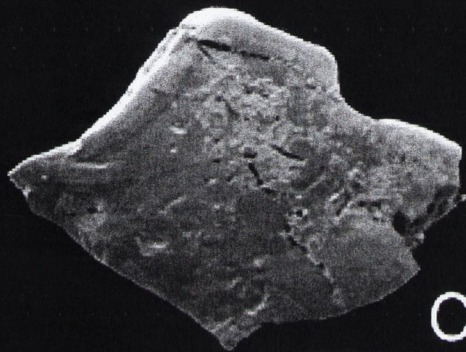
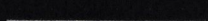
(Scale: A, C-E 500 μ m; B 1000 μ m; G-H 200 μ m)



A



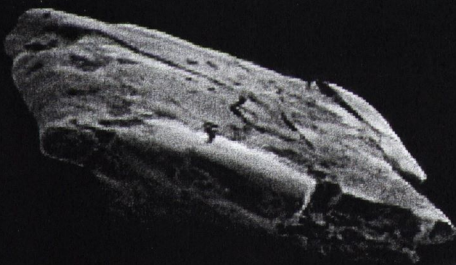
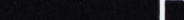
B



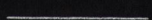
C



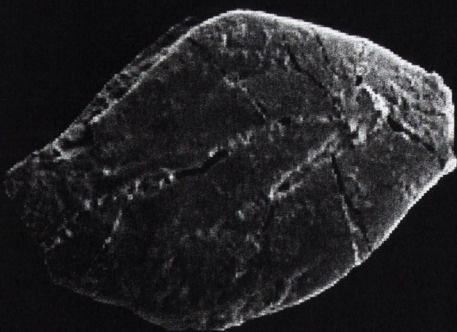
D



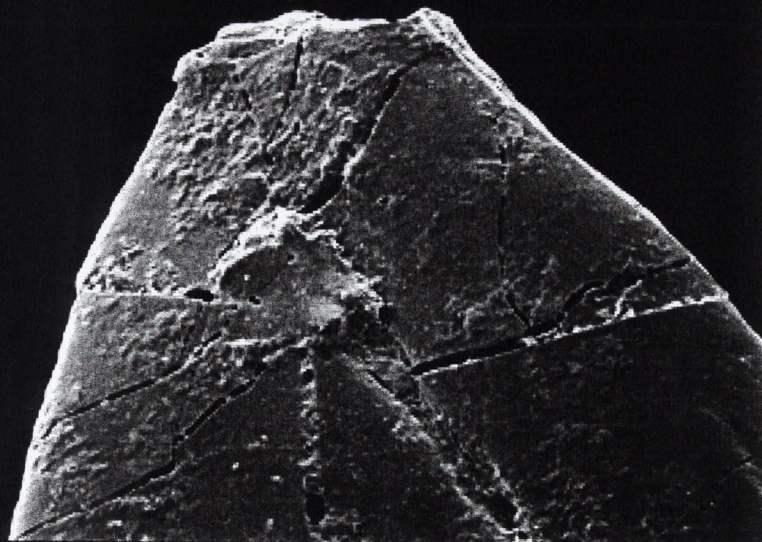
E



F



G



H

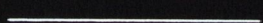


Plate 67

Actinopterygian scales

Figures A-B Moyola K28705

Figure C Moyola K28706

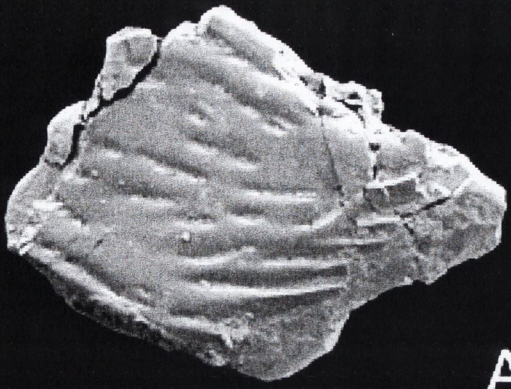
Figures D-E Moyola K28707

Figure F Moyola K28708

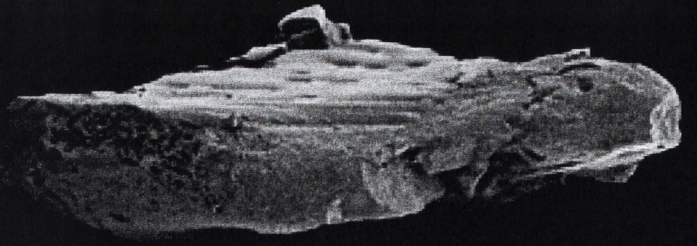
Figures G-H Moyola K28709

A, C, F & G - Upper surface; D & E - Lower surface views, B - Lateral view with the upper surface uppermost; H - detail of a fractured surface of a scale.

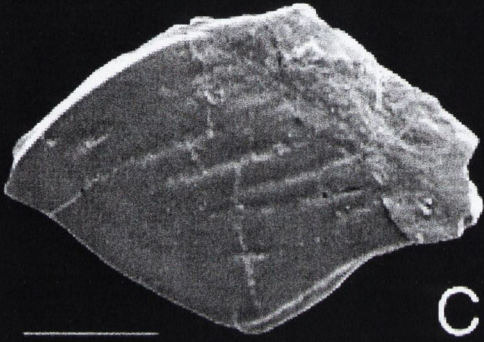
(Scale: A-B 1000µm; C-E & G-H 500µm; F 200µm)



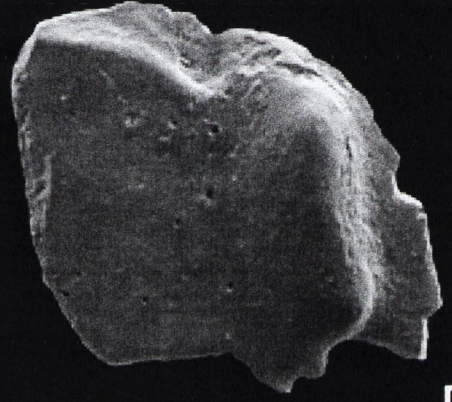
A



B



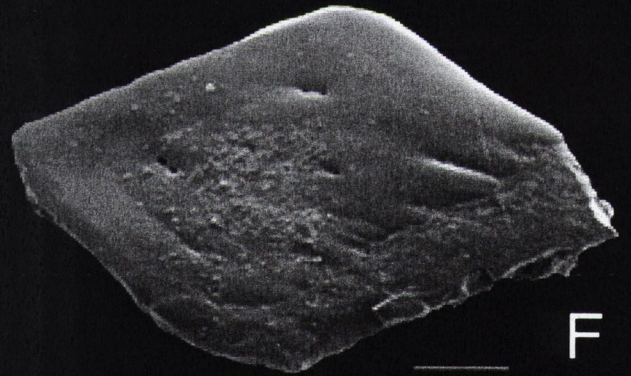
C



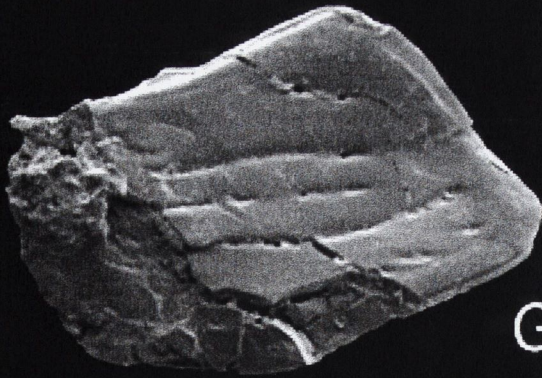
D



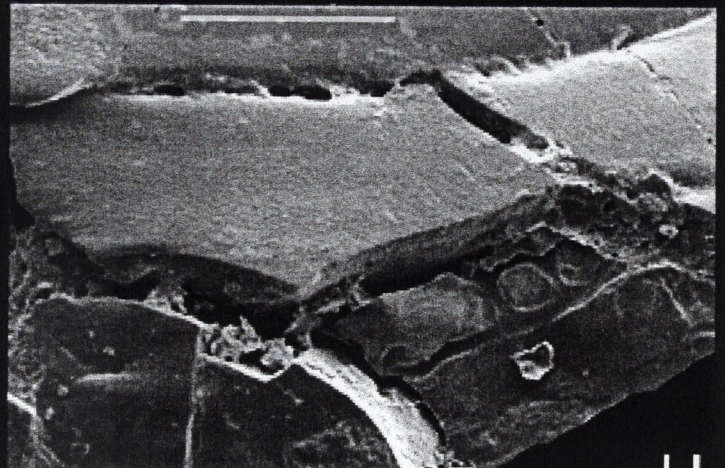
E



F



G



H

Plate 68

Actinopterygian scales

Figures A-B

Moyola K28710

A - Upper surface; B - Lateral view

Hybodont - Morphotype 3

Thorn-like

Figures C-D

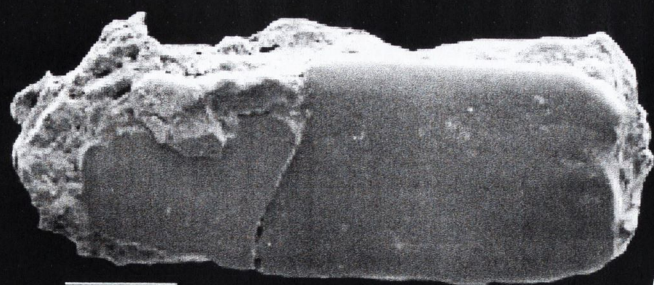
Moyola K28711

Figures E-G

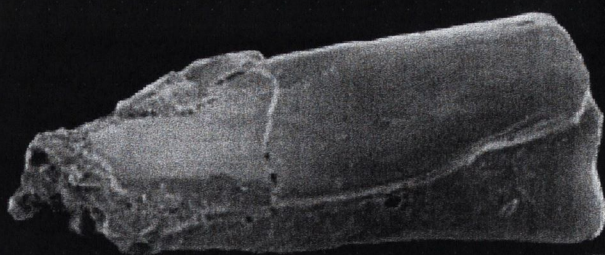
Moyola K28712

C & E - Upper surface; D, F & G - Lateral views

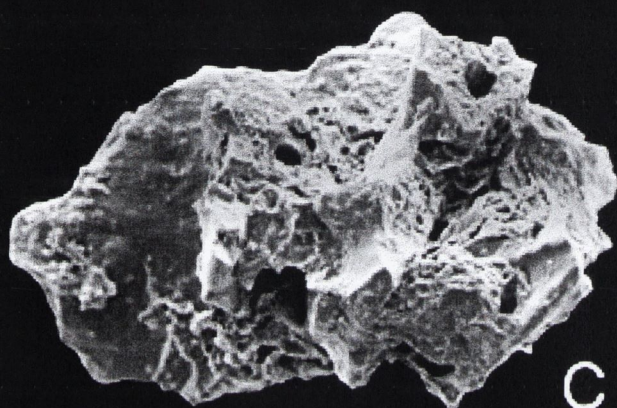
(Scale: A-B & D-G 200 μ m; C 100 μ m)



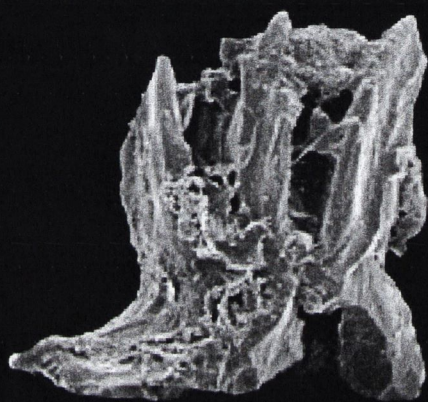
A



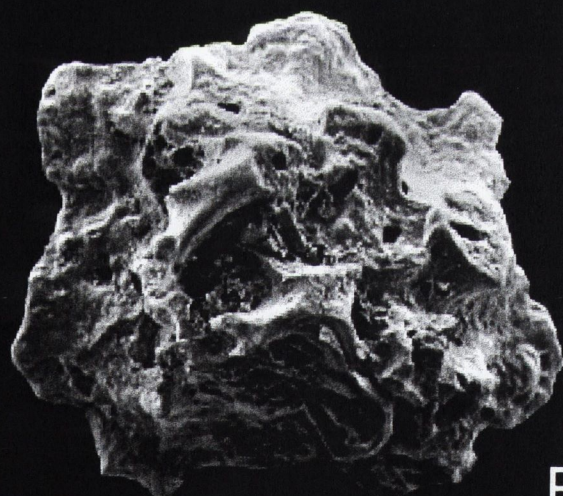
B



C



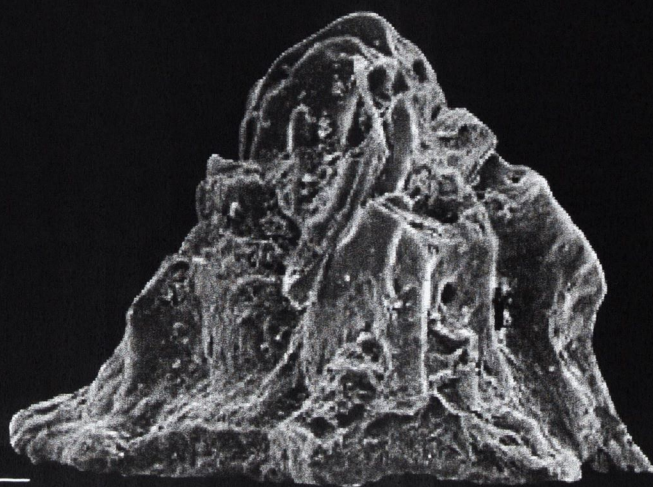
D



E



F



G

Plate 69

Actinopterygian scales

Figures A-B **Moyola K28713**
A -Upper surface; B - Lateral view of two
conjoined scales.

Figure C **Moyola K28714**
C - Upper surface

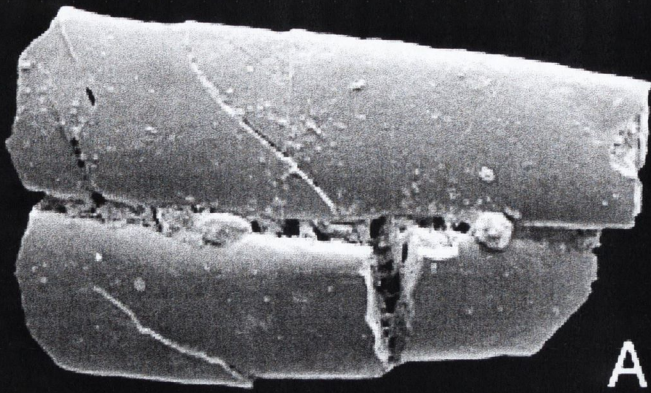
Unidentified

Figure D **Moyola K28715**
D - Upper surface

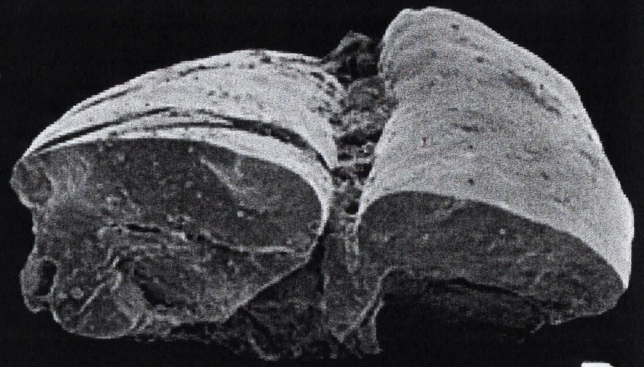
Hybodont - Morphotype 2 **Raised button-like denticles**

Figure E **Moyola K28716**
E - Oblique view of the upper surface

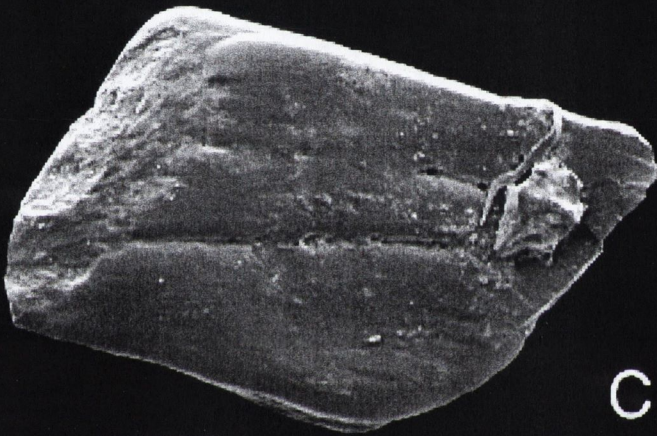
(Scale: A-C 200 μ m; D 100 μ m; E 500 μ m)



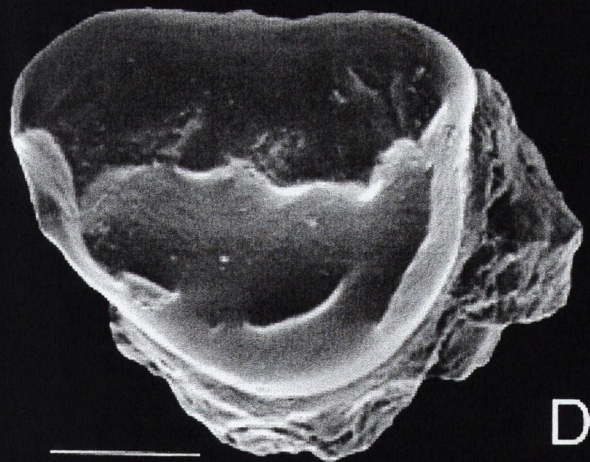
A



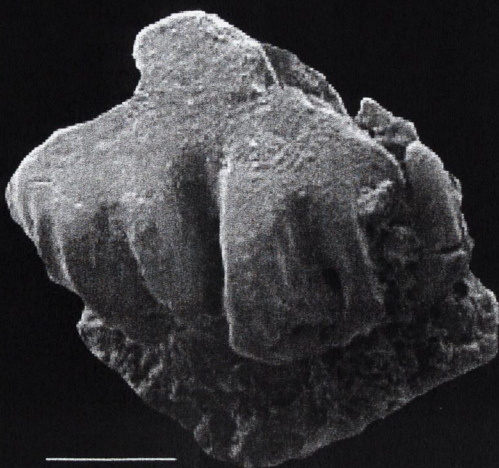
B



C



D



E

Plate 70

Sarcopterygian teeth (probable)

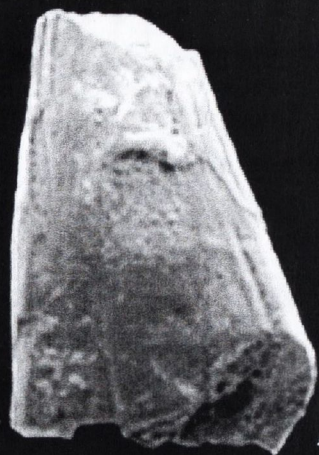
Figures A-C Moyola K28717

Figures D-E Moyola K28718

Figures F-G Moyola K28719

A, B & F - Side views; C - Central tooth area from the existing base of the tooth; D - Lateral view of a longitudinally broken tooth; E - Central area of the same tooth from the basal region; G - Central pulp cavity

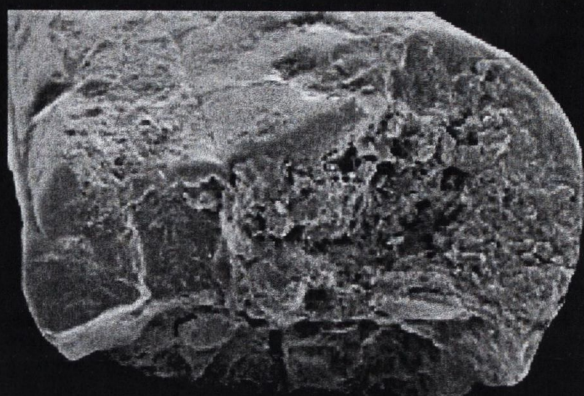
(Scale: A 1000 μ m; B & D-E 500 μ m; C & F-G 200 μ m)



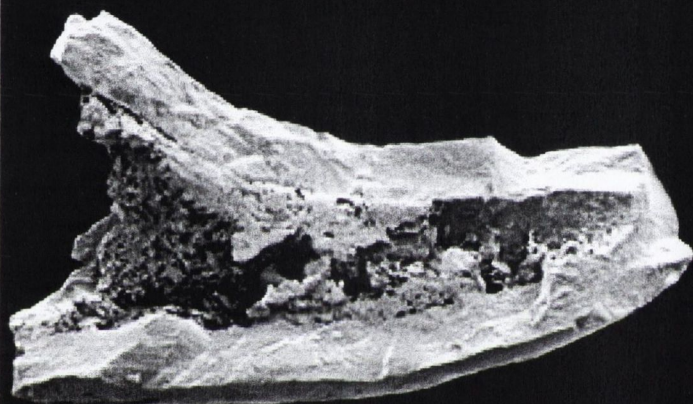
A



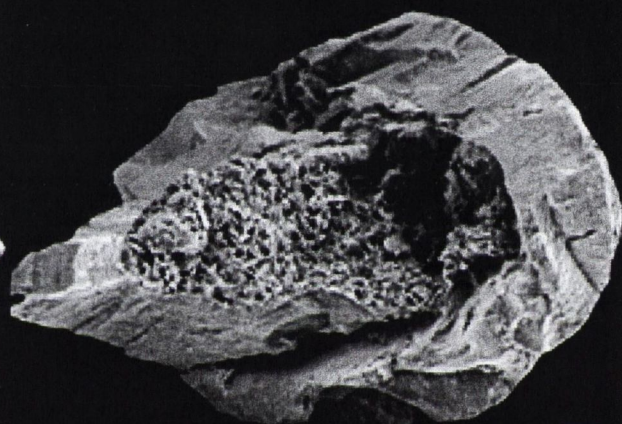
B



C



D



E



F



G

Plate 71

Sarcopterygian teeth (probable)

Figures A-B

Moyola K28720

A - Side view; B - Central area of the crushed tooth from the base

Teeth of unknown affinity

Figure C

Moyola K28721

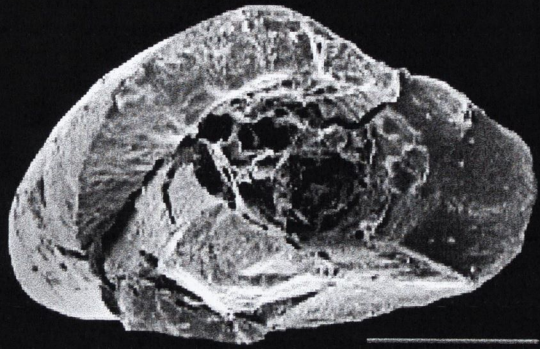
Figures D-E

Moyola K28722

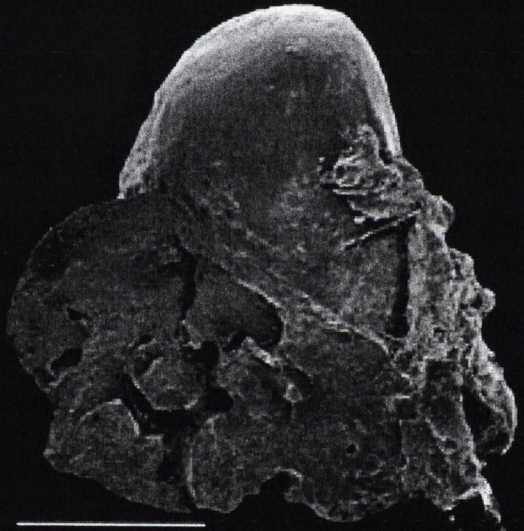
(Scale: A-E 200 μ m)



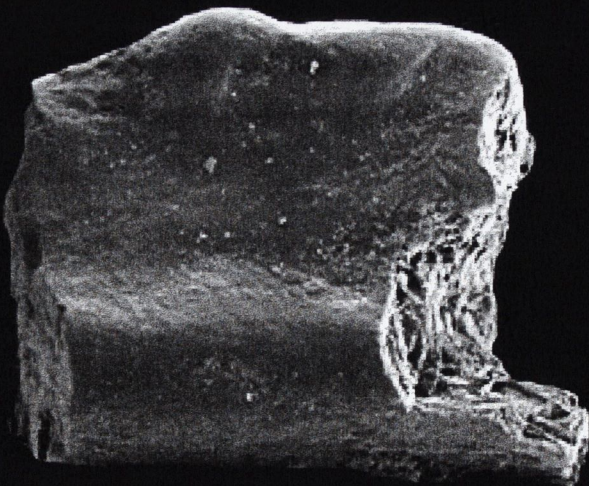
A



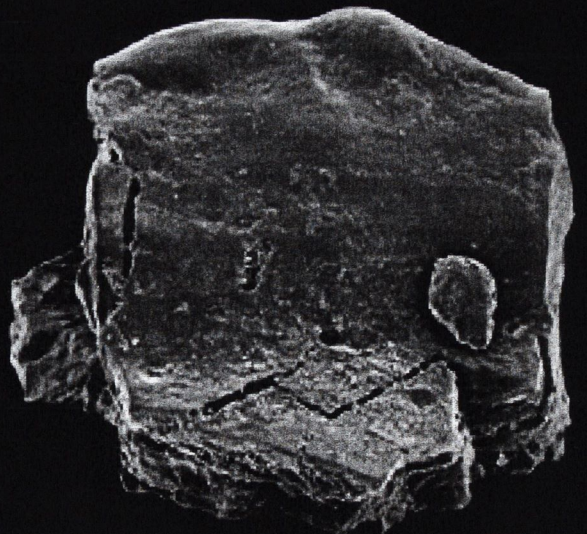
B



C



D



E

BAR LIKE ELEMENTS

The following plates 72 to 92 depict various 'bar-like elements' described in Chapter 8 of the text. Although their affinity is not certain, they have been described in the text using terminology used in the description of vertebrate fish teeth.

Plate 72

Bar Morphotype A

Figures A-E **Kilbride TCD 36694**

A - Lingual view; B - Lingual view; C - Lingual view; D - Labial view;
E - Lateral view

Figures F-J **Kilbride TCD 36695**

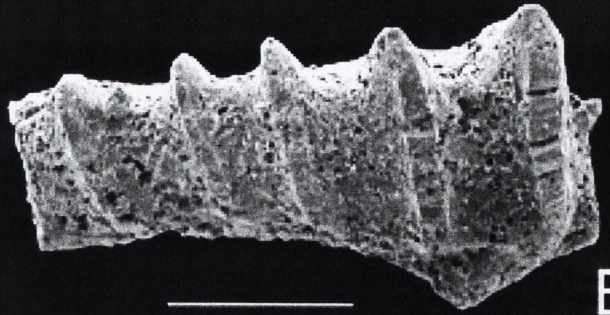
F - Labial view; G - Dorsal view; H - Lingual view; I - Labial view;
J - Lateral view

Right-handed forms. Note the termination at the lateral base extension side and the crenulated cusp ridges.

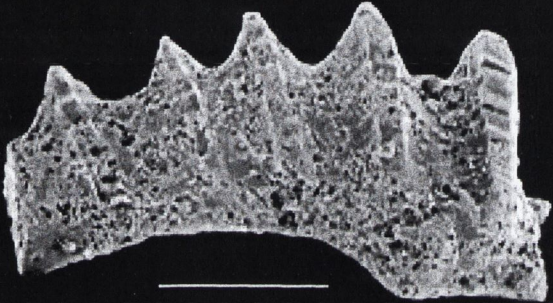
(scale bar: A-D & F-J 200µm; E 100µm)



A



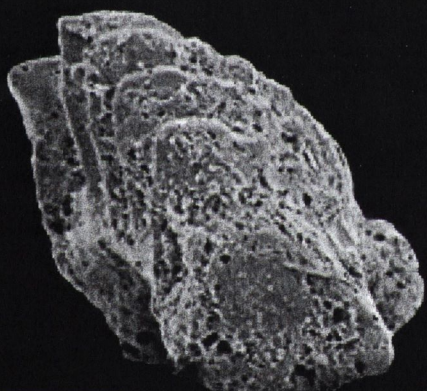
B



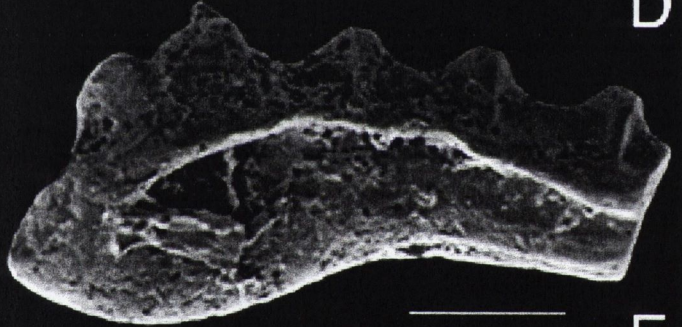
C



D



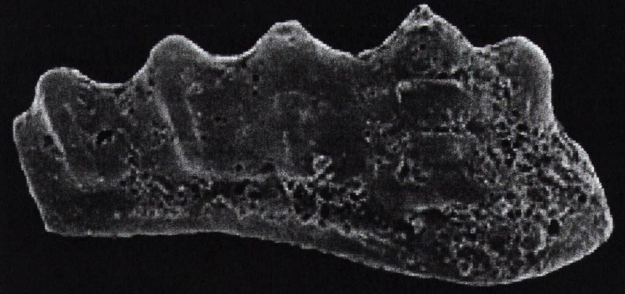
E



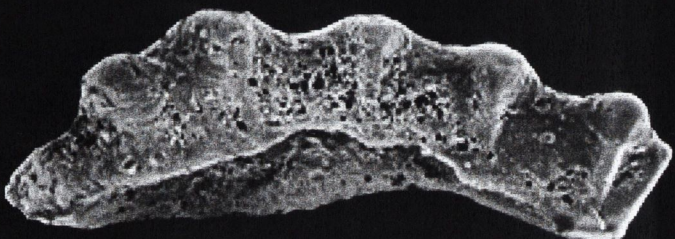
F



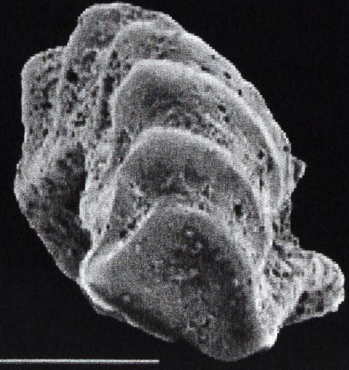
G



H



I



J

Plate 73

Bar Morphotype A

Figures A-D **Kilbride TCD 36696**

A - Lingual view; B - Ventro-lingual C - Labial view; D - Lateral view

Figures E-I **Kilbride TCD 36697**

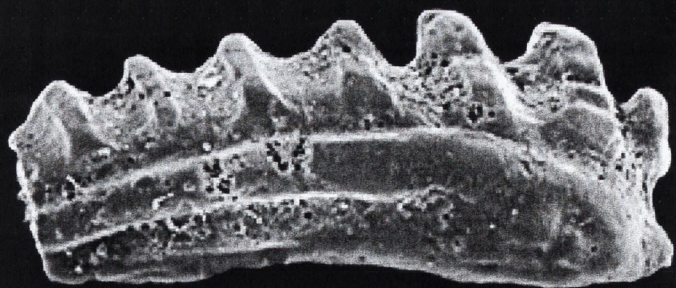
E - Dorsal view; F - Dorsal view; G - Lingual view; H - Labial view;
I - Lateral view

Right-handed forms; their arcuate nature is especially obvious in these specimens. Note the crenulated cusp ridges and the termination of the lateral base extension end

(scale bar: A-C & F-I 200µm; D 100µm; E 500µm)



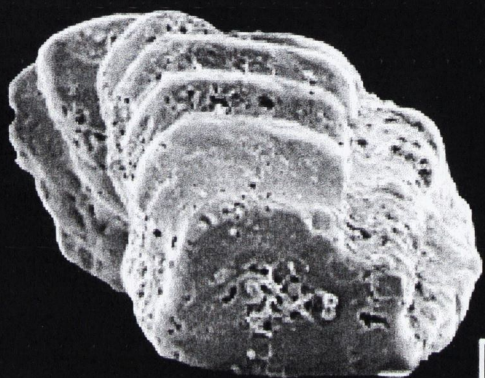
A



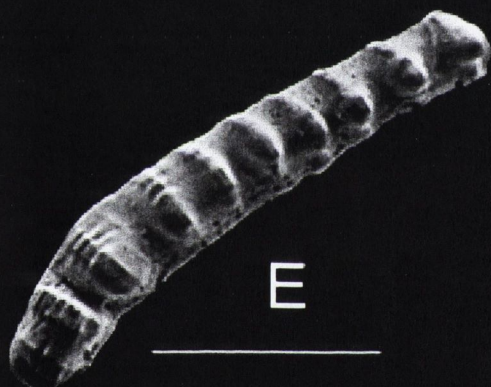
B



C



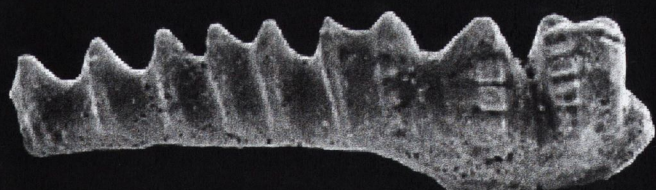
D



E



F



G



H



I

Plate 74

Bar Morphotype A

Figures A-D Kilbride TCD 36698

A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E-H Kilbride TCD 36699

E - Dorso-lingual view; F - Lingual view; G - Labial view;
H - Lateral view

Right-handed forms. Note the arcuate nature, crenulated cusp ridges, long basal extension and the pointed apices of the cusp ridges.

(scale bar: A-C & E-G 200 μ m; D & H 100 μ m)

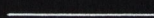
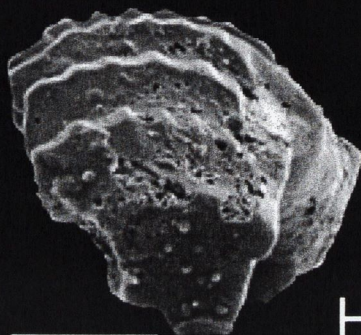
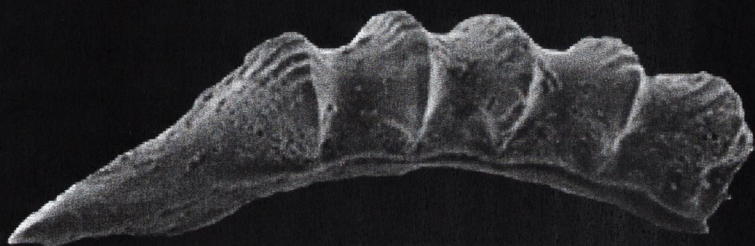
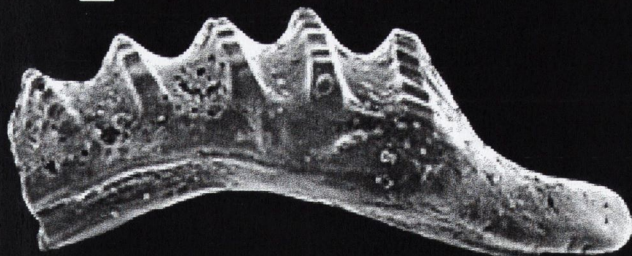
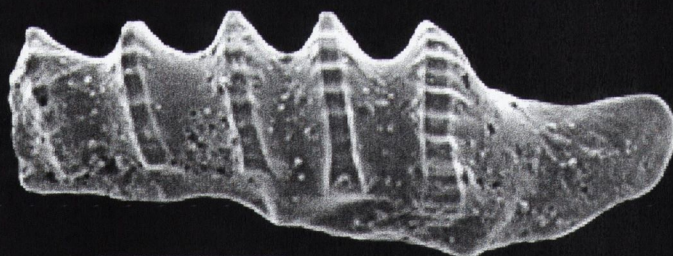
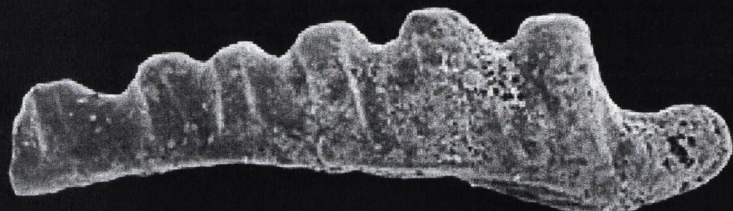


Plate 75

Bar Morphotype A

Figures A-D **Kilbride TCD 36700**

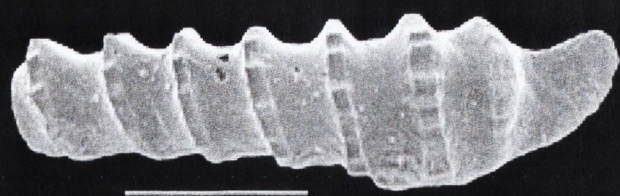
A - Dorsal view; B - Lingual view; C - Labial view; D - Oblique Lateral view

Figures E-H **Kilbride TCD 36701**

E - Oblique Dorsal view; F - Lingual view; G - Labial view;
H - Lateral view

Right-handed forms; the crenulated cusp ridges are particularly obvious in views A-D.

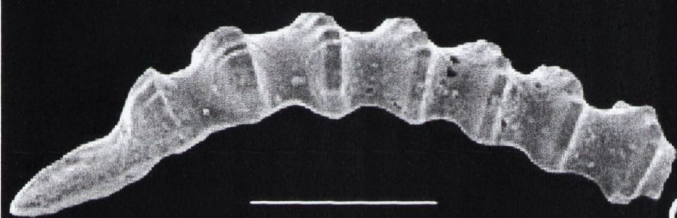
(scale bar: A-C & E-G 200µm; D & H 100µm)



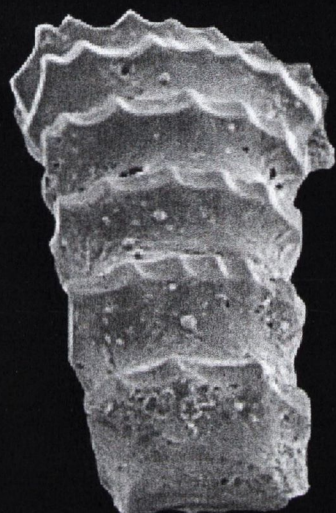
A



B



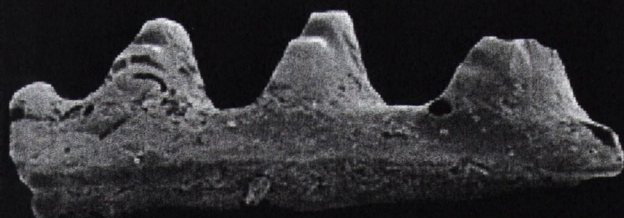
C



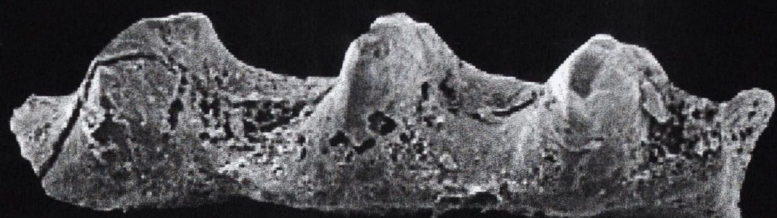
D



E



F



G



H

Plate 76

Bar Morphotype A

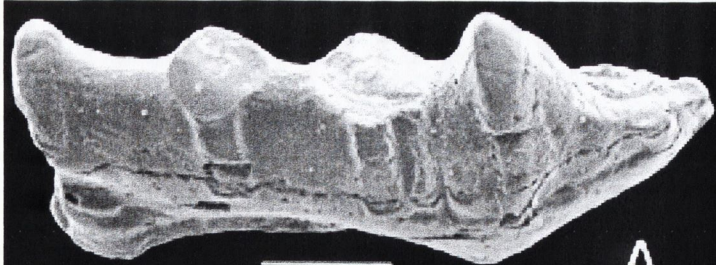
Figures A-D Kilbride TCD 36702

A - Dorsal view; B - Lingual view; C - Ventro-labial D - Lateral view

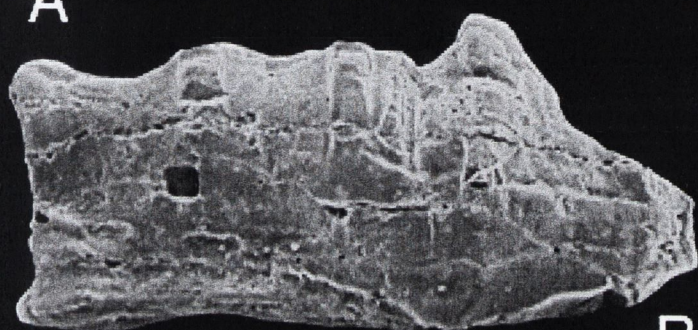
Figures E-F Kilbride TCD 36703

E -Dorso-lingual view; F - Ventro-labial

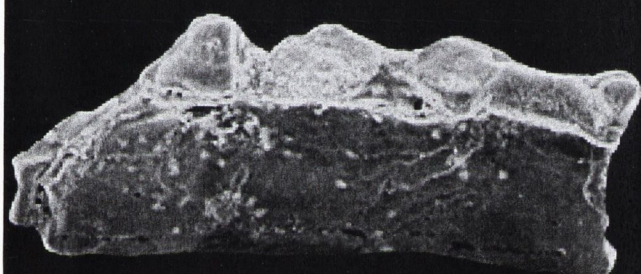
(scale bar: A-F 200µm)



A



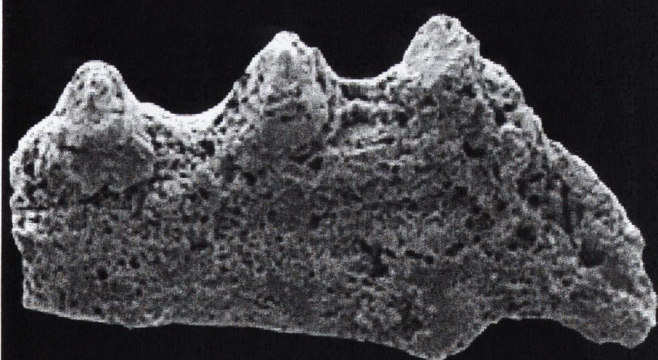
B



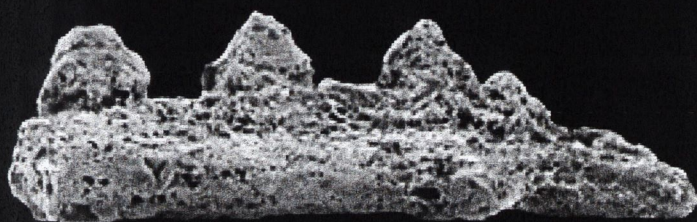
C



D



E



F

Plate 77

Bar Morphotype B

Figures A-E Kilbride TCD 36704

A - Lingual view; B - Dorsal view; C - Lingual view; D - Labial view;
E - Lateral view

Figures F-I Kilbride TCD 36705

F - Dorsal view; G - Lingual view; H - Labial view; I - Lateral view

Right-handed forms with strong lingual base hook.

(scale bar: A-E 200µm; F-H 500µm; I 100µm)

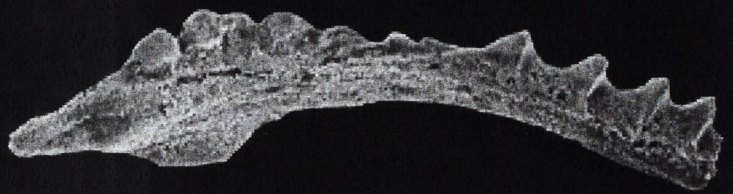
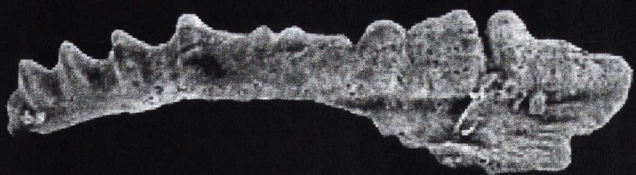
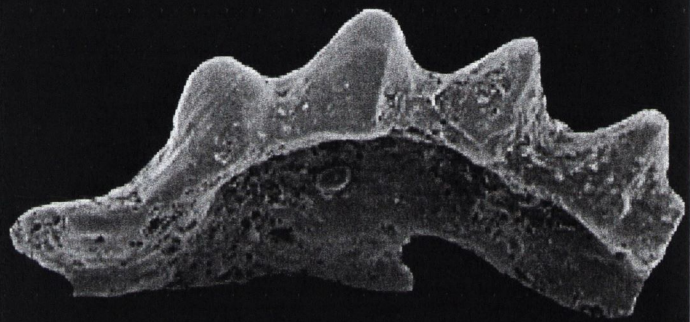
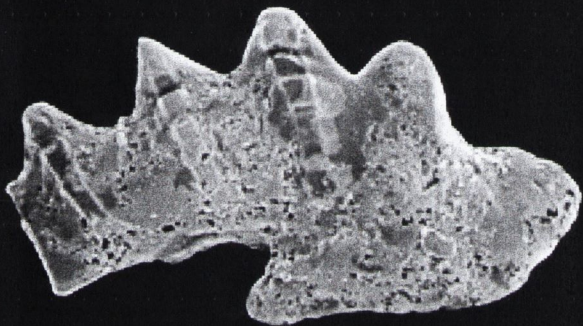
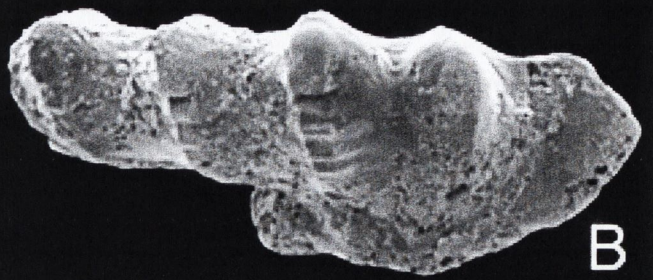
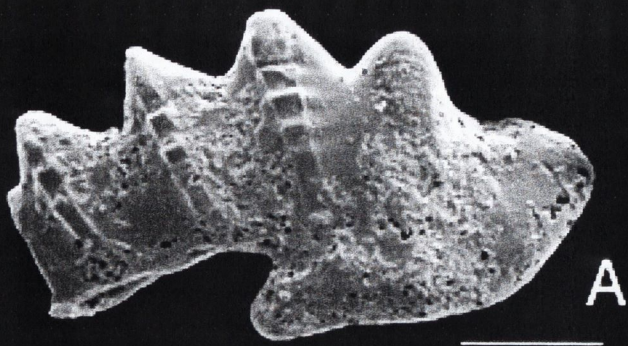


Plate 78

Bar Morphotype B

Figures A-D Kilbride TCD 36706

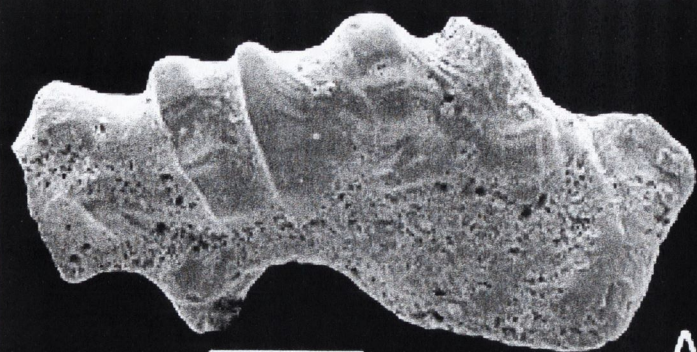
A - Dorso-lingual view; B - Lingual view; C - Dorso-labial view;
D - Lateral view

Figures E-H Kilbride TCD 36707

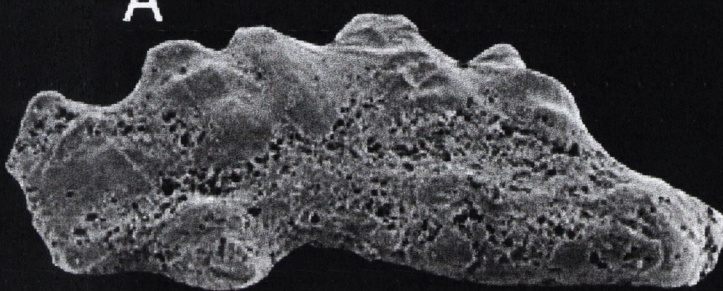
E - Dorso-lingual view; F - Lingual view; G - Lateral view;
H - Labial view

Right-handed forms with strong lingual base hook.

(scale bar: A-H 200µm)



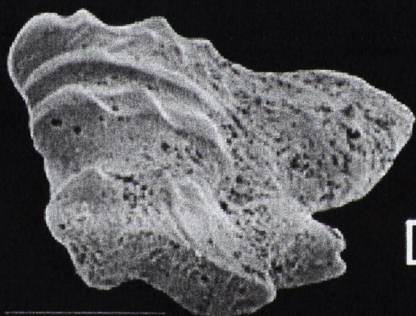
A



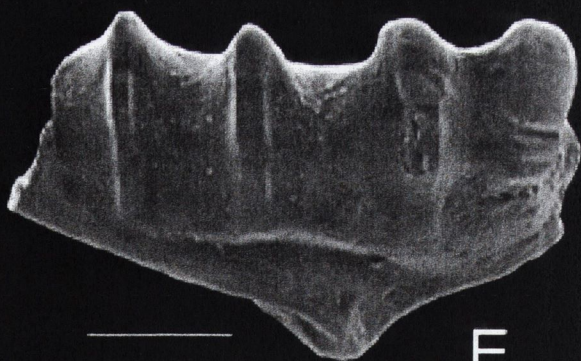
B



C



D



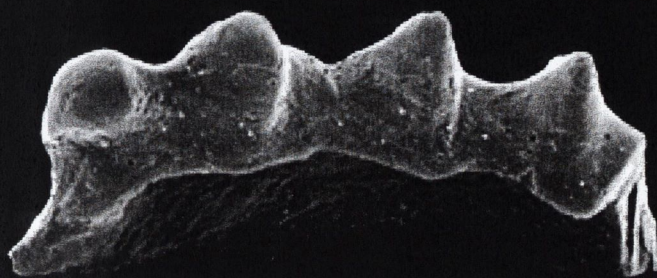
E



F



G



H

Plate 79

Bar Morphotype C

Figures A-D Kilbride TCD 36708

A - Dorso-lingual view; B - Lingual view; C - Labial view;

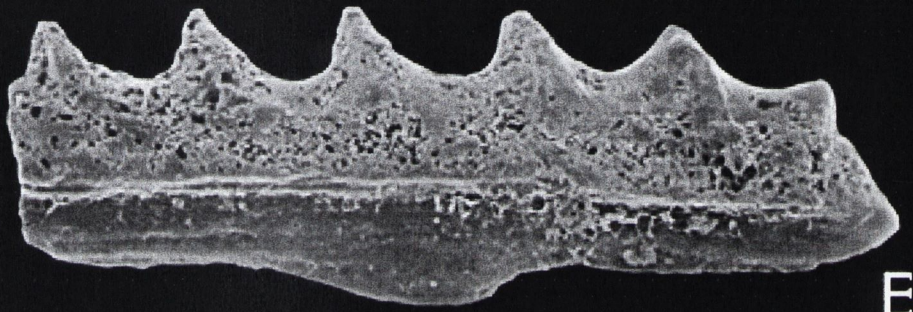
D - Lateral view

Straight bar.

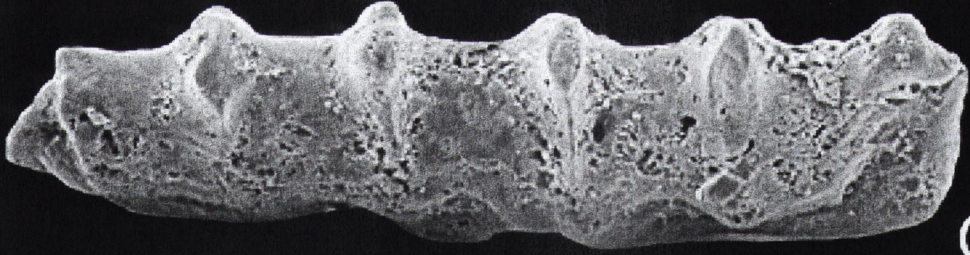
(scale bar: A-C 200µm; D 100µm)



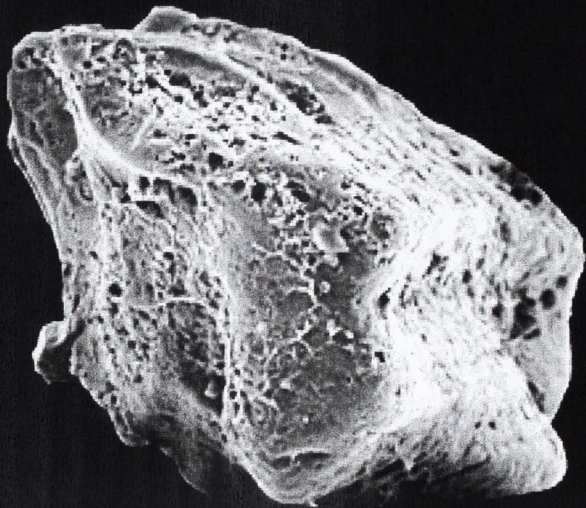
A



E



C



D

Plate 80

Bar Morphotype D

Figures A-D Kilbride TCD 36709

A - Lingual view; B - Labial view; C - Dorsal view; D - Lateral view

Figures E-H Kilbride TCD 36710

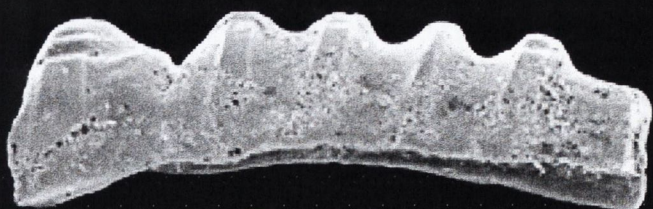
E - Dorsal view; F - Lingual view; G - Labial view; H - Lateral view

Left-handed version of Bar Morphotype A; crenulated cusp ridges are easily seen

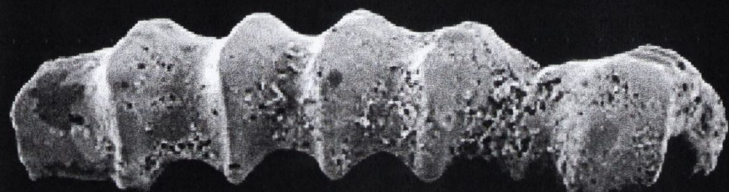
(scale bar: A-C & E-G 200µm; D & H 100µm)



A



B



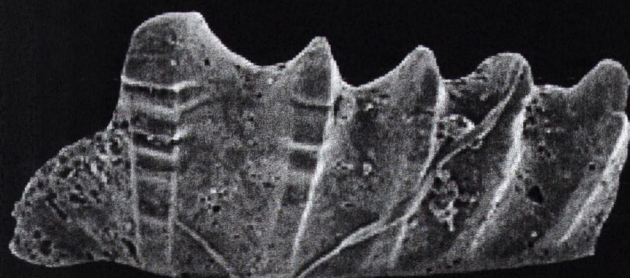
C



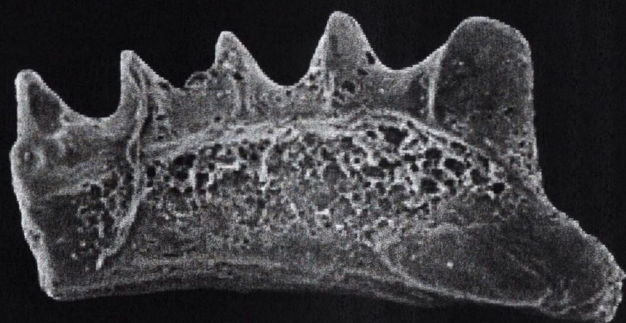
D



E



F



G



H

Plate 81

Bar Morphotype D

Figures A-D **Kilbride TCD 36711**

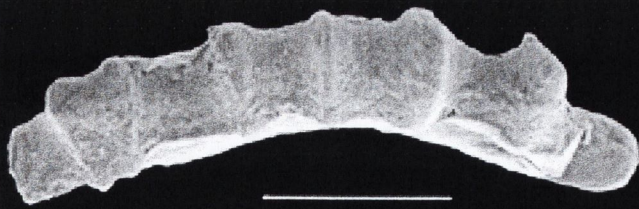
A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E-H **Kilbride TCD 36712**

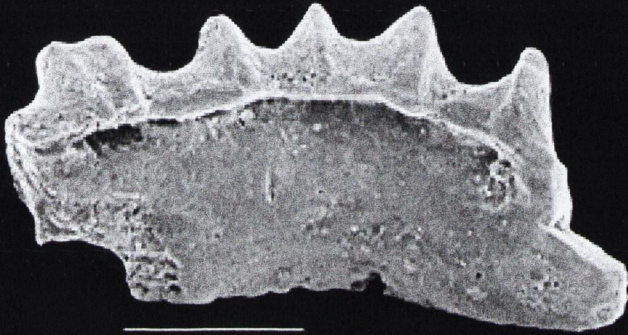
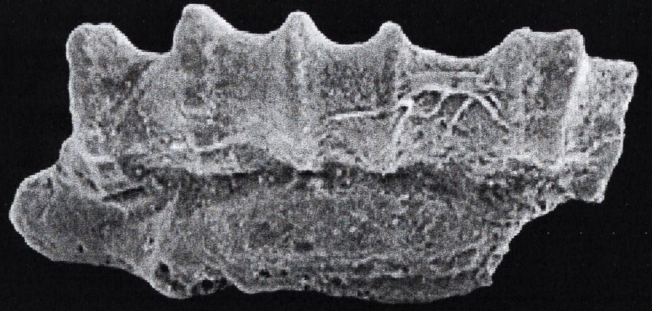
E - Lingual view; F - Labial view; G - Lateral view; H - Dorsal view

Left-handed version of Bar Morphotype A

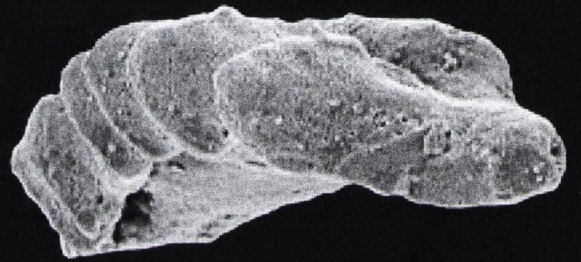
(scale bar: A-G 200µm; H 100µm)



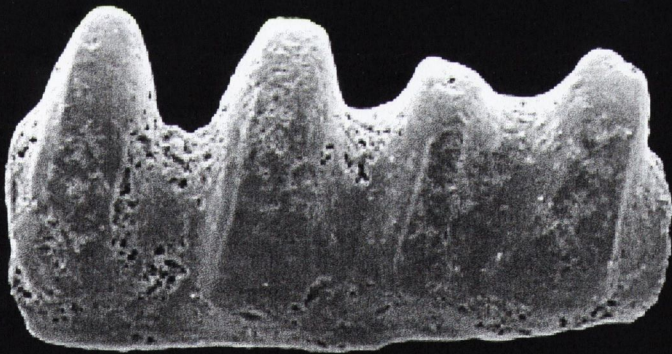
A



C



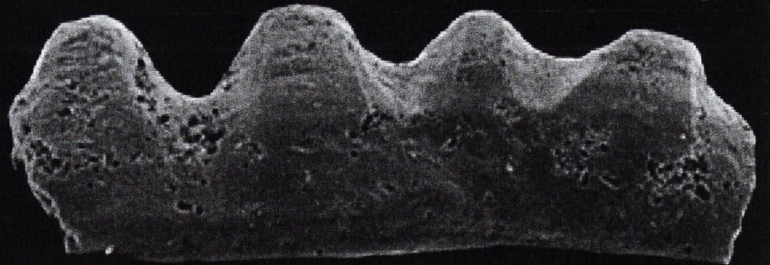
D



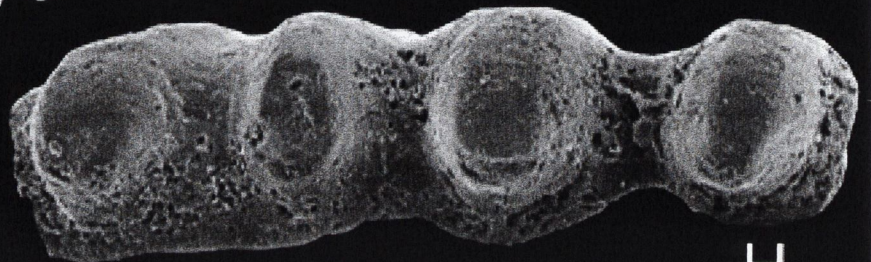
E



G



F



H

Plate 82

Bar Morphotype D

Figures A-D Kilbride (TCD 36713)

A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E-H Kilbride (TCD 36714)

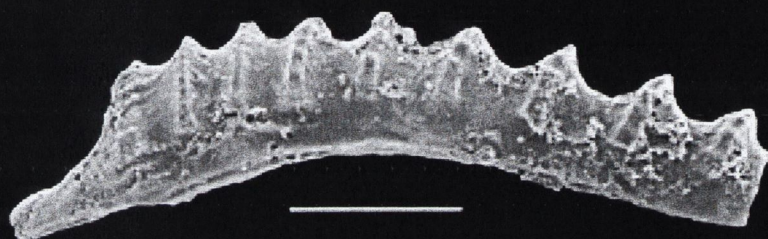
E - Dorsal view; F - Labial view; G - Lingual view; H - Lateral view

Left-handed version of Bar Morphotype A. Note the arcuate nature of the specimens.

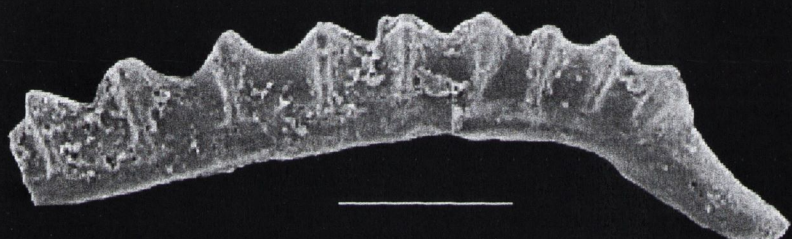
(scale bar: A-D & H 200 μ m; E-G 500 μ m)



A



B



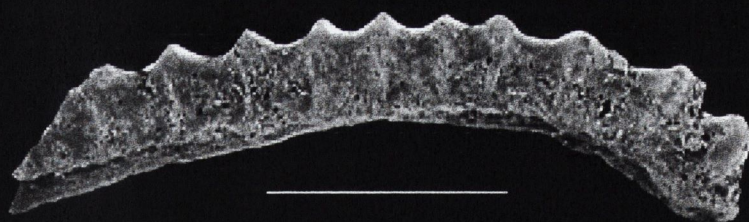
C



E



D



F



G



H

Plate 83

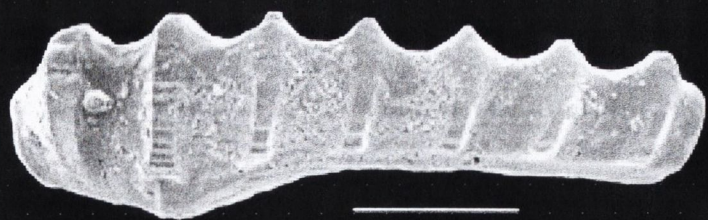
Bar Morphotype D

Figures A-E **Kilbride TCD.36715**

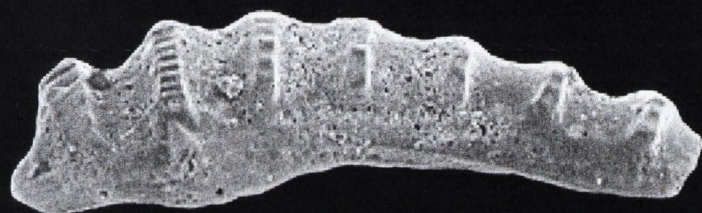
A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view; E - Lateral view

Left-handed version of Bar Morphotype A. Note the crenulated
crest ridges and the terminations at both ends of the specimen

(scale bar: A-C 200µm; D-E 100µm)



A



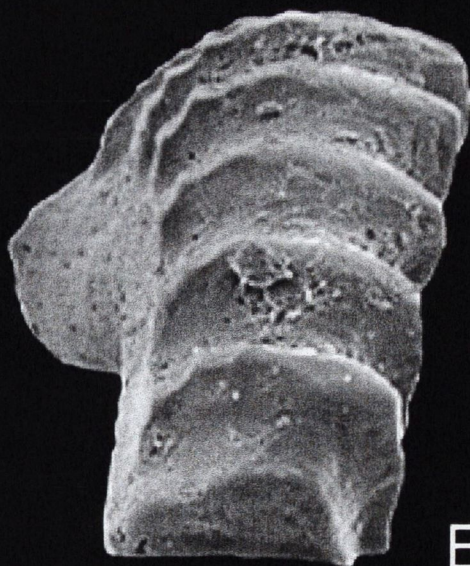
B



C



D



E

Plate 84

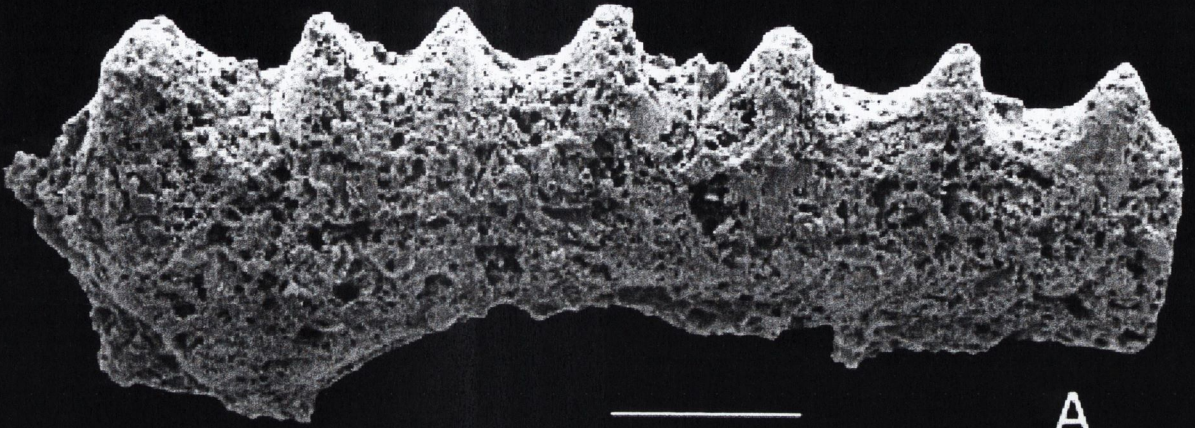
Bar Morphotype D

Figures A-C **Kilbride TCD 36716**

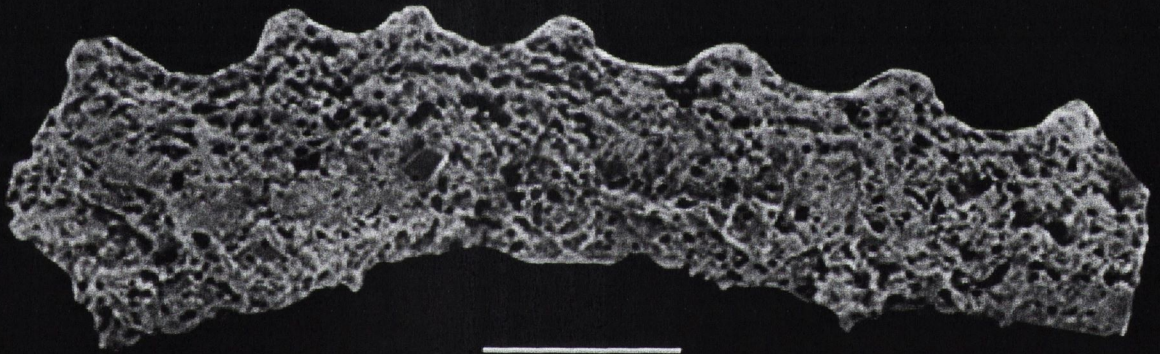
A - Lingual view; B - Labial view; C - Dorsal view

Worn example of a left-handed version of Bar Morphotype A

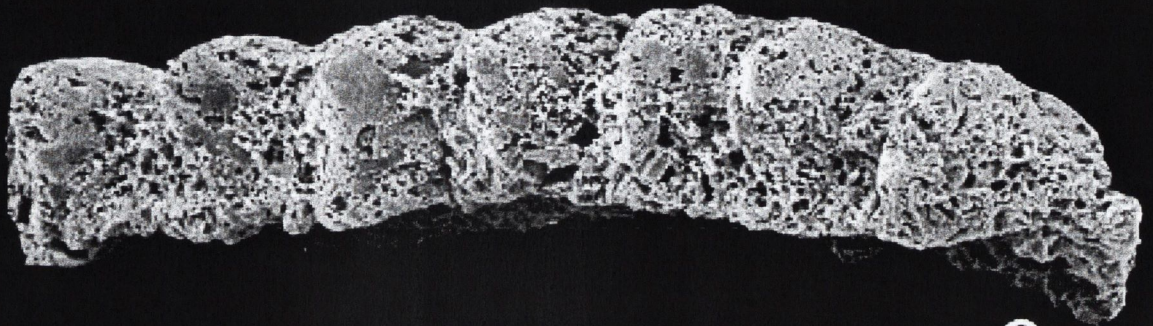
(scale bar: A-C 200µm)



A



B



C

Plate 85

Bar Morphotype D

Figures A-D Kilbride TCD 36717

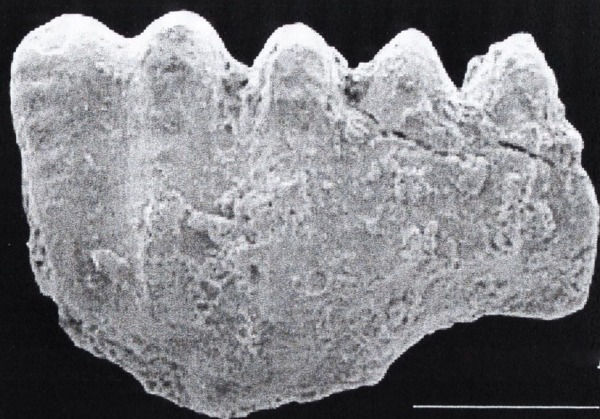
A - Lingual view; B - Dorsal view; C - Lateral view; D - Labial view

Figures E-H Urlingford TCD 36718

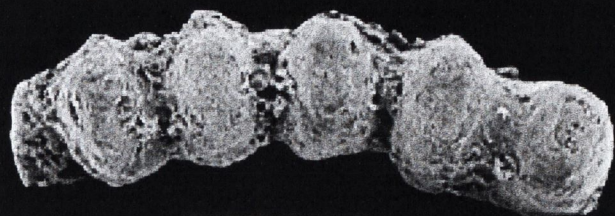
E - Lingual view; F - Detail G - Dorsal view; H - Lateral view

Left-handed version of Bar Morphotype A; F shows detail of part of the crenulated area of a cusp ridge.

(scale bar: A, B & D 200µm; C, E & G 100µm; F 20µm; H 50µm)



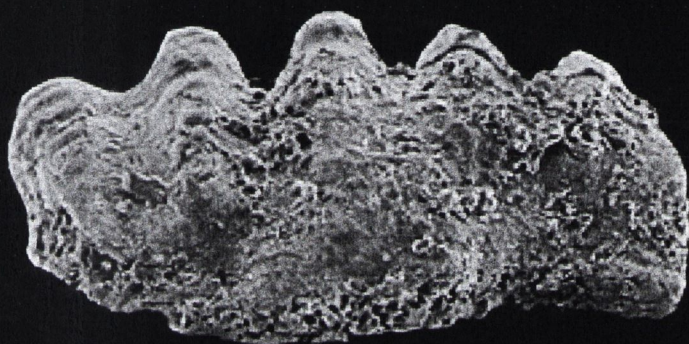
A



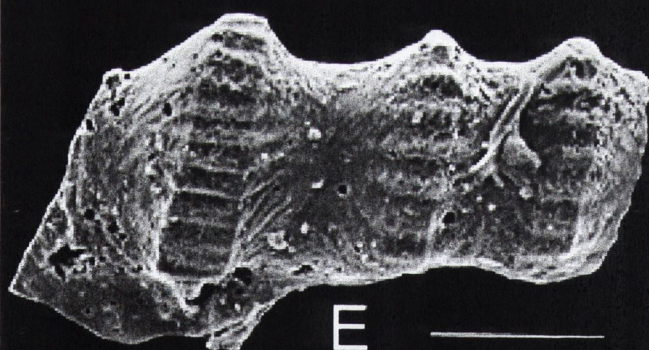
B



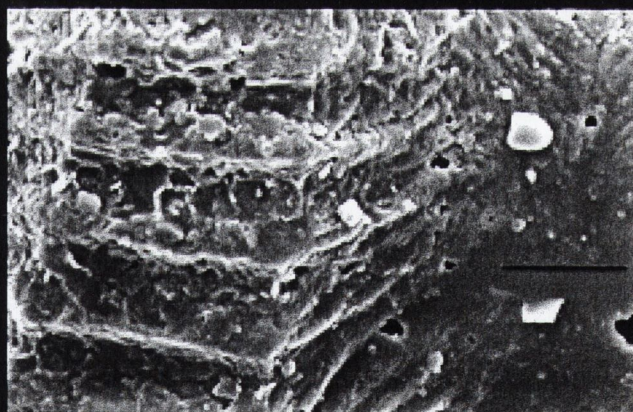
C



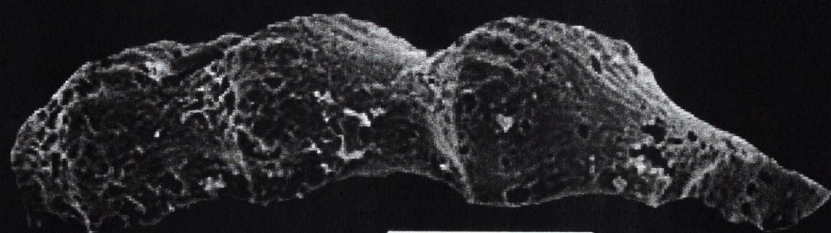
D



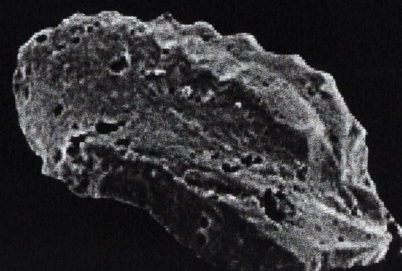
E



F



G



H

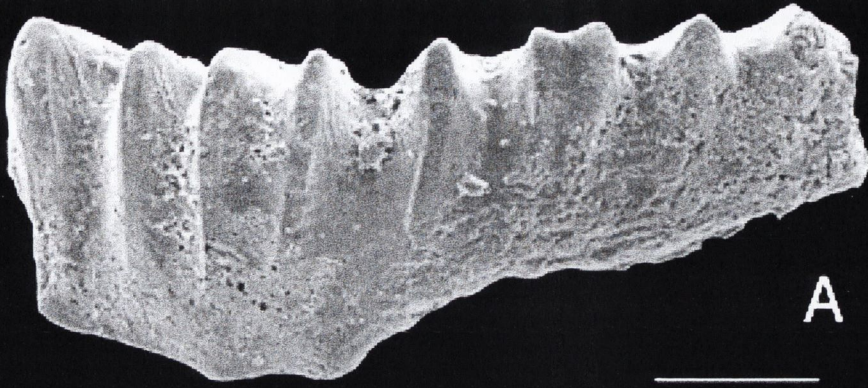
Plate 86

Bar Morphotype E

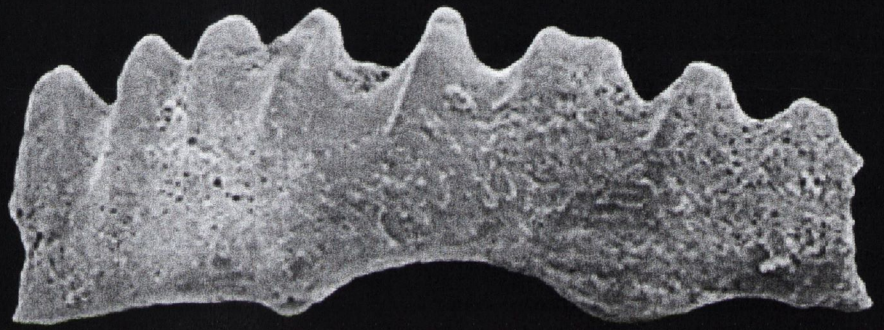
Figures A-D Kilbride TCD 36719

A - Dorso-lingual view; B - Lingual view; C - Labial view;
D - Lateral view

(scale bar: A-D 200µm)



A



B



C



D

Plate 87

Bar Morphotype F

Figures A-D Kilbride TCD 36720

A - Lingual view; B - Labial view; C - Dorsal view; D - Lateral view

Straight bar narrow with long cusp ridges.

(scale bar: A-C 200µm; D 100µm)

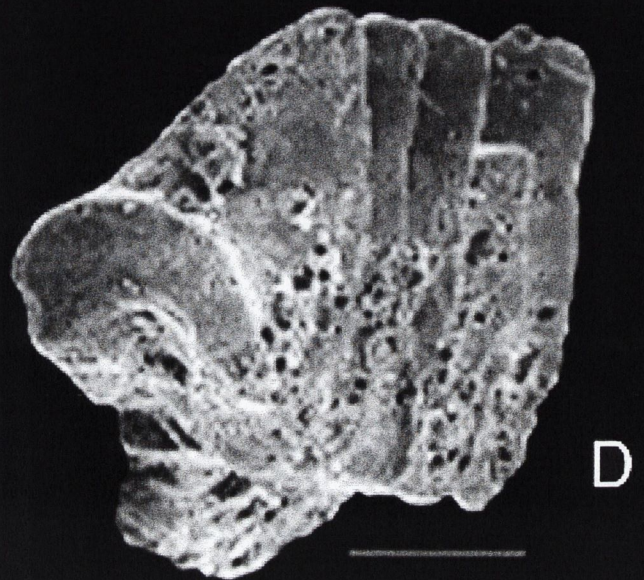
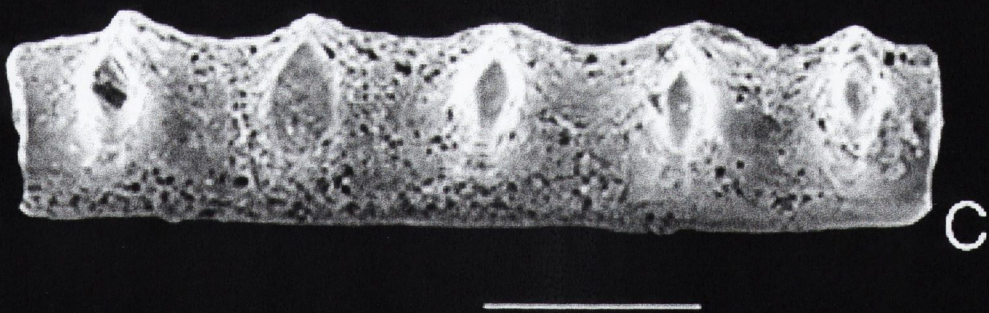
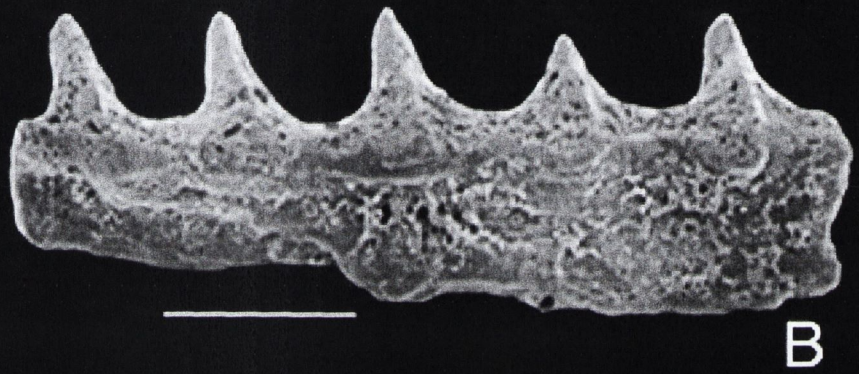
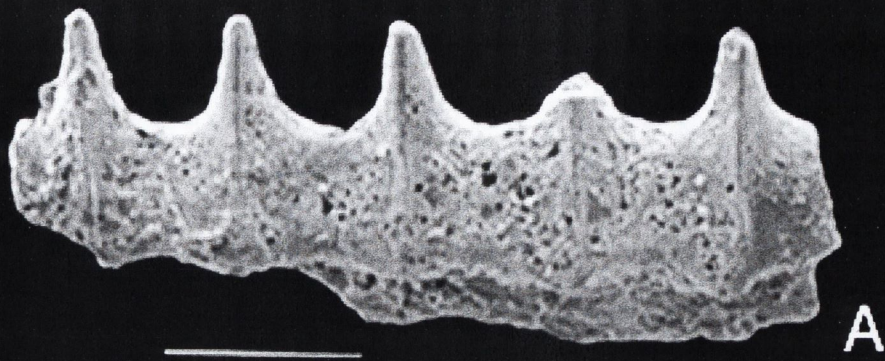


Plate 88

Bar Morphotype F

Figures A-D **Kilbride TCD 36721**

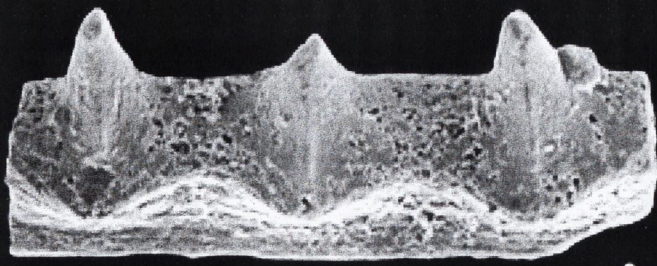
A - Dorso-labial view; B - Dorsal view; C - Lingual view;
D - Lateral view

Figures E-H **Kilbride TCD 36722**

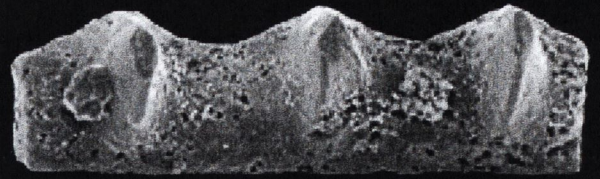
E - Lingual view; F - Lingual view; G - Dorsal view; H - Lateral view

Straight narrow bar with long cusp ridges.

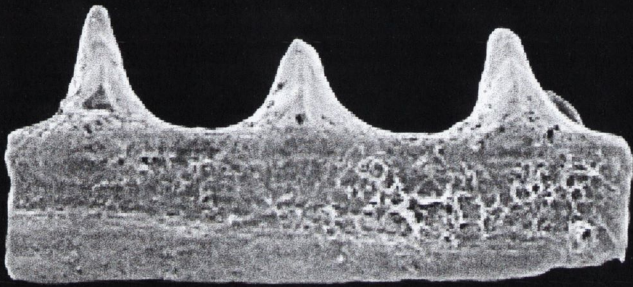
(scale bar: A-C 200 μ m; D & H 100 μ m; E-G 500 μ m)



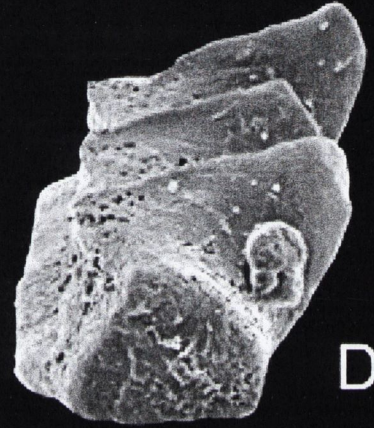
A



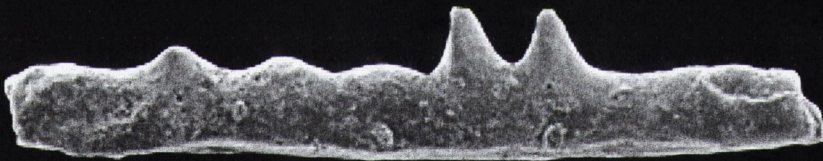
B



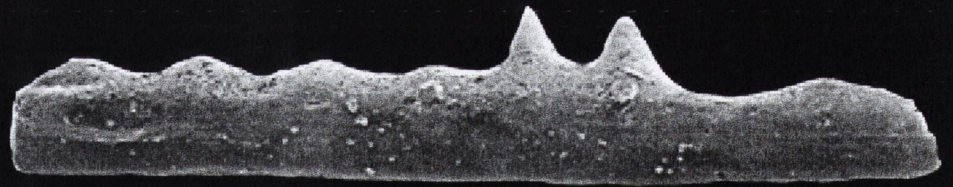
C



D



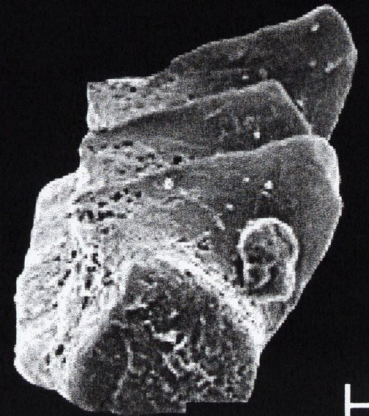
E



F



G



H

Plate 89

Bar Morphotype F

Figures A-C **Kilbride TCD 36723**

A - Dorsal view; B - Ventral view; C - Oblique Dorsal view

Figures D-G **Kilbride TCD 36724**

D - Dorsal view; E - Lateral view; F - Lingual view; G - Labial view

Straight narrow bar with long cusp ridges.

(Scale: A-G 200µm)



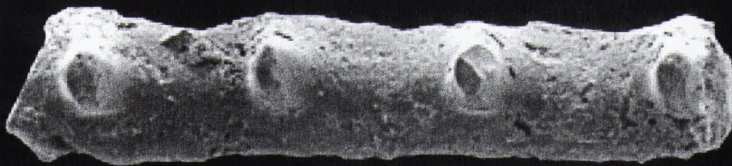
A



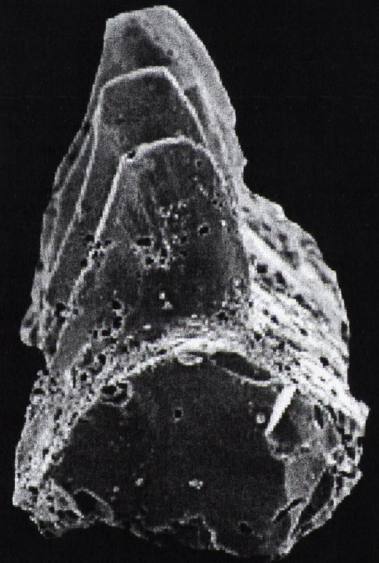
B



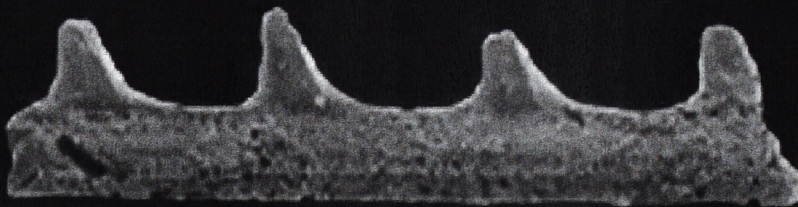
C



D



E



F



G

Plate 90

Bar Morphotype F

Figures A-C **Lyraun Cove TCD 36725**

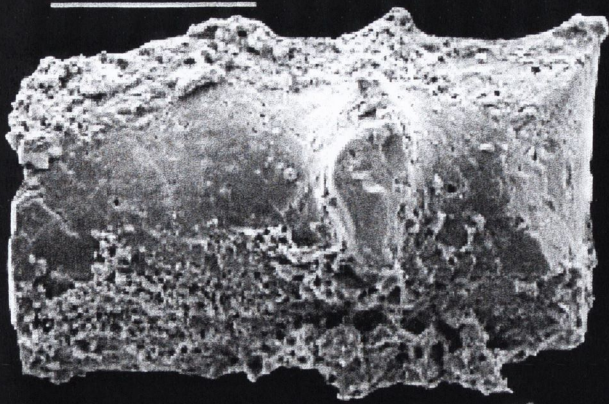
A - Dorsal view, B - Labial view; C - Lingual view

Figures D-E **Lyraun Cove TCD 36726**

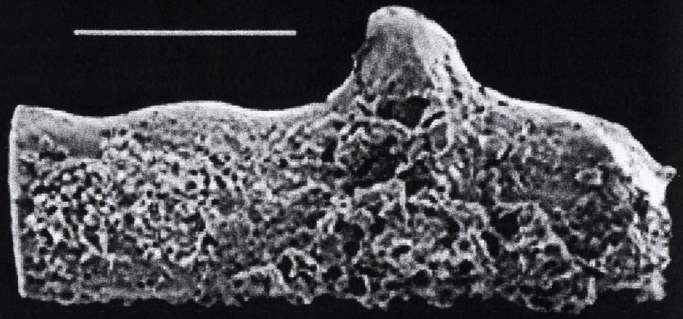
D - Oblique ventral view; E - Dorsal view

Straight narrow bar with long cusp ridges.

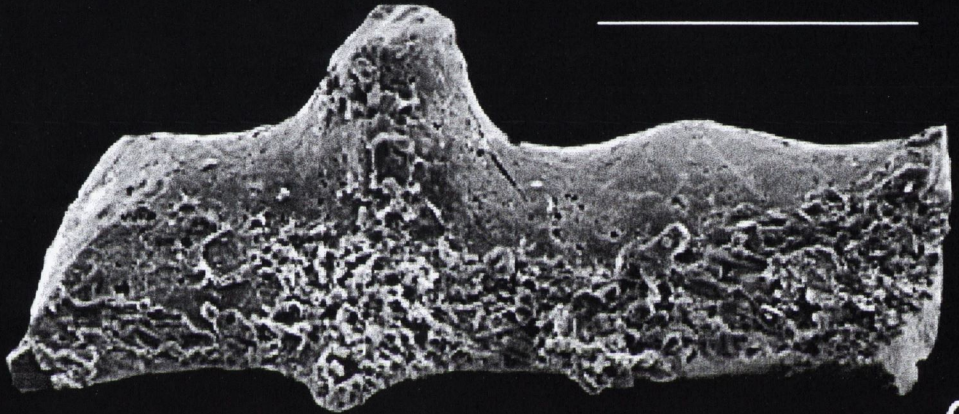
(Scale: A-C 200µm; D-E 100µm)



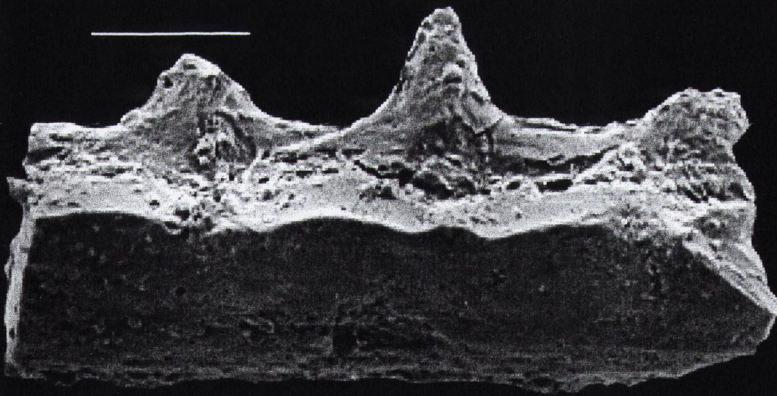
A



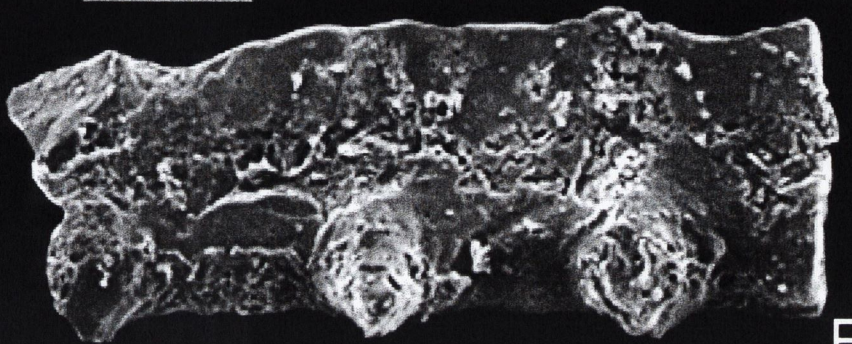
B



C



D



E

Plate 91

Bar Morphotype G

Figures A-D **Kilbride TCD 36727**

A - Dorsal view; B - Lingual view; C - Labial view; D - Lateral view

Figures E-H **Kilbride TCD 36728**

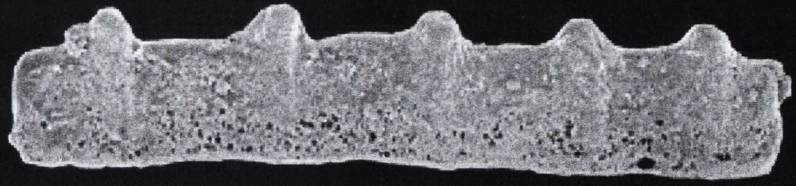
E -Dorsal view; F -Lingual view; G -Labial view; H -Lateral view

Straight narrow bar with short cusp ridges.

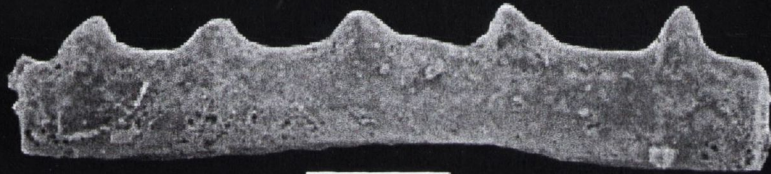
(Scale: A-C & E-G 200µm; D & H 100µm)



A



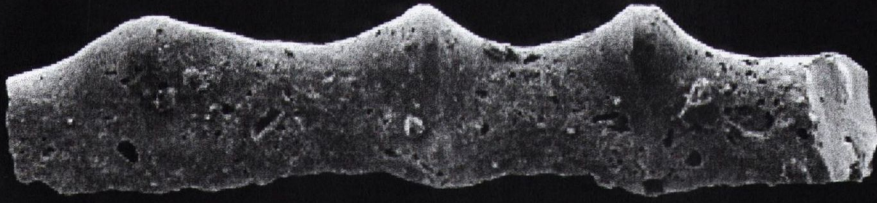
B



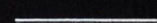
C



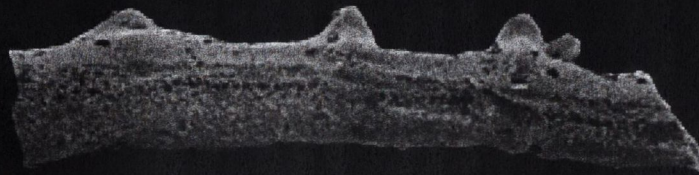
D



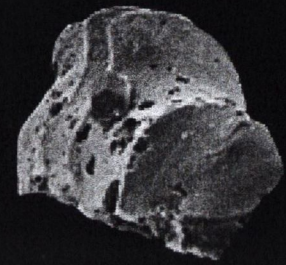
E



F



G



H

Plate 92

Bar Morphotype G

Figures A-D **Kilbride TCD 36729**

A - Dorsal view; B - Labial view; ? C - Lingual view; ? D - Lateral view

Figures E-F **Urlingford TCD 36730**

E - Lingual view; F - Dorsal view

Straight narrow bar with short cusp ridges.

(Scale: A-C, E-F 500 μ m; D 100 μ m)



A



B



C



D



E



F