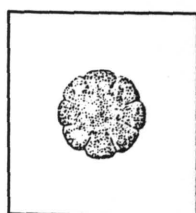
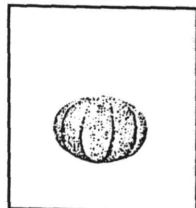


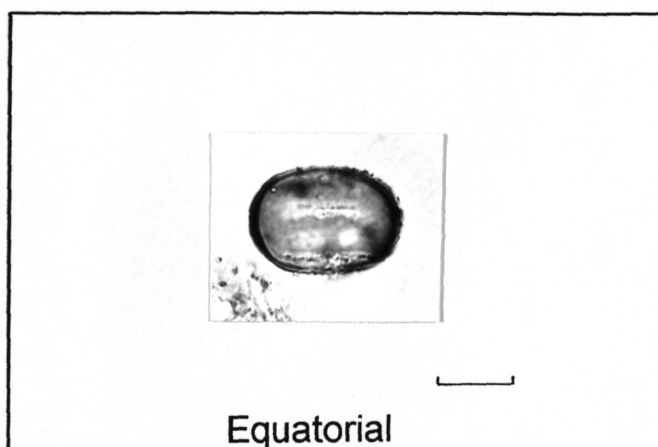
Stephanocolpate Pollen B



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.88

Specimens studied (5)

Spec no	Polar length (μ)	
<u>Equatorial diameter (μ)</u>		
Bold type = illustrated specimen		
69-40	30	24
105-5	35	30
105-16	33	25
106-17	35	23
259-16	20	14
Averages	31	23

Description

Amb shape	Prolate with blunt poles
Colpi	Four; closed or slightly gaping Relatively short; do not reach far into polar area.
Exine	1 - 4 μ thick Sexine thicker than nexine
Sculpturing	Finely to relatively coarsely reticulate

Illustrated specimen

(259-16) NOR-LM showing short, closed colpi

Literature

The west coast specimens were not identified.

Remarks

Few specimens of this type were found in the west coast sediments. They did not closely resemble any descriptions or illustrations in the literature consulted.

They were not placed within *Polycolpites* as this genus requires more than four colpi. *Ephedripites* requires many colpi, with a ribbed appearance. *Retistephanocolpites* has a thinner, more coarsely reticulate exine.

Botanical affinities Not known

Distribution Very rare. Known from the Main Peat Horizon and above at Koinaas.

Age bracket Unknown

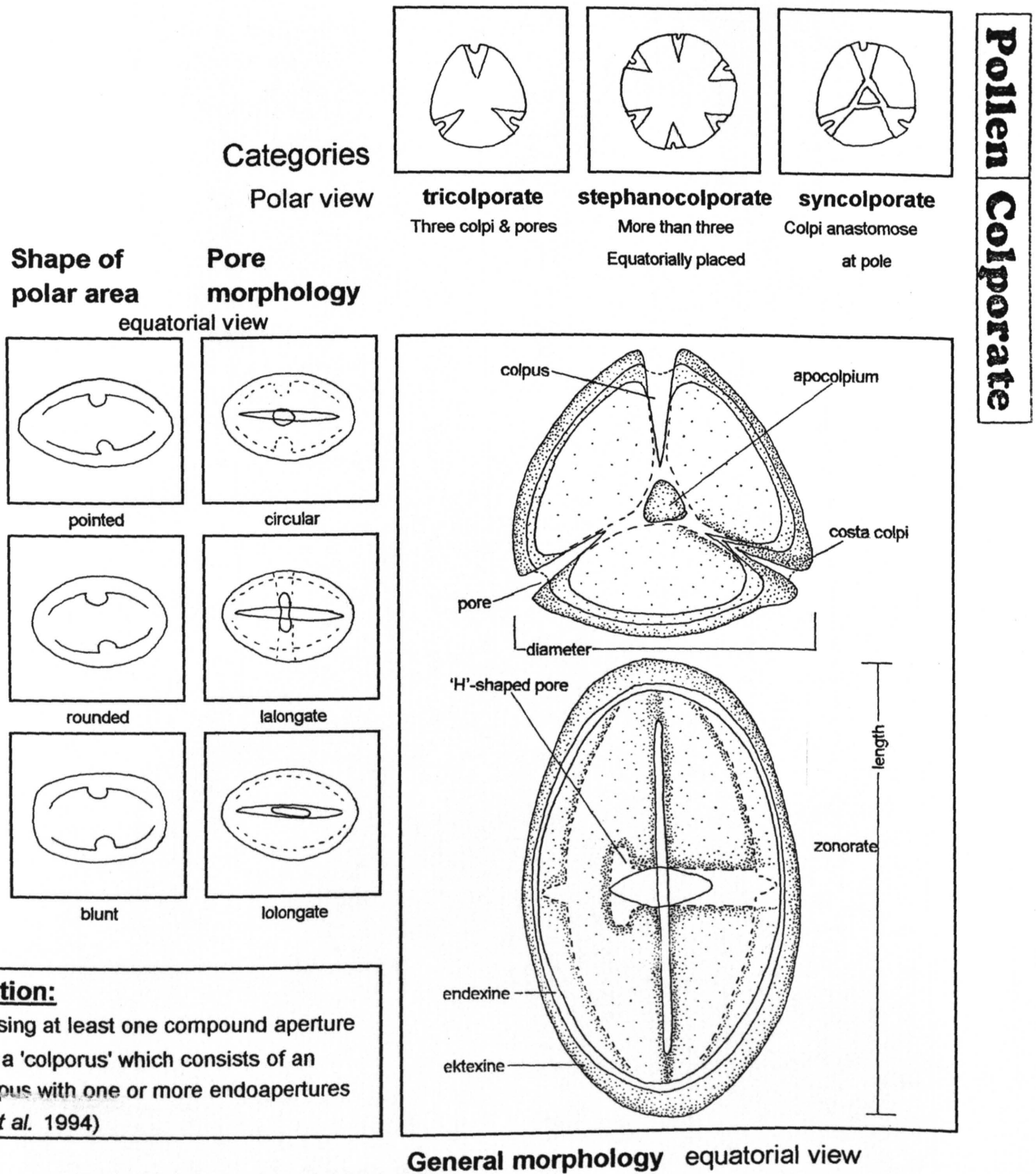
Pollen Colpate

Stephanocolpate

Colporate pollen

Graphic glossary of technical terms

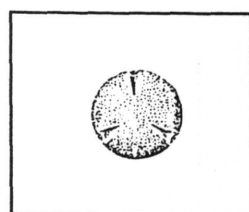
Figure 3.89



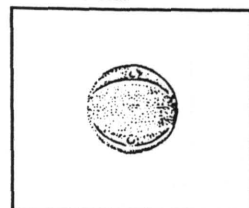
Shape of amb and morphology of colpi as for colpate pollen

Gemmatricolporites berbicensis Leidelmeyer 1966

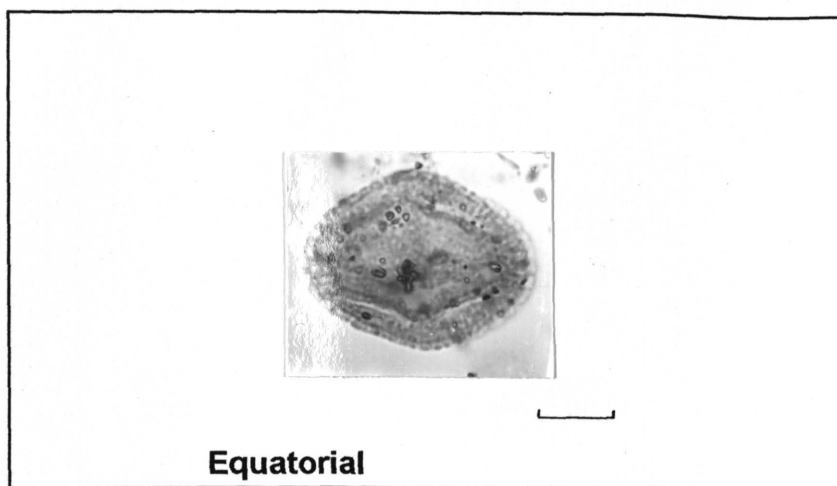
Type species *G. berbicensis* Leidelmeyer 1966



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.90

Specimens studied (5)

Spec no	Polar length (μ)
Bold type = illustrated specimen	
12-18	28
14-9	25
75-32	52
102-15	42
277-30	37
Average	37

Illustrated specimen

(12-18) LM Individual baculae seen at edge of grain

Description

Amb shape	Prolate in equatorial view Poles rounded
Colpi	Three; meridionally aligned Long, reach almost to poles Distinct, may gape slightly
Pores	Three; within colpi at equator Circular to lalongate
Exine	Intectate. Ektoexine >2 μ . Baculae each have large caput.
Sculpturing	Gemmate; elements approx 2-3 μ high and 2 μ wide. Densely distributed

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Gemmatricolporites berbicensis</i>	Leidelmeyer 1966 p 55		Pl 4 fig 5	Guyana	Palaeo-Eo
<i>Gemmatricolporites</i>	Jansonius & Hills 1976		p 1097	n/a	n/a

Remarks

The west coast specimens match the illustration and description of the type species exceptionally well.

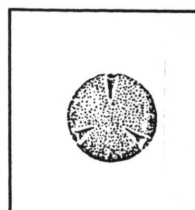
Botanical affinities Not stated by Leidelmeyer (1966)

Distribution Rare. Known from the Main Peat Horizon and above at Koningnaas

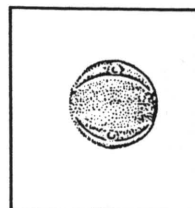
Age bracket Palaeocene-Eocene (Leidelmeyer 1966)

Malvacipolloides sp Anzotegui & Garralla 1985

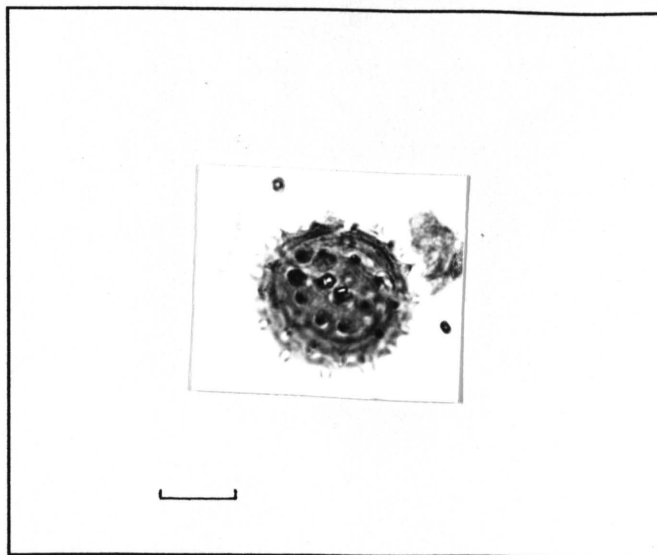
Type species *M. densiechinata* Anzotegui & Garralla 1985



Polar



Equatorial



Scale bar = 10 μ

Figure 3.91

Specimens studied (2)

Spec no	Polar length(μ)
Bold type = illustrated specimen	
84-37	34
168-39	20

Illustrated specimen

(168-39) LM showing densely packed spines

Description

Amb shape	Spherical; stellated with spines
Colpi	Three; meridionally aligned May gape. Not well seen
Pores	Three; within colpi at equator Not well seen due to spines
Exine	Exine approx even thickness throughout grain. Ektexine <2 μ . Tectate. Endexine thinner
Sculpturing	Echinate. Spines approx 2 μ high Regularly distributed over grain

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Malvacipolloides comodoroensis</i>	Barreda 1993 p 178		Pl 4 fig 1-6	Argentina	U Oligo-Mio
<i>Spinaepollis</i>	Jansonius & Hills 1976		p 2645	n/a	n/a

Remarks

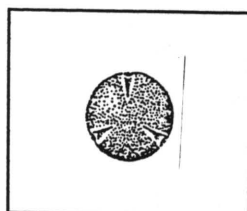
Only two grains of this type were found. They bear a good resemblance to the grains featured in Barreda (1993) but were not positively identified to species level as there were too few. They also resemble *Spinaepollis* Krutzsch 1961, but some of the details of the sculpturing could not be determined. They differ from *Tubulifloridites* and other Compositae in the literature consulted as their spines have a different structure, they are smaller and further apart.

Botanical affinities Malvaceae (Barreda 1993) of the Malvales (Dilleniidae)

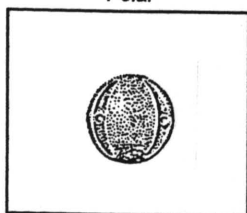
Distribution Very rare. Isolated specimens found at Koinaas and Langklip

Age bracket Upper Oligocene - Miocene

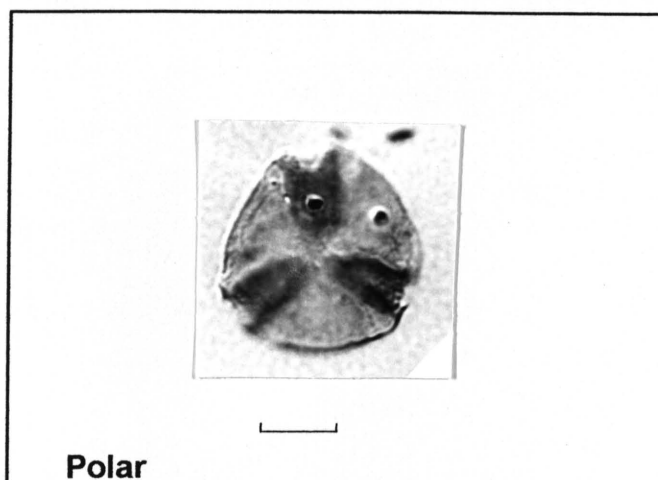
Margocolporites scabratus Pocknall & Mildenhall 1984



Polar



Equatorial



Polar

Scale bar = 10 μ

Figure 3.92

Specimens studied (8)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
40-21	20
56-27	17
80-8	28
84-40	27
162-19	19
219-1	29
277-7	17
277-25	16
Average	22

Illustrated specimen

(80-8) NOR-LM showing structure of colpi

Description

Amb shape	Circular to triangular in polar view Probably oblate in equatorial view.
Colpi	Three; meridionally aligned Long, reach almost to poles Broad. Costa colpi noted Characteristically, exine thicker inside colpi Angulaperturate
Pores	Three; within colpi at equator Shape of pore not seen well
Exine	Relatively thin. Ektoexine <1 μ . Appears structureless. Endoexine also thin, but thicker in colpi
Sculpturing	Scabrate

Literature

Genus/species	Author	Desc & Illustration	Geog loc	Age
<i>M. scabratus</i>	Pocknall & Mildenhall 1984	p 34 Pl 15 fig 1-4	New Zealand	late Oligocene

Remarks

Botanical affinities ? Bignoniaceae (Pocknall & Mildenhall 1984)Distribution Very rare. Eight isolated specimens were found, from all levels and all sites.Age bracket late Oligocene

Margocolporites sp Ramanujam 1966 ex Srivastava 1969

Type species *M. tsukadai* Ramanujam 1966

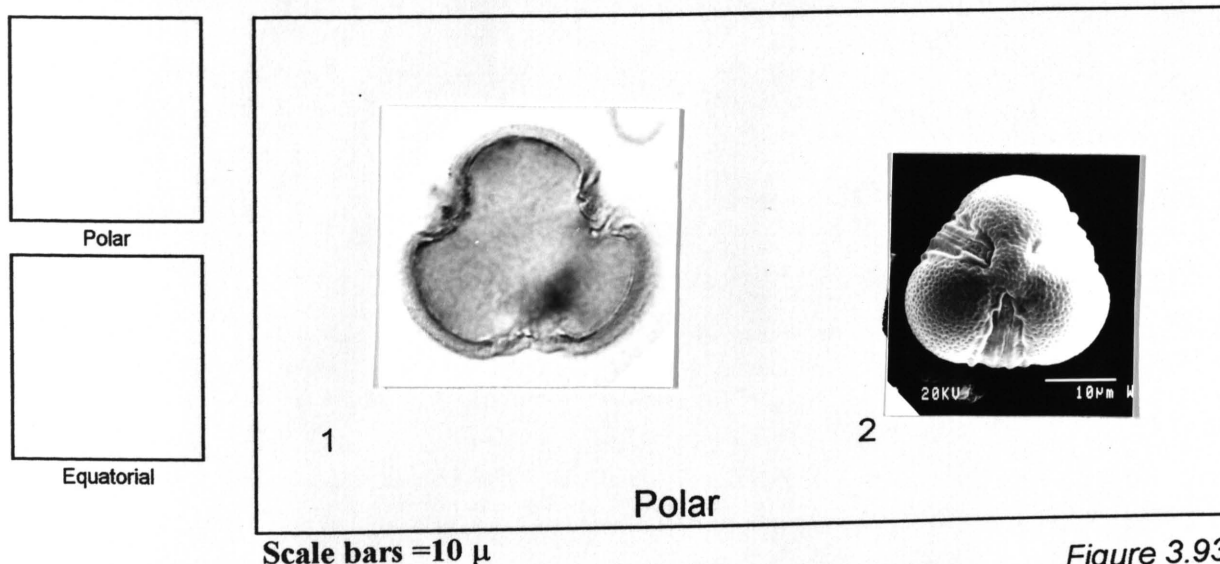


Figure 3.93

Specimens studied (7)

Spec no	Equ diam (μ)
Bold type = illustrated specimen	
82-34	50
82-39	45
112-14	25
268-6	25
268-11	30
273-29A	26
276-21	28
Average	33

Illustrated specimens

- (276-21) NOR-LM. Focus on wall of grain
- (268-11) SEM showing nature of apertures

Description

Amb shape	Triangular to trilobate in polar view Oblate to spheroidal Large grain, 33μ diam
Colpi	Three; long and very broad Fossaperturate, ends pointed Surrounded by wide margo Small apocolpium
Pores	Slightly protruding, not seen well. Membrane psilate
Exine	Thick; 2 - 4m, thickest between colpi Endexine thinner in colpal area Foveolate tectum over most of grain
Sculpturing	Pitted; <1μ apart. Colpi psilate

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>M. vanwijhei</i>	Germeraad <i>et al.</i>		p 340 fig 3	Caribbean	Mid-Tertiary
<i>Margocolporites</i>	Jansonius & Hills 1976				
<i>M. raувolfii</i>	Salard-Cheboldaeff 1979	Fig 5		Cameroon	U Eocene
<i>M. raувolfii</i>	Coetzee & Rogers 1982			South Africa	Miocene
<i>M. vanwijhei</i>	Pocknall 1982	Fig 8 & 9		New Zealand	Eo - Miocene

Remarks

The west coast specimens resemble various published illustrations and descriptions well, as noted above. The grains did not resemble some other illustrations and descriptions, such as *M. sahnii* Ramanujam in Rao 1989.

Botanical affinities Leguminosae (Pocknall 1982).

Distribution Very rare. Known from channel peats at Koingnaas and from Somnaas/Noup.

Age bracket Eocene - Miocene.

Genus *Rhoipites* Wodehouse 1933

Type species *R. bradleyi* Wodehouse 1933

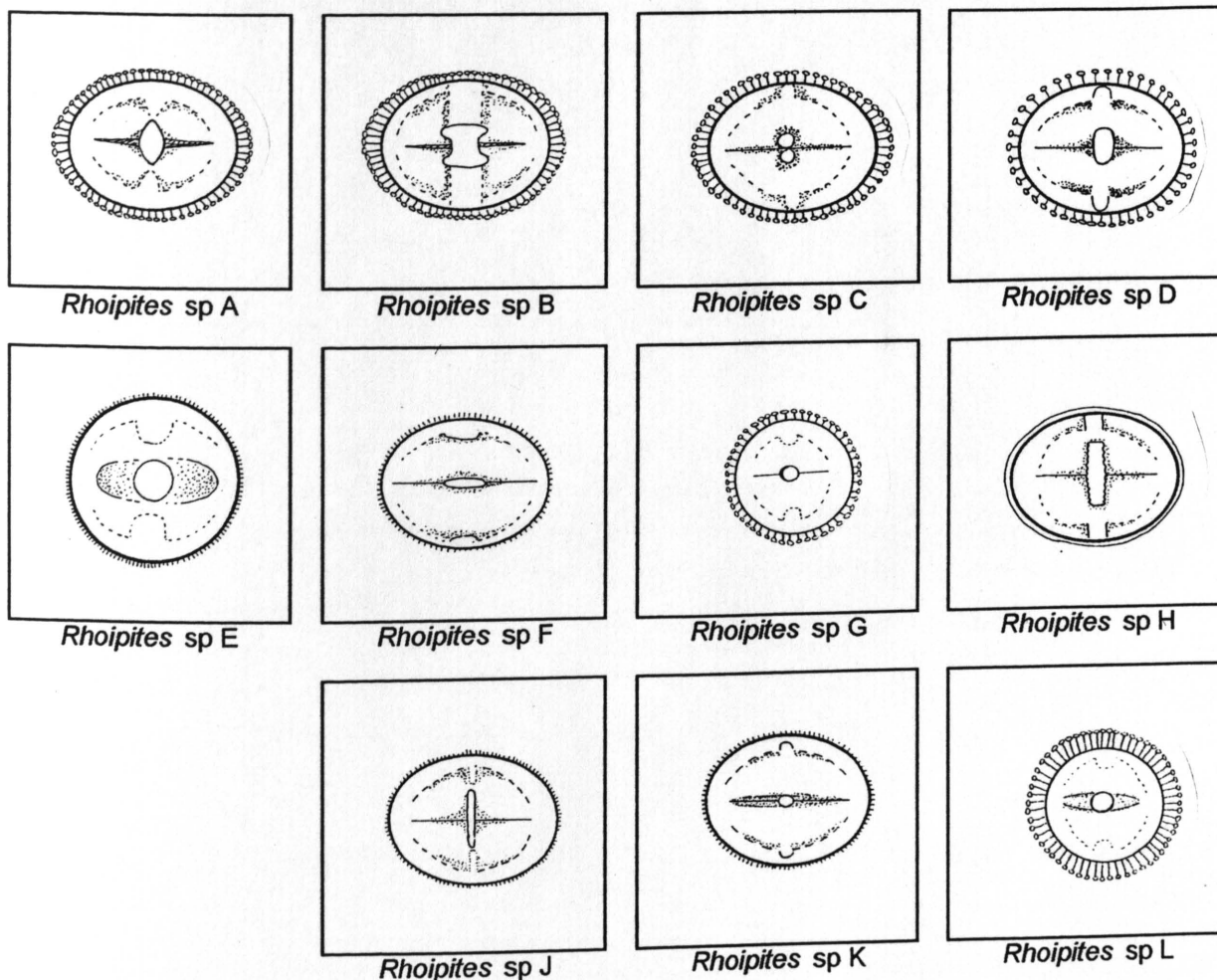


Figure 3.94

Pollen Colporate Tricolporate

Remarks

Special attention has been given to the genus *Rhoipites* because of its importance in the samples studied. Tricolporate grains were by far the most numerous palynomorphs found, and the vast majority of them can be assigned to this genus.

As noted by Kemp & Harris (1977), there appears to be little difference between *Rhoipites* Wodehouse and *Tricolporites* Cookson. The former name has priority, and other genera such as *Rhooidites* Potonié, Thomson & Thiergart, *Rhoipollenites* Potonié and *Tricolporopollenites* Pflug & Thomson are accepted as junior synonyms of *Rhoipites* (Potonié 1960). *Retitricolporites* (van der Hammen) van der Hammen & Wijmstra 1964 is illegitimate.

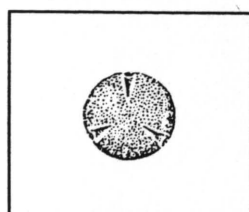
Tricolporites has been widely used, especially by southern hemisphere workers, for tricolporate pollen with a reticulate exine pattern. This genus was emended by Stover & Partridge (1973) to include non-reticulate grains, making the diagnosis even broader.

The tricolporate pollen grains assigned to *Rhoipites* showed much variation in such features as size and shape of pores and colpi, height of columellae and coarseness of reticulum, and the overall size and shape of the grain, within the limits allowed for in the generic description. They were placed into several groups on a morphological basis equivalent to species. Each group was judged to have features which distinguished it from the others. Cognisance was taken of the fact that a considerable variety of pollen is obtained from a single anther of a modern plant. However, no connection to a parent plant or the level of variation that existed for these plants can be established, thus the separation into groups must rest merely on morphological differences.

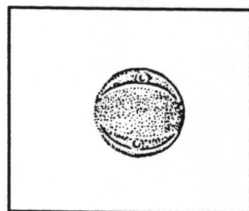
The species of *Rhoipites* recognised here are represented above for ease of comparison. The characteristics of each species, and the features which distinguish one from the other, are discussed with the species descriptions.

Rhoipites sp A

Type species *R. bradleyi* Wodehouse 1933

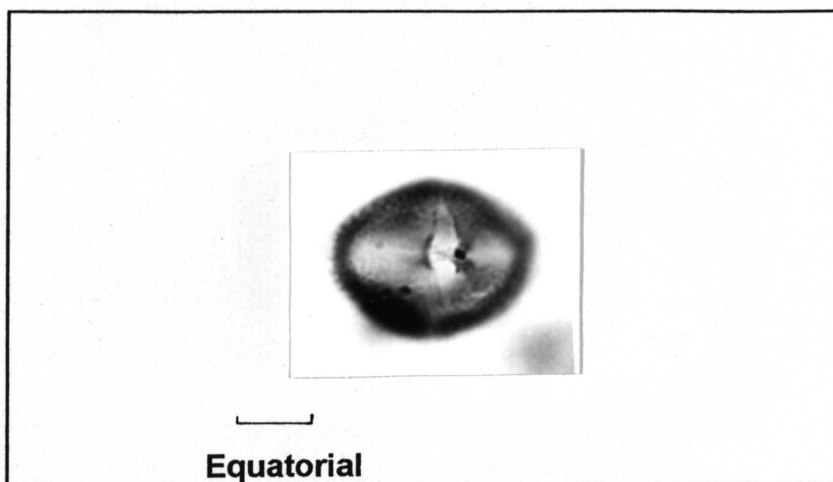


Polar



Equatorial

Also see Colour Plate 1



Equatorial

Scale bar = 10 μ

Figure 3.95

Specimens studied (18)

Average (μ)	
Polar length (18 specimens)	26

Range (m)	
Polar length (18 specimens)	15-50

Illustrated specimen	
(5-29) LM. Focus on top of grain to show structure of pore	

Description

Amb shape	Prolate in equatorial view Poles rounded
Colpi	Three; meridionally aligned Long, reach almost to poles Distinct. May be closed Some specimens show deep colpi
Pores	Three; within colpi at equator Lalongate; 6 μ x 14 μ "eye"-shaped, taper both ends
Exine	Ektoexine <2 μ . Columellae higher at pole. Endoexine thin, 1 μ
Sculpturing	Reticulate; mesh approx 0.5 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Retitricolporites guianensis</i>	van der Hammen & Wymstra 1964		PI fig 1 & 2	British Guiana	
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

Specimens were placed in this group if they were prolate with tapering, lalongate pores. The pores of the illustrated specimen are similar to those seen in the illustration of *Retitricolporites guianensis* van der Hammen & Wymstra 1964. The west coast specimens were not identified with this species as the exine structure was not similar.

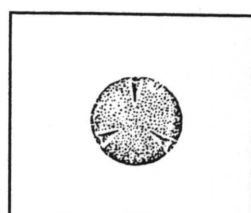
Botanical affinities Grains are similar to Araliaceae featured in Erdtman (1952) and possibly to Cornaceae, Umbelliferae and Vitaceae.

Distribution Very rare. Isolated specimens found in the Main Peat Horizon at Koningnaas and from Somnaas/Noup.

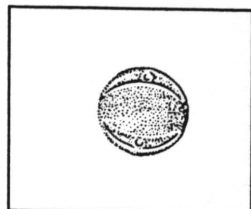
Age bracket ? U Cretaceous - Tertiary (van der Hammen & Wymstra 1964)

Rhoipites sp B

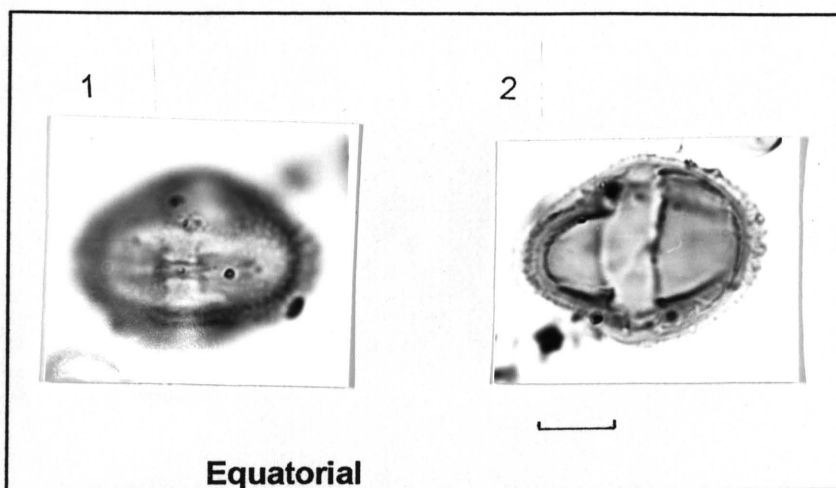
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bars = 10 μ

Figure 3.96

Also see Colour Plate 3

Specimens studied (25)

Averages (μ)
Polar length (24 specimens) 29
Equatorial diameter (24 specimens)
Ratio Pol/Eq (24 specimens) 1.37
Ranges (μ)
Polar length (24 specs) 15-52
Equatorial diameter (24 specs) 11-42
Ratio Pol/Eq (24 specs) 1.17-1.86
Illustrated specimen
1. (55-9) LM. Focus on top of grain to show "H"-shaped pore in ectexine
2. As above. Focus on zonorate aperture

Description

Amb shape	Prolate in equatorial view Poles rounded
Colpi	Three; meridionally aligned Long, reach almost to poles
Pores	Three; within colpi at equator "H"-shaped pore possibly developed only in ectexine as not visible in median focus. Zonorate in endexine
Exine	Ektoexine <2 μ . Columellae higher at pole. Endoexine 1-1.5 μ
Sculpturing	Reticulate; mesh approx 0.5 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a
<i>Tricolporopollenites</i> spp C and D	Scholtz 1985 p 75		Fig 18 A-F	South Africa U Cret-Palaeo	

Remarks

Specimens were placed in this group if they possessed the characteristic "H"-shaped pore. The pores of the illustrated specimen are similar to those seen in the illustration of *Tricolporopollenites* spp C and D in Scholtz 1985. The west coast specimens were not identified with this species because the grains featured by Scholtz were not zonorate.

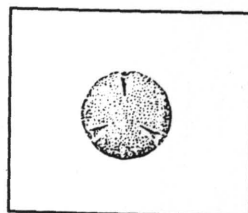
Botanical affinities ? Cornaceae (Scholtz 1985)

Distribution Little known. Found in all levels at Koingnaas and Langklip.

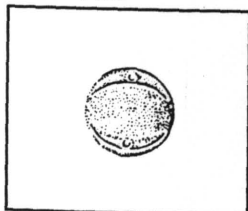
Age bracket ? U Cretaceous - Tertiary (Scholtz 1985)

Rhoipites sp C

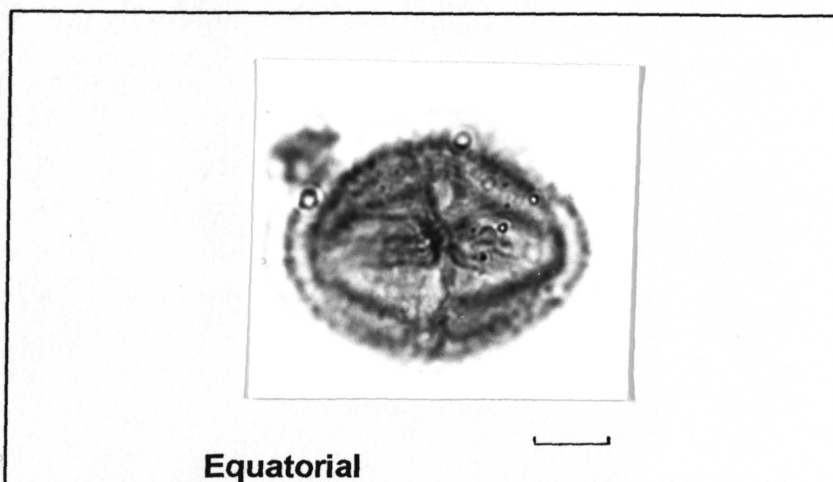
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.97

Specimens studied (17)

Averages (μ)
Polar length (16 specimens) 23
Equatorial diameter (16 specimens) 18
Ratio Pol/Eq (16 specimens) 1.20

Ranges (μ)
Polar length (16 specs) 115-45
Equatorial diameter (16 specs) 10-38
Ratio Pol/Eq (16 specs) 1.00-1.56

Illustrated specimen

(67-38) LM. Focus on 'bow'-shaped pore

Description

Amb shape	Prolate in equatorial view Some grains almost circular Poles very rounded
Colpi	Three; meridionally aligned. Long and broad, reach almost to poles
Pores	Three; within colpi at equator "Bow"-shaped; divided into two parts Developed in endexine. Ektexine bulges at equator over pores.
Exine	Ektexine 2-4 μ . Columellae higher at pole. Endexine 1-1.5 μ
Sculpturing	Reticulate; mesh approx 0.5 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a
<i>Pleurospermaepollenites</i>	Jansonius & Hills 1976		p 2036	Asia	Eocene

Remarks

Specimens were placed in this group if they possessed the characteristic "bow"-shaped pore. The pores of the illustrated specimen are similar to those seen in the illustration of *Pleurospermaepollenites* Kulkova in Jansonius & Hills 1976. The west coast specimens were not identified with this genus because other diagnostic features were not seen.

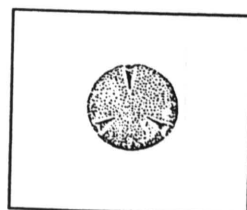
Botanical affinities Not known

Distribution Significant in Channel peats at Koingnaas. Known in all levels from all sites.

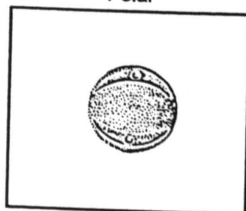
Age bracket ? Eocene (Jansonius & Hills 1976)

Rhoipites sp D

Type species *R. bradleyi* Wodehouse 1933

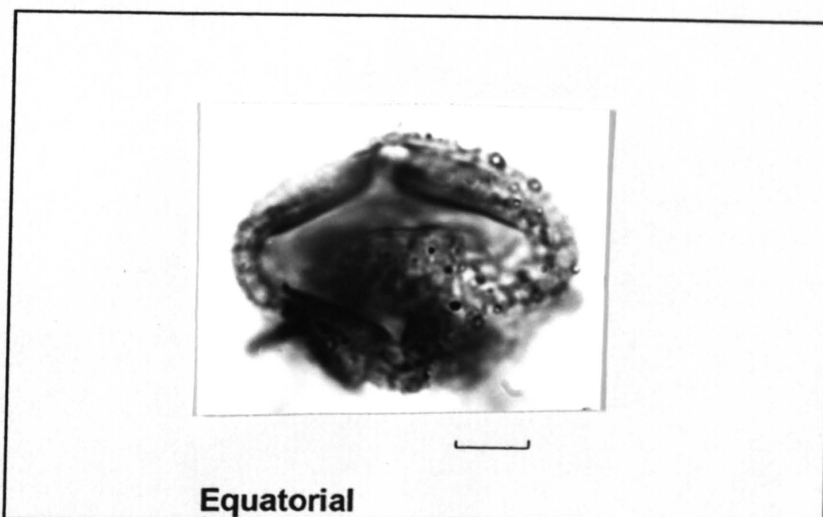


Polar



Equatorial

Also see Colour Plate 3



Equatorial

Scale bar = 10 μ

Figure 3.98

Specimens studied (11)

Spec no	Polar length (μ)
Bold type = illustrated specimen	
10--40	25
25-20	20
30-31	20
65-26	46
78-30	35
89-11	20
89-6	25
100-3	37
140-40	45
177-26	20
229-34A	25
Average	29

Description

Amb shape	Prolate in equatorial view Poles rounded to pointed Average polar length 29 μ
Colpi	Three; meridionally aligned Long, reach almost to poles Sculpturing finer close to colpi
Pores	Three; within colpi at equator Lalongate, but not seen well Oval in shape
Exine	Ektexine <2 μ . Columellae even throughout grain. Endexine thinner
Sculpturing	Coarsely reticulate; mesh >1 μ Lumina irregular in shape Slightly larger in polar area

Illustrated specimen

(65-26) LM. Shows length of colpi and bulging pores. Dimensions and size of lumina seen well

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

Specimens were placed in this group if they possessed a very coarse reticulum. They appear similar to grains identified as *Calodendrum* in Coetzee (1983). No further details were given.

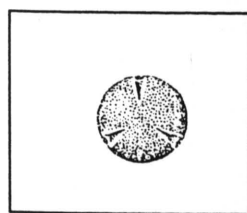
Botanical affinities ? Rutaceae (Erdtman 1952)

Distribution Very rare. Isolated specimens found in the Main Peat Horizon at Koingnaas and from Langklip.

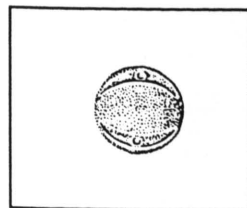
Age bracket Unknown.

Rhoipites sp E

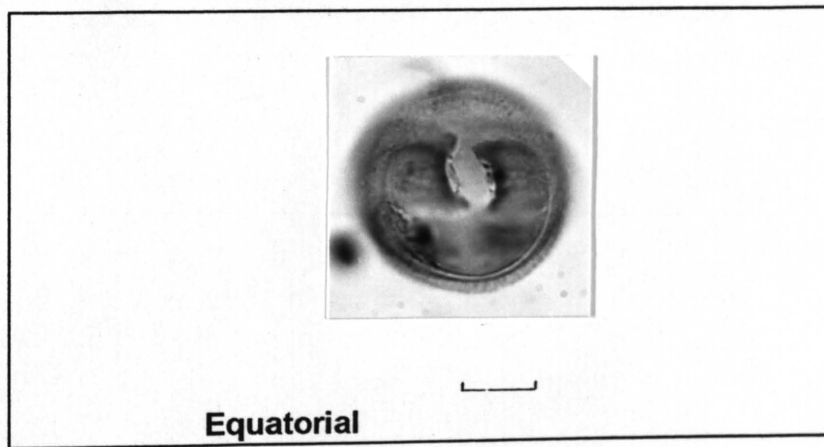
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.99

Also see Colour Plate 3

Specimens studied (32)

Average (μ)
Polar length (32 specimens) 27

Range (μ)
Polar length (32 specs) 10-55

Illustrated specimen

(119-7) LM. Pore slightly distorted
Fine ectexine shown

Description

Amb shape	Sub-prolate to circular in equatorial view. Poles very rounded
Colpi	Three; meridionally aligned Very long and broad, reach almost to poles
Pores	Three; within colpi at equator Large and perfectly circular Developed in both layers of exine median focus.
Exine	Ektexine <2 μ . Columellae very fine equal in height throughout grain. Endoexine thin 1 μ
Sculpturing	Very finely reticulate; mesh <0.2 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a
<i>R. isoreticulatus</i>	Kemp & Harris 1977 p 38		Pl 6 fig 7-9, 17	Nin'st Ridge	Palaeocene
<i>Rhoipites</i> sp E	Christopher et al 1980		Pl 4 fig 12-14	USA	Palaeocene
<i>Tricolporopollenites</i> sp	EI Bealy 1995 p 75		Pl 4 fig 21	Egypt	U Cretaceous

Remarks

Specimens were placed in this group if they were approximately spherical, with a relatively thin exine and large circular pores. They resembled several published illustrations, as noted above. They were not identified with *R. isoreticulatus* because the exine of the colpi was not seen to be smooth. The Ninetyeast Ridge specimens also had a coarser reticulum. They were not identified with *Rhoipites* sp E Christopher et al or *Tricolporopollenites* sp EI Bealy for similar reasons.

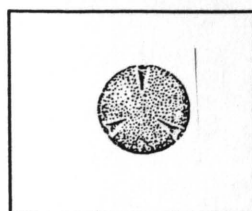
Botanical affinities Not known (Angiospermae)

Distribution Well known from the Main Peat Horizon at Koingnaas. Found in other levels and at Langklip and Somnaas/Noup.

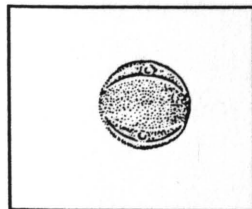
Age bracket ? U Cretaceous - Palaeocene

Rhoipites sp F

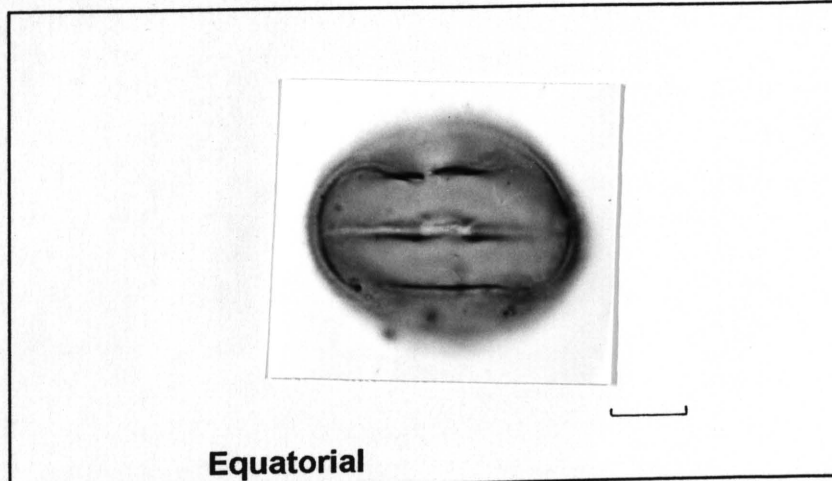
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.100

Specimens studied (29)

Average (μ)
Polar length (29 specimens) 24

Range (μ)
Polar length (29 specs) 17-53

Illustrated specimen
(57-8) LM. Focus on colpus and pore

Description

Amb shape	Prolate in equatorial view Poles rounded to pointed
Colpi	Three; meridionally aligned Long and narrow, reach virtually to poles
Pores	Three; within colpi at equator Lolongate; c. 5x2 μ Costae pori present
Exine	Exine relatively thin; ektoexine <2 μ . Columellae very fine and equal in height throughout grain. Endoexine very thin; <1 μ
Sculpturing	Very finely reticulate; mesh <0.2 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

Specimens were placed in this group if they possessed lolongate pores. This appears to be relatively unusual as most tricolporate grains seem to have lalongate pores.

The west coast specimens did not closely resemble any published illustrations.

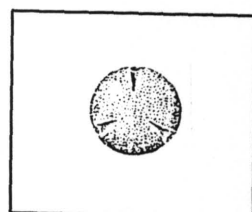
Botanical affinities Not known (Angiospermae)

Distribution Well known from all levels and all sites.

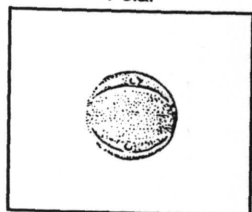
Age bracket Not known

Pollen Colporate Tricolporate

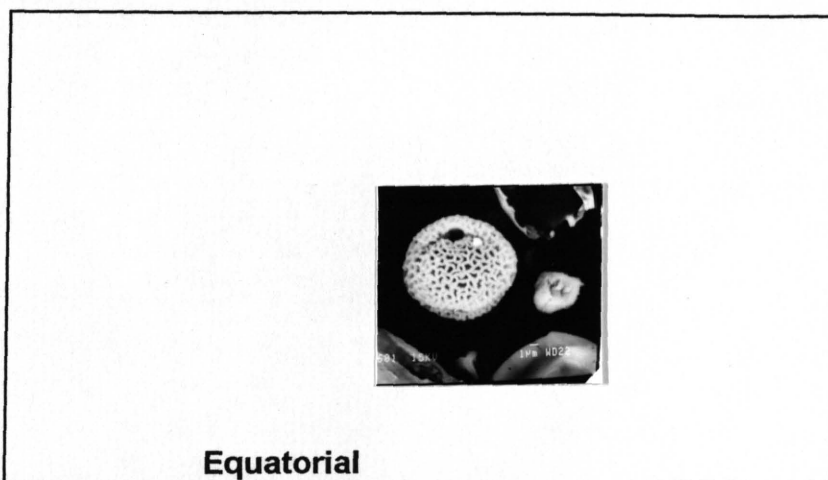
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.101

Specimens studied (16)

Average (μ)	
Polar length (16 specimens)	13

Description

Amb shape	Spheroidal; small grain
Colpi	Three; meridionally aligned Long, reach well into polar area Distinct. Do not gape
Pores	Three; within colpi at equator Circular, approx 3 μ in diameter Simple, not bordered
Exine	Ektoexine <2 μ Columellae may be taller in intercolpial areas Endoexine 1 μ
Sculpturing	Fairly coarsely reticulate; mesh approx 1 μ . Lumina irregular in shape but size even throughout

Illustrated specimen

(245-25) SEM. Shows coarse reticulum and round pore.

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

Specimens were placed in this group if they were small, spheroidal grains with a coarse reticulum. In polar view they may look very much like *Tricolpites reticulatus* however to be identified as *Rhoipites* sp G, the colpi must be seen to contain pores.

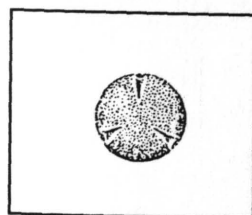
Similar to *Tricolporopollenites arnotiensis* Scholtz (1985) however not identified as such because the reticulum is coarser and the pores are larger.

Botanical affinities Unknown (Angiospermae)

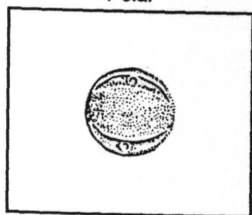
Distribution Little known at Langklip. Isolated specimens at Koningnaas.

Age bracket Unknown ?Palaeocene

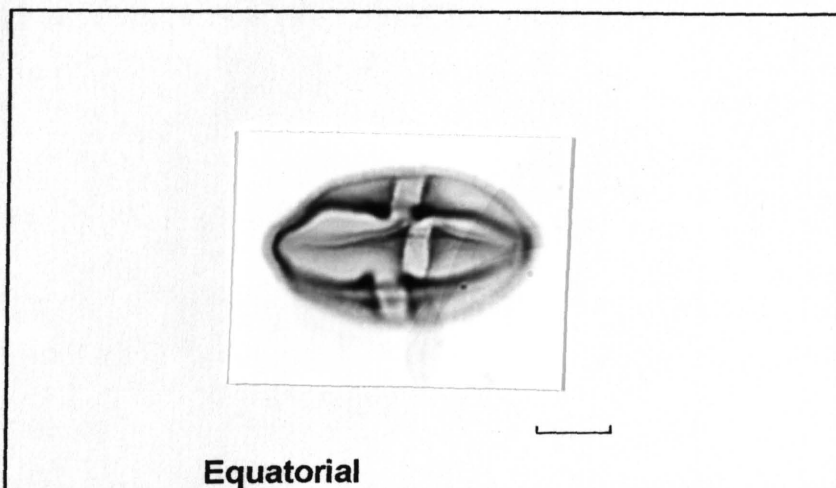
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bars = 10 μ

Figure 3.102

Also see Colour Plate 3

Specimens studied (32)

Averages (μ)
Polar length (30 specimens) 27

Ranges (μ)
Polar length (30 specs) 13-47

Illustrated specimen

(76-31) LM. Shows rectangular pores and long colpi.

Description

Amb shape	Prolate in equatorial view Poles rounded to pointed
Colpi	Three; meridionally aligned Long, reach virtually to poles Marked costa colpi, which extend to form costa pori
Pores	Three; within colpi at equator Lalongate, rectangular-shaped pore blunt or straight ends up to x4 wider than broad Are offset rather than coalesce into zonorate feature
Exine	Thin. Ektoexine <1 μ . Columellae not seen. Endexine thickens adjacent to colpi and pores
Sculpturing	Reticulate; mesh extremely fine

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

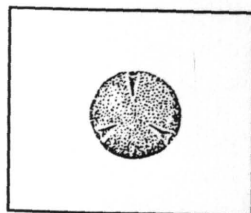
Specimens were placed in this group if they possessed the characteristic rectangular pore. This species differs from *Rhoipites* sp A in that the pores have a blunt not pointed end and have a rectangular not "eye" shape. They differ from *Rhoipites* sp B in not being zonorate.

Botanical affinities Unknown (Angiospermae)

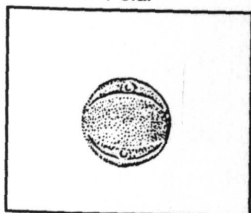
Distribution Well known at Somnaas-Noup. Found in all levels at Koinaas and Langklip.

Age bracket Unknown

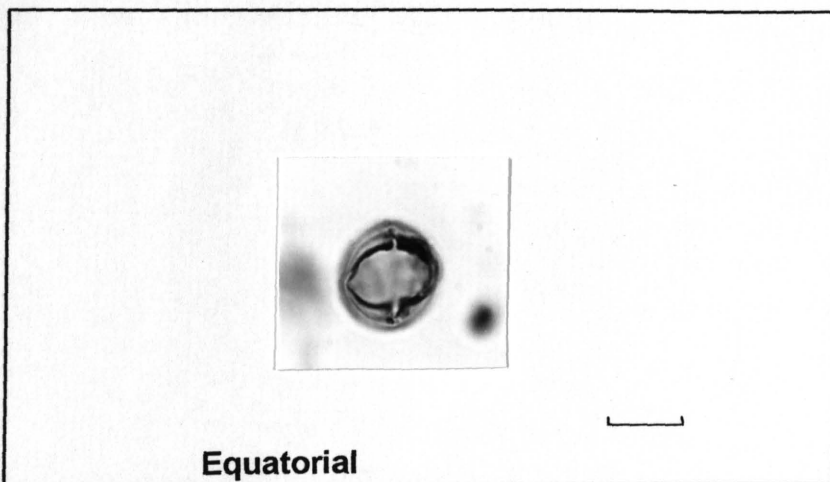
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.103

Specimens studied (17)

Averages (μ)
Polar length (13 specimens) 28

Ranges (μ)
Polar length (13 specs) 15-57

Illustrated specimen
(119-15) LM. Focus on colpi and pores

Description

Amb shape	Prolate-subprolate in equatorial view May be spherical Poles rounded to blunt
Colpi	Three; meridionally aligned Long, reach almost to poles
Pores	Three; within colpi at equator Lalongate; slit-like May be almost closed
Exine	Ektoexine <2 μ . Fine columellae Endexine thickens adjacent to colpi and pores
Sculpturing	Reticulate; mesh very fine

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

Specimens were placed in this group if they possessed slit-like lalongate pores. This species differs from *Rhoipites* sp H in that the pores are closed. It is similar to *Liaongpollis* Song Zhi-Chen & Cao Liu 1980 (Jansonius & Hills 1976, p 3997) however it was not identified with this genus because the shape of the west coast grains varies, it is not always prolate.

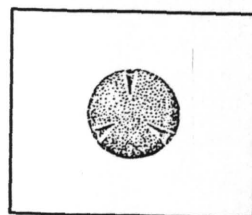
Botanical affinities Unknown (Angiospermae)

Distribution Well known at Somnaas-Noup. Found in all levels at Koingnaas and Langklip.

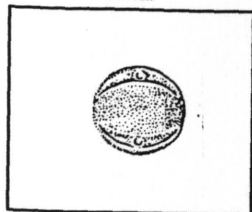
Age bracket Unknown

Pollen Colporate Tricolporate

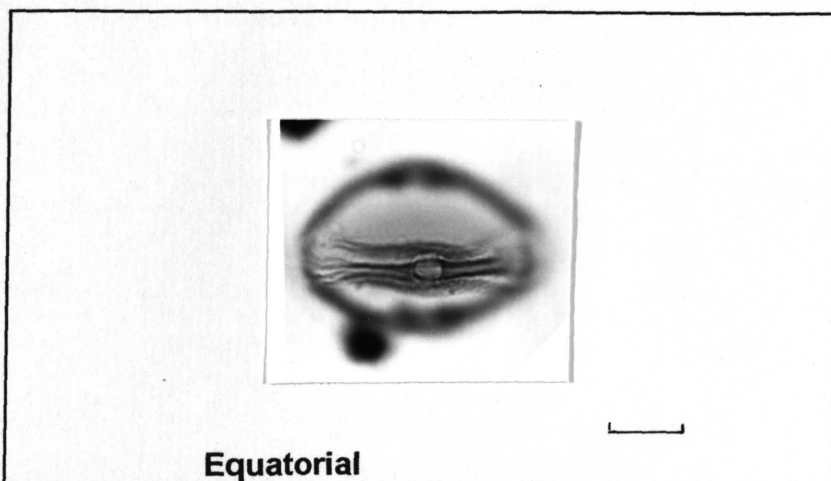
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.104

Specimens studied (23)

Averages (μ)
Polar length (16 specimens) 25

Ranges (μ)
Polar length (16 specs) 14-36

Illustrated specimen
(189-33) LM. Focus on small round pore

Description

Amb shape	Sub-prolate to circular in equatorial view. Poles rounded
Colpi	Three; meridionally aligned Long and relatively narrow, Reach virtually to poles Costae colpi seen
Pores	Three; within colpi at equator Circular but relatively small
Exine	Exine relatively thin. Ektexine <1.5 μ . Columellae fine. Endexine >1 μ
Sculpturing	Reticulate; mesh > 0.5 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

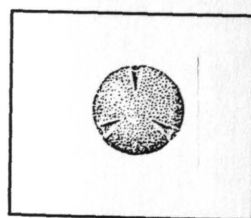
Specimens were placed in this group if they were relatively large but possessed small, circular pores. They differ from *Rhoipites* sp E in having small, not large, pores and narrow colpi, and from *Rhoipites* sp F in the shape of the pores.

Botanical affinities Not known (Angiospermae)

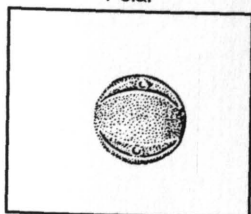
Distribution Well known. Found in all levels at all sites.

Age bracket Unknown

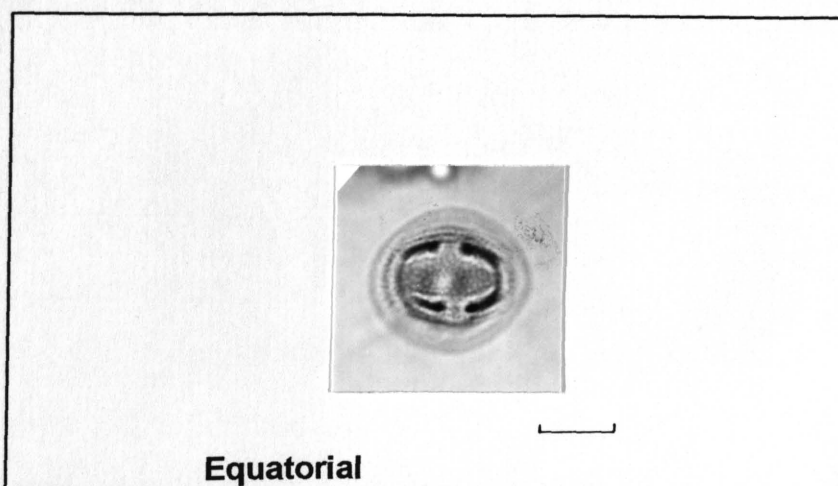
Type species *R. bradleyi* Wodehouse 1933



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.105

Specimens studied (16)

Averages (μ)
Polar length (16 specimens) 21

Ranges (μ)
Polar length (16 specs) 15-40

Illustrated specimen
(188-33) LiM. Focus on pores and colpi. Coarse reticulum seen.

Description

Amb shape	Circular in equatorial view Spheroidal
Colpi	Three; meridionally aligned Relatively short and wide, large polar area. Costae colpi seen
Pores	Three; within colpi at equator Circular or lalongate
Exine	Exine thick. Ektexine approx 5 μ . Columellae very tall. Endexine 1-1.5 μ
Sculpturing	Coarsely reticulate; mesh 1 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

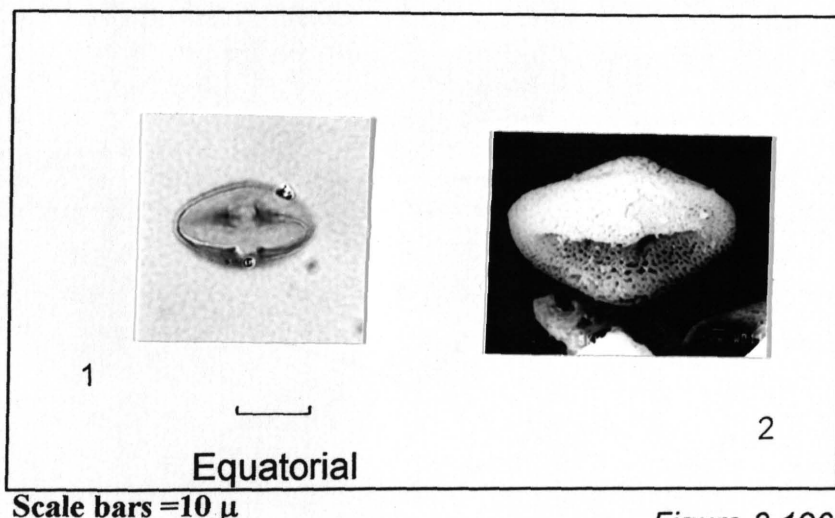
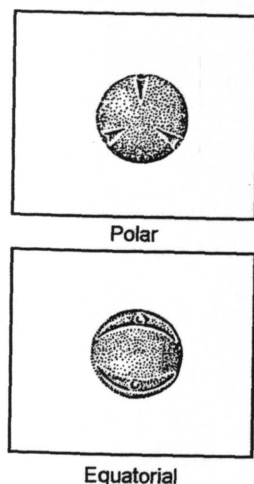
Specimens were placed in this group if they were relatively small with a thick exine. The grains are characterized by a very high reticulum. They differ from *Rhoipites* sp D in the size of the grain and the coarseness of the reticulum and from *Rhoipites* sp E on the size of the pores and the thickness of the exine.

Botanical affinities Unknown (Angiospermae)

Distribution Little known. Found in all levels at all sites.

Age bracket Unknown

Type species *R. bradleyi* Wodehouse 1933



Scale bars =10 μ

Figure 3.106

Also see Colour Plate 3

Specimens studied (153)

Mean (μ)
Polar length (153 specimens) 18

Range (μ)
Polar length (153 specs) 10-57

Illustrated specimen

1. (189-33) LM. Focus on round pore and long colpi
2. (242-4) SEM. Shows reticulum, colpi and pore position.

Description

Amb shape	Sub-prolate to prolate in equatorial view. May be almost spheroidal
Colpi	Three; meridionally aligned Relatively long, may reach well into polar area. Ranges from wide to narrow. Costae colpi often seen
Pores	Three; within colpi at equator Circular in shape
Exine	Exine relatively thick. Ektexine approx 2-3 μ m with columellae. Endexine 1-1.5 μ m
Sculpturing	Reticulate; Mesh size varies

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Rhoipites</i>	Jansonius & Hills 1976		p 2421	n/a	n/a

Remarks

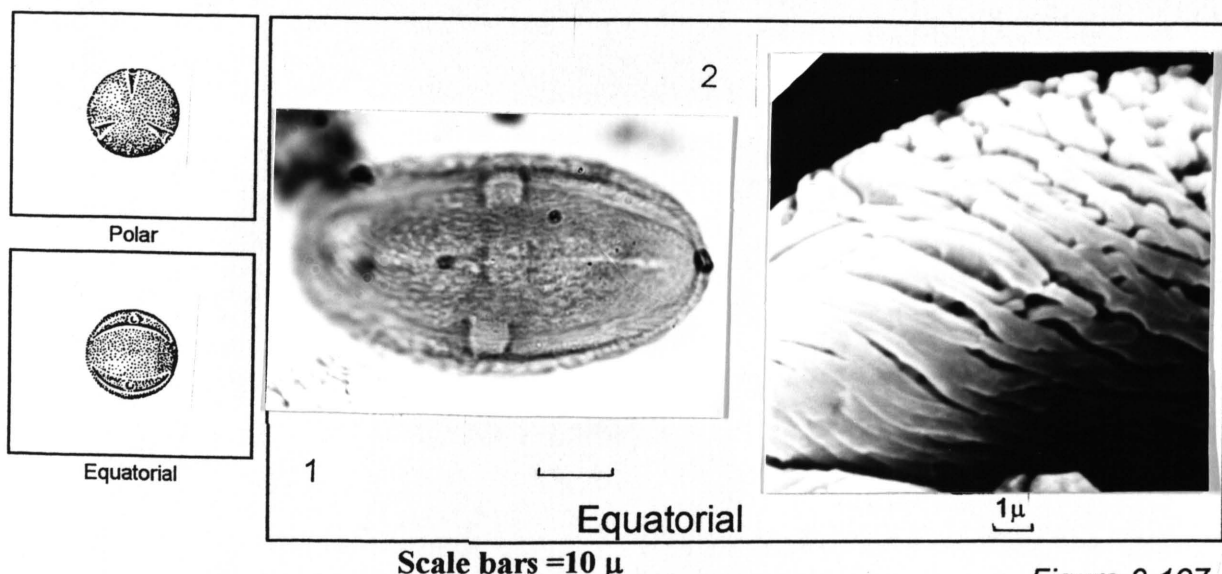
Tricolporate pollen grains predominated in the samples examined and the majority of them were assigned to the genus *Rhoipites*. They were identified merely as *Rhoipites* sp if they could not be more accurately placed within the eleven different species assigned to the genus. A spectrum of features is included, with a complete range from each end point. Grains were large or small, prolate to spheroidal. Pores were large or small and approximately circular. Colpi were relatively long and were either closed, or open and broad. The reticulum was usually relatively fine. The grains could possess any combination of the above features, thus more accurate speciation was impossible.

Botanical affinities Unknown (Angiospermae)

Distribution Dominant. Found in all levels at all sites.

Age bracket Unknown

Type species *S. mullensis* (Simpson) Srivastava 1975



Scale bars =10 µ

Figure 3.107

Specimens studied (17)

Average (µ)
Polar length (17 specs) 47

Range (µ)
Polar length (17specs) 19-56

Illustrated specimens

- (151-40) LM. Prolate grain shows variation of striae between poles and equator. Columellae appear thicker near poles
- (246-13) SEM Detail of sculpturing details.

Description

Amb shape	Prolate in equatorial view. Large grains; polar length c.45-55µ Poles blunt or rounded May be 'waisted' at equator
Colpi	Three; very long, extend almost to pole. Meridionally aligned. Narrow with faint borders
Pores	Three; within colpi. Rectangular (c.5 x 7µ) Elongated equatorially Some grains are zonorate
Exine	2 - 5µ thick. Ektexine columellate Exine thins at poles
Sculpturing	Striate; Ridges irregular in length Approx parallel to polar axis Longer in polar areas Shorter in equatorial region

Literature

Genus/species	Author	Description& Illustration	Geog loc	Age
<i>Simpsonipollis</i>	Jansonius & Hills 1976 p 2604		Scotland	Maastrichtian
<i>Tricolporopollenites grandis</i>	Scholtz 1985 p 69 Fig 17 K-N		South Africa	Maas-Palaeo

Remarks

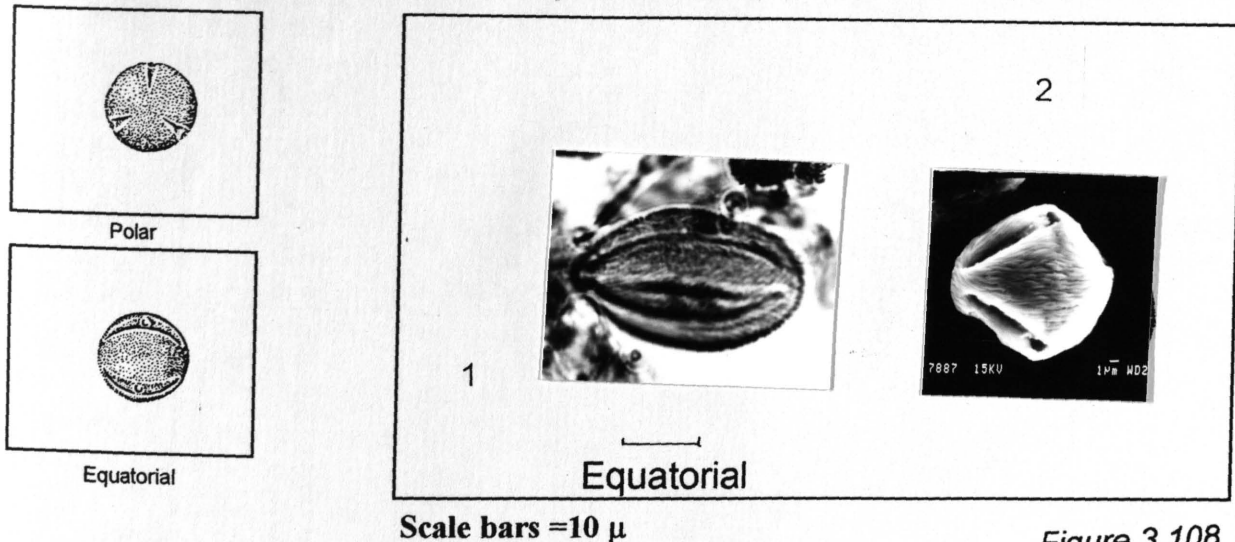
The specimens examined during this research project are identical to the grains found at Arnot in Namaqualand by Scholtz (1985) which were named *Tricolporopollenites grandis*. This genus is probably a junior synonym of *Rhoipites* (Jansonius & Hills 1976) which requires reticulate not striate sculpturing. In all probability, the grains found by Scholtz (1985) should be transferred to *Simpsonipollis*.

Botanical affinities As for *Simpsonipollis* sp.

Distribution Common at Langklip. Known from all levels at Koiningnaas.

Age bracket Maastrichtian-Palaeocene

Type species *S. mullensis* (Simpson) Srivastava 1975



Pollen Colporate Tricolporate

Specimens studied (24)

Average (μ)
Polar length (24 specs) 31

Range (μ)
Polar length (24specs) 17-43

Illustrated specimens

1. (167-16) LM showing long striae near poles and short near equator.
2. (251-8) SEM. Grain with relatively pointed poles

Description

Amb shape	Prolate in equatorial view Medium-sized to large grains Poles round or relatively pointed
Colpi	Three; usually long (2/3 polar length) Meridionally aligned. May be narrow.
Pores	Three; within colpi c.4μ diam Elliptical; slightly elongated equatorially.
Exine	Relatively thin; 1 - 1.5μ Very fine structure, not well seen
Sculpturing	Striate; thin, wavy ridges of irregular width and height, usually aligned parallel to polar axis Striae shorter in equatorial region

Figure 3.108

Literature

Genus/species	Author	Description & Illustration	Geog loc	Age
<i>Simpsonipollis</i>	Jansonius & Hills 1976 p 2604		Scotland	Maastrichtian
<i>Striacolporites</i>	Jansonius & Hills 1976 p 2726		India	Tertiary
<i>S. mulleri</i>	Kemp & Harris p 40 Pl 7 fig 3-6, 13		Ninetyeast R	U Oligo-L Mioc

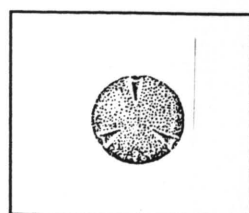
Remarks

Striate, tricolporate grains were assigned to the genus *Simpsonipollis*. Kemp & Harris (1977) comment that such grains have been assigned to several genera in the past, which are either invalid according to the ICBN (*Striacolporites*) or too broadly circumscribed (*Tricolporites*). *Striacolporites* is of doubtful validity (Jansonius & Hills 1976). Grains which could not be more accurately placed were identified only as *Simpsonipollis* sp. More than one species may be included due to variations in overall size, pore morphology and texture of the striae. Some grains in this group bear a resemblance to the illustration of *Rhuspollenites* in Jansonius & Hills (1976).

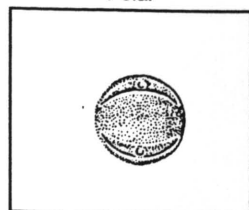
Botanical affinities Muller (1968) remarked on the difficulty of recognizing the relationship of tricolporate pollen with a striate exine pattern, as these occur in several modern families including Leguminosae, Anacardiaceae, Sapindaceae, Cucurbitaceae and Nolanaceae (Kemp & Harris 1977).

Distribution Known from all levels at all sites. Rare in Koingnaas and Somnaas/Noup but common at Langklip.

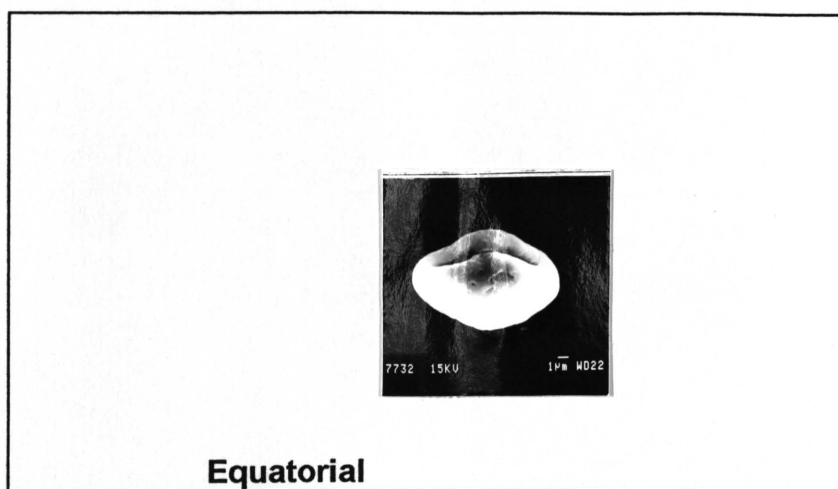
Age bracket Maastrichtian - Miocene

Type species *T. sphaericus* Cookson 1947

Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.109

Specimens studied (18)

Averages (μ)
Polar length (18 specimens) 30

Range (μ)
Polar length (18 specs) 10-65

Illustrated specimen
(247-11) SEM. Grain with generally psilate surface

Description

Amb shape	Subprolate to prolate in equatorial view. Poles usually rounded
Colpi	Three; meridionally aligned Long, may reach almost to poles
Pores	Three; within colpi at equator Usually circular, may be lalongate only in ectexine as not visible in median focus.
Exine	Ektexine 2-5 μ . Appears to be structureless. Endoexine thinner
Sculpturing	Psilate

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Tricolporites</i>	Jansonius & Hills 1976		p 3786	n/a	n/a

Remarks

Specimens were placed in this group if they possessed a psilate surface.

Tricolporites appears to be the only valid genus in which psilate, tricolporate grains may be accommodated. The generic diagnosis is broad and allows a wide variety of species to be assigned to it. *Psilatricolporites* (van der Hammen) ex Pierce 1961 is a later synonym of *Tricolporites* van der Hammen 1954, which itself is illegitimate. The original diagnosis of *Tricolporites* included a finely reticulate exine, however this was emended in 1973 by Stover & Partridge to 'exine variable in thickness and sculpturing'. S. K. Srivastava (1972) suggested that the genus should be restricted to small grains with a smooth exine, but this is no longer relevant (Jansonius & Hills 1976).

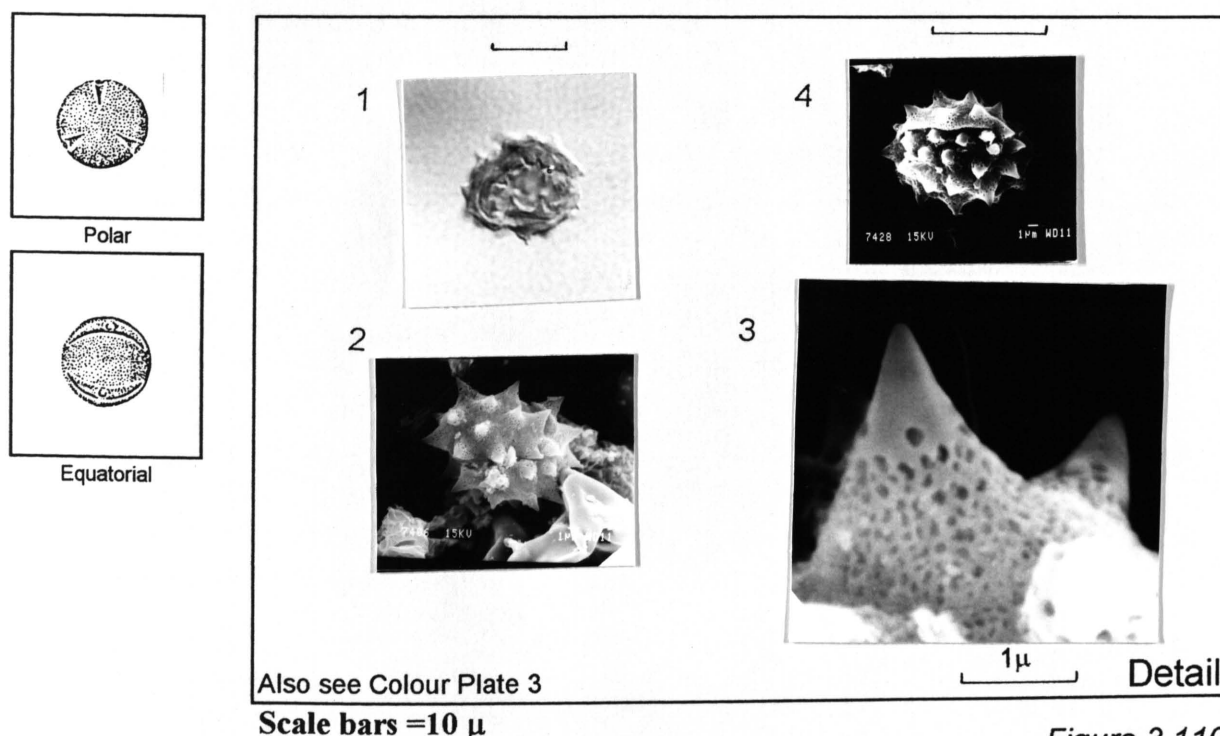
More than one species may be included here, due to variations in the size of the grains and features such as size and shape of the apertures.

Botanical affinities Not stated (Angiospermae)

Distribution Common. Found in all levels at all sites.

Age bracket Unknown

Type species *T. antipodica* Cookson 1947 ex Potonie' 1960



Specimens studied (52)

Average (μ)
Diameter (52 specimens) 16

Range (μ)
Diameter (52 specs) 9-30

Illustrated specimens

1. (271-17) NOR-LM. Gaping colpus shown
2. (242-20) SEM showing spines - broad punctate base and tapering, psilate tips
3. As above, detail of single spine
4. (242-35) SEM. Partly obscured by debris

Description

Amb shape	Spherical; stellated Grains seen in all orientations
Colpi	Often not well seen due to heavy sculpturing. Probably three present May gape widely
Pores	Colpi contain pores at equator Usually not well seen
Exine	Ektexine approx 2μ. Columellae thick. Support perforated tectum, visible between spines. Endexine thinner Exine details difficult to observe because of high spines
Sculpturing	Echinate. Spines are 2-3μ high Broad at base, with punctae. Tapers toward tip, psilate surface

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Tubulifloridites antipodica</i>	Cookson 1947 p 134		Pl 15 fig 44	Kergulen	L Tertiary
<i>Tubulifloridites antipodica</i>	Martin 1973 p 25		Fig 106, 107	Australia	
<i>Tubulifloridites</i>	Jansonius & Hills 1976		p 3110	n/a	n/a
<i>Tubulifloridites</i> cf <i>antipodica</i>	Kemp & Harris 1977 p 34		Pl 6 fig 3&4	Ninetyeast Ridge	Pre-Oligo
<i>Tubulifloridites antipodica</i>	Martin 1978 p 191		Fig 7T	Australia	
<i>Tubulifloridites antipodica</i>	Partridge 1978		Pl 2 fig 3&4	Off Angola	U Tertiary
<i>Tubulifloridites antipodica</i>	Barreda 1993 p 174		Pl 2 fig 1-8	Argentina	U Oligo-Mio

Remarks

The west coast specimens exactly match the published illustrations and descriptions of *T. antipodica*. These grains are particularly interesting as they form an early record of one of today's main plant groups.

During the preliminary work on the samples only a few, badly preserved specimens were found. Once they had been identified, and it appeared that the Koingnaas assemblage was older than other assemblages from which similar pollen was known, some special investigations were made of the few samples containing these forms. The number of grains stated in the sample 12-2 is probably inflated because they are easy to recognise due to their distinctive structure, even if broken or damaged (not true for most other forms) and because the structureless grains (Incertae sedis A) were not counted in this sample due to doubt about their affinities.

A realistic figure is no more than 2% of the sample.

Kemp & Harris (1977) remark upon the use of *Tubulifloridites* as a form-genus and the confusion between it and *Compositoipollenites* Potonie' and *Echitricolporites* van der Hammen. Barreda (1993) compared the three genera and decided to use *Tubulifloridites* for all tricolporate grains related to the Compositae. This advice will be followed here.

Botanical affinities Compositae: Tubuliflorae group (Kemp & Harris 1977)

Also known as Asteraceae of the Asterales (Asteridae)

Distribution Little known. Found in the Main Peat Horizon at Koingnaas and at Langklip and Somnaas/Noup.

Age bracket ? from Eocene onwards

Type species *T. antipodica* Cookson 1947 ex Potonie' 1960

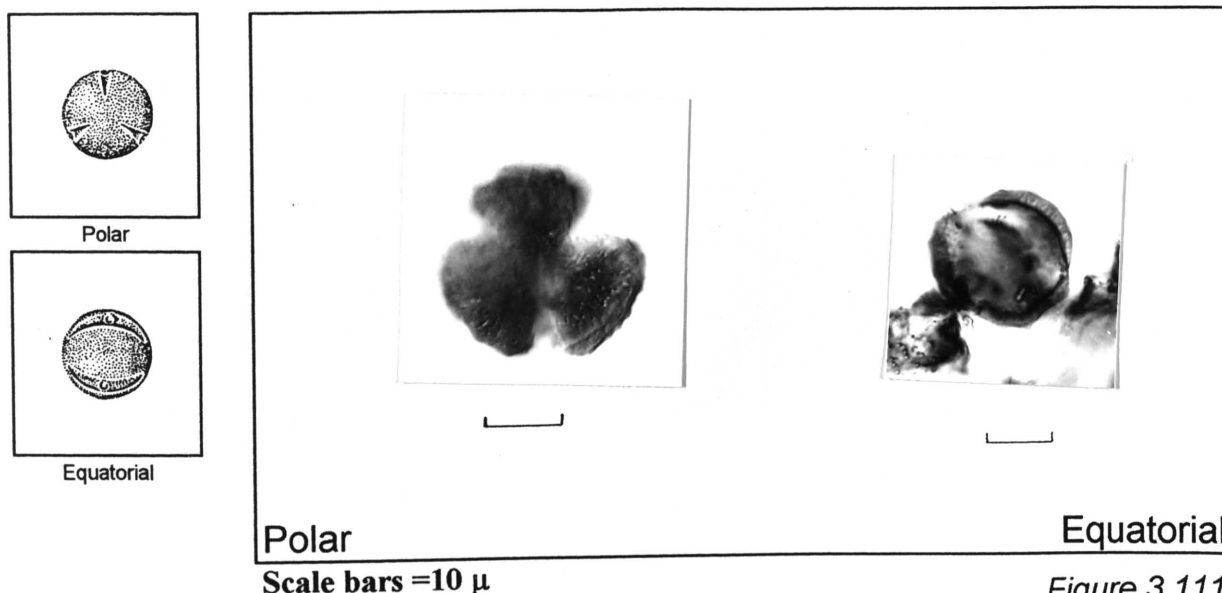


Figure 3.111

Specimens studied (3)

Spec no	Polar length(μ)	Diam (μ)
Bold type = illustrated specimen		
254-25	25	
256-9	20	
270-16		23

Illustrated specimens

1. (270-16) NOR-LM showing widely gaping colpi
2. (256-9) NOR-LM. Focus on wall of grain

Description

Amb shape	Spherical; stellate with small spines Circular in polar view Circular-subprolate in equatorial view
Colpi	Three; meridionally aligned Long, broad, widely gaping
Pores	Three; within colpi at equator Relatively large - 4μ. Circular
Exine	Exine thickest between apertures Ektexine >3μ. Columellae high and support tectum. Endexine thinner
Sculpturing	Echinate. Small, low spines >1μ high Regularly spaced 1-3μ apart

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Tubulifloridites</i>	Jansonius & Hills 1976		p 3110	n/a	n/a
<i>Tubulifloridites</i> sp	Kemp & Harris 1977 p 35		PI 6 fig 5&6	Ninetyeast Ridge	Pre-Oligo
<i>Tubulifloridites</i> sp	Partridge 1978		PI 1 fig 12&13	Off Angola	U Tertiary
Compositae	Coetzee & Rogers 1982		PI 1 no 14	South Africa	Tertiary
<i>Tubulifloridites viteauensis</i>	Barreda 1993 p 176		PI 3 fig 1-6	Argentina	U Oligo-Mio

Remarks

This species is distinct from *T. antipodica* because it is larger with smaller, lower spines. It is similar to *Tubulifloridites* sp Partridge (1978) which was not described, as mentioned by Barreda (1993). It is similar to *Tubulifloridites* sp Kemp & Harris (1977) in that it has smaller spines, but the connection is not conclusive. It resembles grains found by Coetzee & Rogers (1982) which were not identified beyond being placed as Compositae. They have similarly low spines, and thick ektexine between the colpi.

Botanical affinities Compositae: Tubuliflorae group (Kemp & Harris 1977)

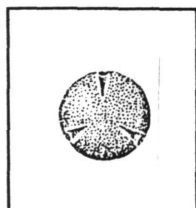
Distribution Little known. Found in the Main Peat Horizon at Koingnaas and at Langklip and Somnaas/Noup.

Age bracket ? from Eocene onwards

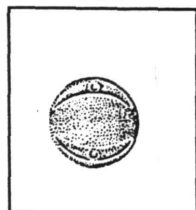
Pollen Colporate Tricolporate

Tubulifloridites sp A Cookson 1947 ex Potonie' 1960

Type species *T. antipodica* Cookson 1947 ex Potonie' 1960



Polar



Equatorial



Also see Colour Plate 3

Scale bar = 10 μ

Figure 3.112

Specimens studied (1)

Spec no	Polar length (μ)
229-21	45

Description

Amb shape	Circular in polar view; stellate.
Colpi	Three; gaping. Relatively short, large polar area
Pores	Not well seen, within colpi at equator
Exine	Very thick, more than 5 μ . Ektexine approx 5 μ . Tall, thick collumellae joined to form tectum Thickest between colpi. Endexine 2-3 μ , thickens close to pores
Sculpturing	Robustly echinate. Spines are 5 μ high Broad at base, taper towards tip Taper toward tip, psilate surface

Illustrated specimen

(220-21) NOR-LM showing tall columellae

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Tubulifloridites</i>	Jansonius & Hills 1976		p 3110	n/a	n/a

Remarks

These grains differ from *T. antipodica* in having a larger size, more robust spines and a thicker exine. They differ from *T. vitauensis* in the size of the spines.

Botanical affinities Compositae (or Asteraceae of the Asteridales: Asteridae)

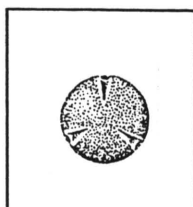
Distribution Very rare. One specimen found at Somnaas/Noup.
and Somnaas/Noup.

Age bracket ? from Eocene onwards

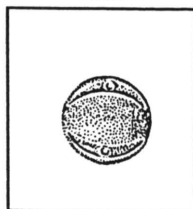
Pollen Colporate Tricolporate

***Tubulifloridites* sp Cookson 1947 ex Potonie' 1960**

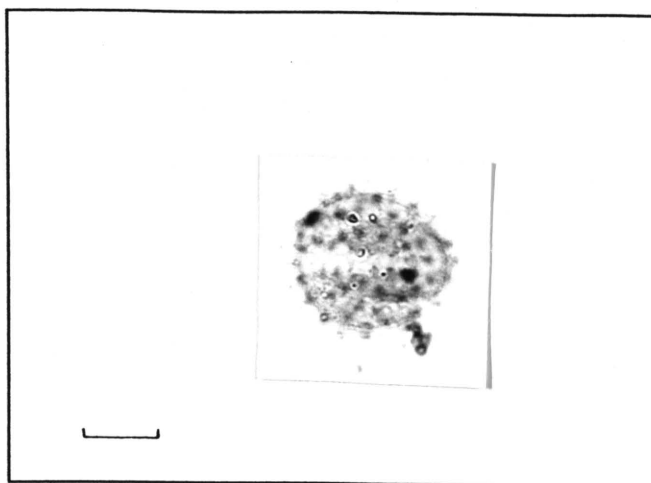
Type species *T. antipodica* Cookson 1947 ex Potonie' 1960



Polar



Equatorial



Scale bar = 10 μ

Figure 3.113

Specimens studied (11)

Average (μ)
Diameter (11 specimens) 23

Range (μ)
Diameter (11 specs) 15-28

Illustrated specimen

(46-22) NOR-LM Grain with gaping colpus and small spines with regular distribution

Description

Amb shape	Spherical; stellated. Grains seen in all orientations, usually equatorial
Colpi	Often not well seen due to heavy sculpturing. Probably three present May gape widely
Pores	Colpi contain pores at equator Circular or lalongate Usually not well seen
Exine	Exine approx 2 μ . Structure difficult to observe because of spines
Sculpturing	Echinate. Spines are 1- 2 μ high Broad at base, with punctae. Taper toward tip, psilate surface Regular distribution over surface

Pollen Colporate Tricolporate

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Tubulifloridites</i>	Jansonius & Hills 1976		p 3110	n/a	n/a

Remarks

Specimens with features attributed to the Compositae which could not be more accurately placed were assigned to *Tubulifloridites* sp.

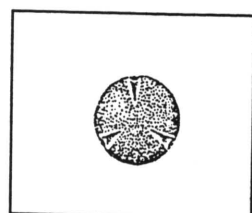
These grains differ from *T. antipodica* in having a larger size and slightly smaller and more numerous spines. They differ from *T. vitauensis* in the size of the spines and the structure of the exine, which is not thick and does not have sturdy columellae. *Tubulifloridites* sp A is a far larger grain, with high spines and a thick exine.

Botanical affinities Compositae

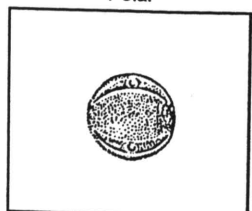
Distribution Rare. Found in the Main Peat Horizon and above at Koningnaas, at Langklip and Somnaas/Noup.

Age bracket ? from Eocene onwards

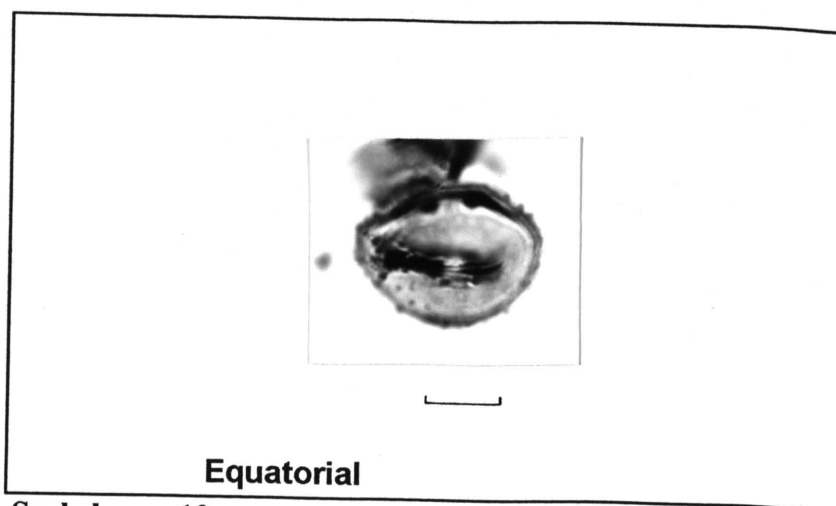
Type species *V. rotundiporis* van der Hammen & Wymstra 1964



Polar



Equatorial



Equatorial

Scale bars = 10 μ

Figure 3.114

Specimens studied (2)

Spec no	Polar length (μ)
Bold type = illustrated specimen	
58-40	30
173-23A	22

Description

Amb shape	Sub-prolate in equatorial view Poles rounded
Colpi	Three; meridionally aligned Relatively short, large polar area Costa colpi seen
Pores	Three; within colpi at equator Circular in shape
Exine	Tectate. Ektoexine <0.5 μ . Columellae very fine. Endexine <0.5 μ
Sculpturing	Verrucate; elements approx 1 μ Sparsely distributed. Smaller ones resemble echinae

Illustrated specimen

(173-23A) LM showing isolated verrucae
Isolated verrucae/echinae seen well

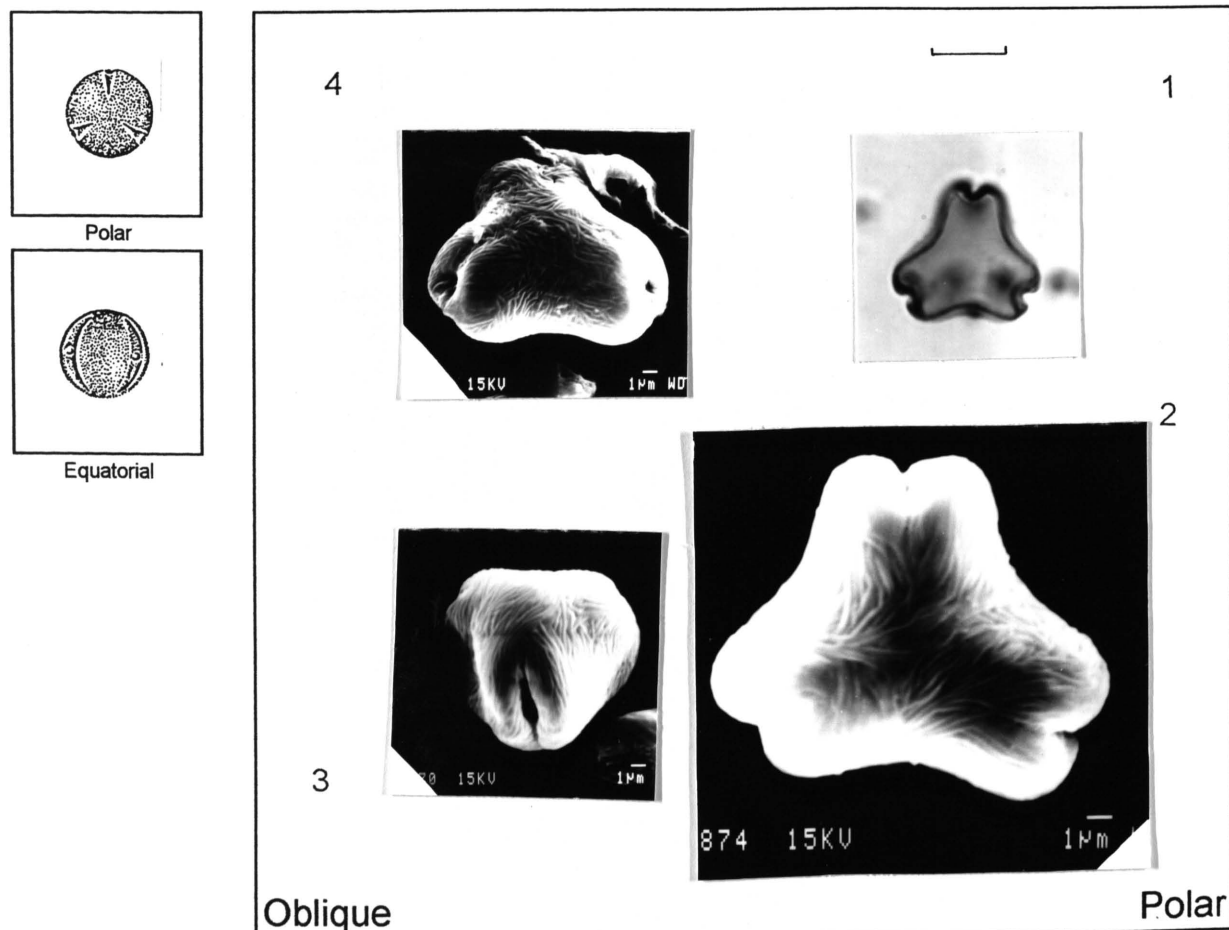
Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Verrutricolporites rotundiporis</i>	van der Hammen & Wymstra 1964 p 237		PI 1 fig 14	Africa	L-U Miocene
<i>Gemmatricolporites</i>	Jansonius & Hills 1976		p 3824	n/a	n/a

Remarks

Botanical affinities Not stated by van der Hammen & Wymstra (1964).
Distribution Very rare. Isolated specimens found in the Main Peat Horizon, Koingnaas and from Langklip.
Age bracket L-U Miocene (van der Hammen & Wymstra 1964)

Tricolporate pollen A



Scale bars = 10 μ

Figure 3.115

Pollen Colporate Tricolporate

Specimens studied (48)

Mean (μ)
Polar diameter (48 specs) 15

Range (μ)
Polar diameter (47specs) 12-28

Illustrated specimens

1. (8-3) LM. Focus on wall of grain to show variation in exine thickness. Colpi are faint.
2. (250-23) SEM. Striae are only visible on SEM
3. (310-18) SEM showing structure of colporus
4. (250-10) SEM Colpi and pores appear distinct

Description

Amb shape	Triangular in polar view, oblate in equatorial view. Small grains Apices very rounded, concave or straight sides
Colpi	Three; angulaperturate Very short to moderately short Only faintly discernable as very shallow and narrow. Large polar area
Pores	Three; within colpi. Lologate. (c. 1 -2 x 3-4 μ) Simple borders
Exine	Thick <5 μ especially between colpi Ektexine appears structureless
Sculpturing	Psilate under light microscope Very fine striae seen under SEM Approx parallel to colpi, but whorls turn in varied directions

Literature

Genus/species	Author	Description& Illustration	Geog loc	Age
<i>Elytranthe cf colensoi</i>	Couper 1953	p PI 6 Fig 84	New Zealand L	Mio-Recent
<i>Elytranthe striatus</i>	Couper 1953	p PI 6 Fig 85	New Zealand L	Oligo-U Mio

Remarks

The west coast specimens did not closely resemble any published illustrations or descriptions in the literature consulted.

Couper (1953) found grains similar to *Elytranthe*, however the pollen currently under consideration has not been positively identified with it because the genus is not recognised as a fossil form.

Two species may be included here as a histogram drawn on the polar diameter of the grains clusters around two medians - at 15 μ and 25 μ . The grains are otherwise indistinguishable.

Few grains (7) fall within the larger size category.

Botanical affinities Not known (Angiospermae)

Distribution Well known at Koingnaas and Somnaas/Noup

Age bracket Unknown

Retistephanocolporites sp van der Hammen & Wijmstra 1964

Type species *R. quadriporus* van der Hammen & Wijmstra 1964

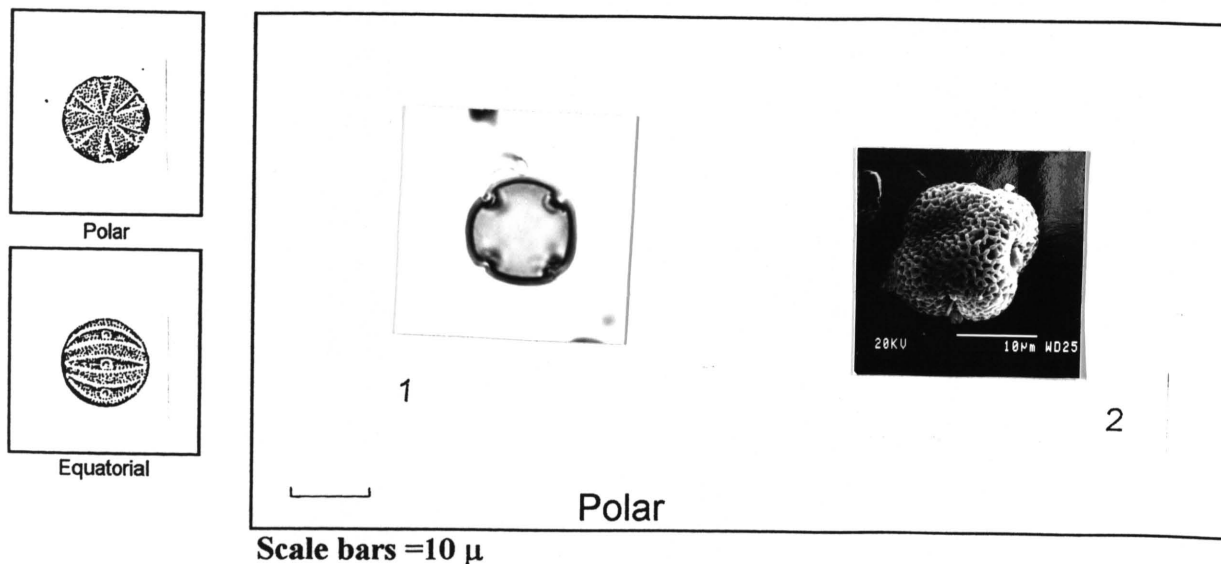


Figure 3.116

Specimens studied (13)

Average (μ)
Eq diam (13 specs) 23

Range (μ)
Eq diam (13 specs) 17-63

Illustrated specimens

1. (173-29A) LM showing position of short colpi
2. (268-20) SEM. Reticulum shown well

Description

Amb shape	Circular to almost lobate in polar view. Spheroidal or oblate in lateral view
Colpi	Four; fossaperturate or meridionally aligned. May gape Very short; grains have large polar area
Pores	Four; circular Almost same size as colpi
Exine	Thick; 2 - 3μ Columellate endexine supports high reticulum. Ektexine thinner
Sculpturing	Reticulate mesh diameter approx 1μ

Pollen Colporate Stephanocolporate

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Retisteph'pites</i>	Jansonius & Hills 1976		p 2394	British Guiana	Oligocene
<i>R. quadriporus</i>	van der Hammen & Wijmstra 1964 fig 9			Guiana	Tertiary
<i>Retisteph. sp A</i>	Dettmann & Thomson 1987 p 35 fig 6			Antarctica	Cretaceous

Remarks

More than one species may be present due to variations in overall size and shape. Differences in the nature of the colpi were noted.

Botanical affinities Not stated

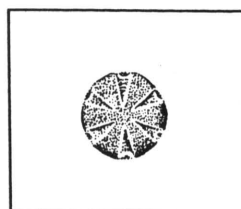
Distribution Known from the Main Peat Horizon and above at Koingnaas and at Langklip.

Age bracket Cretaceous - Tertiary

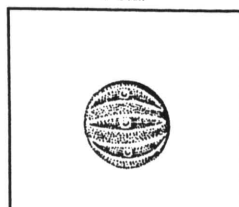
Sapotaceoidaepollenites sp

Potonie', Thomson & Thiergart 1950 ex Potonie' 1960

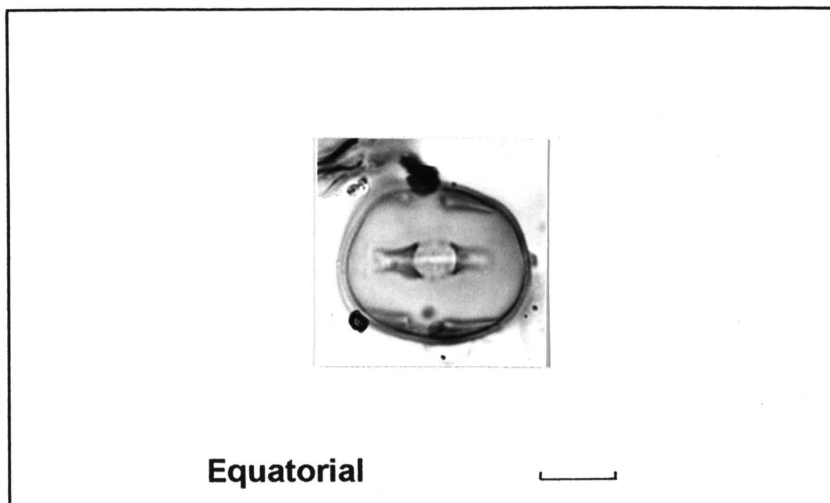
Type species *S. manifestus* Potonie' 1950



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.117

Pollen Colporate Stephanocolporate

Also see Colour Plate 3

Specimens studied (39)

Averages (μ)
Polar length (39 specimens) 27

Range (μ)
Polar length (39 specs) 13-68

Illustrated specimen
(5-41) LM. Focus on circular pore and short colpi

Description

Amb shape	Prolate in equatorial view Poles very rounded "barrel-shaped"
Colpi	Three; meridionally aligned Relatively short, thus large polar area Broad, may gape
Pores	Three; within colpi at equator Circular or slightly lalongate Simple in construction
Exine	Ektexine <2 μ . Columellae very fine Endexine 1-1.5 μ
Sculpturing	Very finely reticulate; mesh > 0.2 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Sapotaceoidaepollenites</i>	Jansonius & Hills 1976		p 2500	n/a	n/a
<i>S. rotundus</i>	Kemp & Harris 1977 p 44		PI 7 fig 7	Ninetyeast Ridge L Eo-Mio	
<i>S. rotundus</i>	Martin 1978 p 188		Fig 6C, 6D	Australia	
<i>S. manifestus</i>	Pocknall & Mildenhall 1984 p 37		PI 18 fig 2	New Zealand M Eo-U Mio	
<i>S. rotundus</i>	Stover & Partridge 1982		PI 1 fig 6	Australia	

Remarks

Some of the grains assigned to *Sapotaceoidaepollenites* closely resembled the published illustrations of *Sapotaceoidaepollenites rotundus* Harris. They were not positively identified as such because no detailed descriptions accompanied the illustrations in the literature consulted, as also because a range of forms was seen within the group.

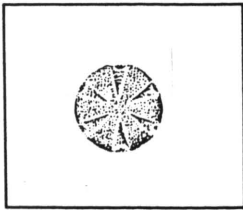
Botanical affinities ? Sapotaceae (Kemp & Harris 1977) of the Ebenales (Dilleniidae)

Distribution Little known. Found in all levels at all sites.

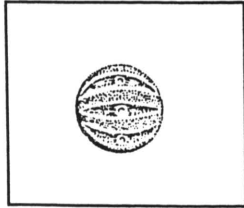
Age bracket L Eocene - U Miocene

Stephanocolporites sp van der Hammen 1954

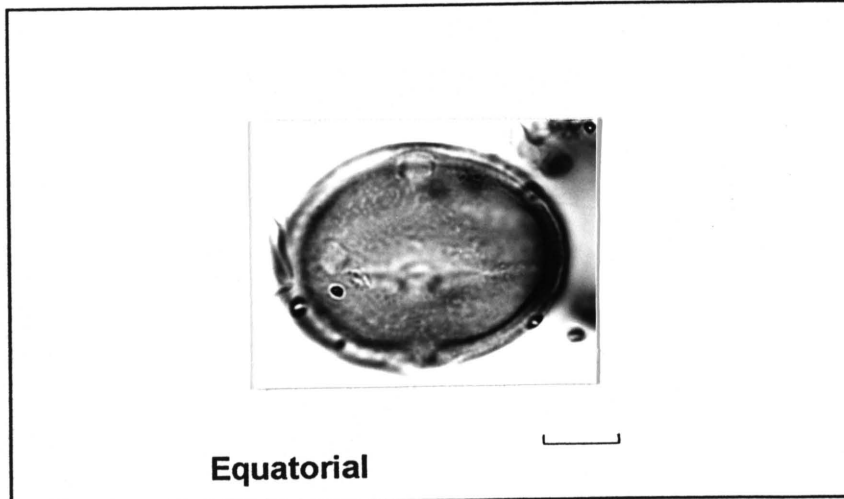
Type species None designated



Polar



Equatorial



Equatorial

Scale bars = 10 μ

Figure 3.118

Pollen Colporate
Stephanocolporate

Specimens studied (16)

Averages (μ)

Polar length (16 specimens) 33

Range (μ)

Polar length (16 specs) 17-62

Illustrated specimen

(163-36) LM. Specimen has five colpi with pores

Description

Amb shape	Prolate in equatorial view Poles rounded
Colpi	Four or more; meridionally aligned Long, reach far into polar area Broad, may gape
Pores	Four or more; one within each colpus Circular or slightly lalongate Simple in construction
Exine	Ektexine approx 2 μ with columellae Endexine 1-1.5 μ structureless
Sculpturing	Reticulate; mesh approx 0.5 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Stephanocolporites</i>	Jansonius & Hills 1976		p 2700	n/a	n/a

Remarks

Reticulate colporate pollen grains with four or more colpi and pores were assigned to this group. The genus *Stephanocolporites* may not be accepted under the rules of the ICBN as no type species was designated. An alternative genus for this group, *Retistephanocolporites* was not used due to the brevicolpate nature of the apertures, which did not match with the west coast specimens.

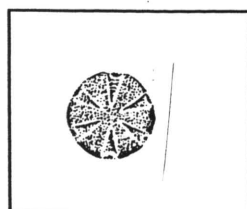
Botanical affinities ? Polygalaceae (Jansonius & Hills 1976) of the Polygalales (Rosidae)

Distribution Little known. Found in all levels at all sites.

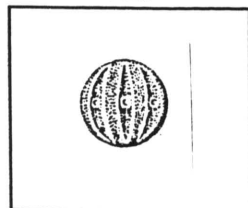
Age bracket Unknown

Tetracolporites sp Couper 1963

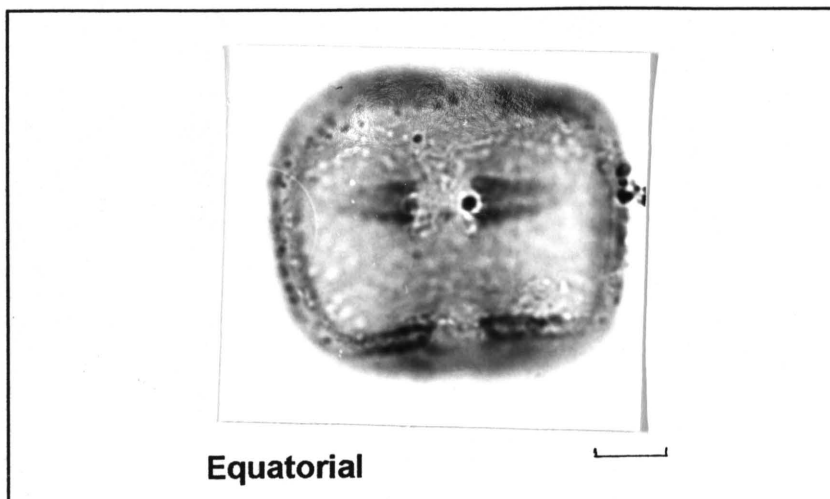
Type species *T. oamaruensis* Couper 1963



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.119

Pollen
Colporate
Stephanocolporate

Specimens studied (2)

Spec no	Polar length (μ)
Bold type = illustrated specimen	
80-12	48
91-7	42
Average	45

Description

Amb shape	Prolate in equatorial view Poles blunted, grain appears 'square' May be slightly 'waisted' at equator
Colpi	Four; meridionally aligned Relatively short with costa colpi
Pores	Four; within each colpus at equator Slightly lalongate; $3\mu \times 10\mu$ Median septum seen
Exine	Thick. Ektexine $<5\mu$. Columellae same height all over grain. Endexine 1μ thicker close to pores
Sculpturing	Coarsely reticulate; mesh 1μ Lumina irregular in size and shape

Illustrated specimen

(80-12) LM showing pores and columellae

Literature

Author	Description	Illustration	Geog Loc	Age
Jansonius & Hills 1976	p 2859			Tertiary

Remarks

Specimens were placed in this group if they were 'square' shaped stephanocolporate grains with a coarse reticulum.

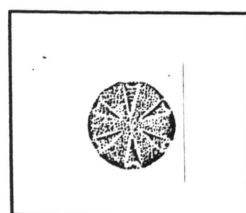
They conformed with the generic diagnosis found in Jansonius & Hills (1976), however did not closely resemble any grains in the literature assigned to this genus.

Botanical affinities Uncertain (Angiospermae)

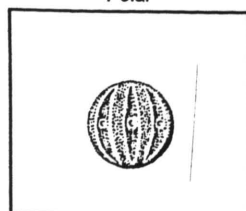
Distribution Very rare. Two isolated specimens found at Koingnaas

Age bracket Tertiary

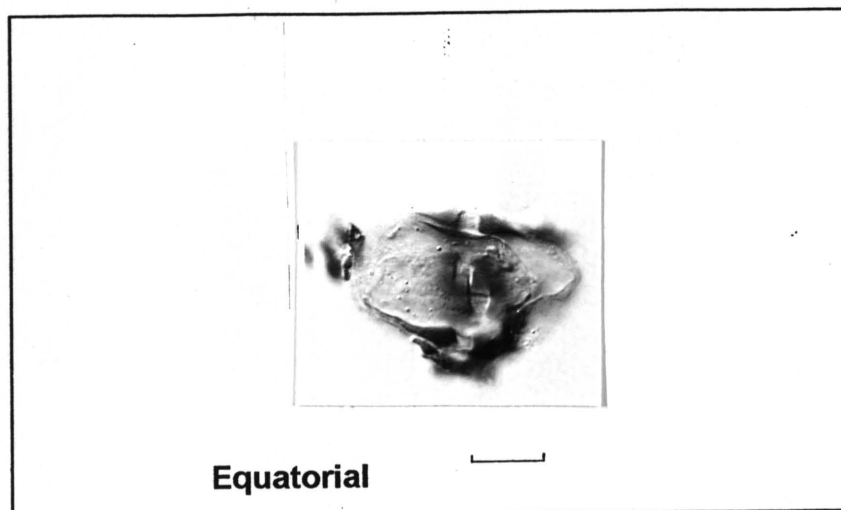
Stephanocolporate pollen A



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.120

Pollen Colporate Stephanocolporate

Specimens studied (2)

Spec no	Polar length (μ)
Bold type = illustrated specimen	
90-30	53
252-27	29
Average	41

Illustrated specimen

(252-27) LM. Grain probably has five colpi and pores but grain not well preserved

Description

Amb shape	Prolate in equatorial view Poles rounded
Colpi	At least four; meridionally aligned Long, not well seen
Pores	Four; within each colpus at equator Lalongate; almost rectangular Broad costa pori seen
Exine	Ektexine approx 2 μ . Columellae fine Endexine 1 μ thicker close to pores
Sculpturing	Finely reticulate; mesh <0.5 μ Lumina irregular in size and shape

Literature

The west coast specimens could not be identified

Remarks

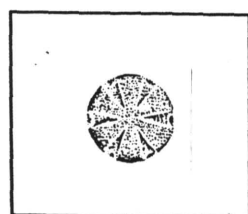
Specimens were placed in this group if they were stephanocolporate with marked costa pori

Botanical affinities Unknown (Angiospermae)

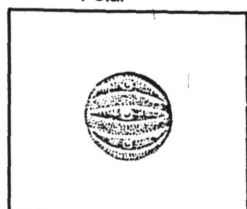
Distribution Very rare. Two isolated specimens found above the Main Peat Horizon at Koingnaas

Age bracket Unknown

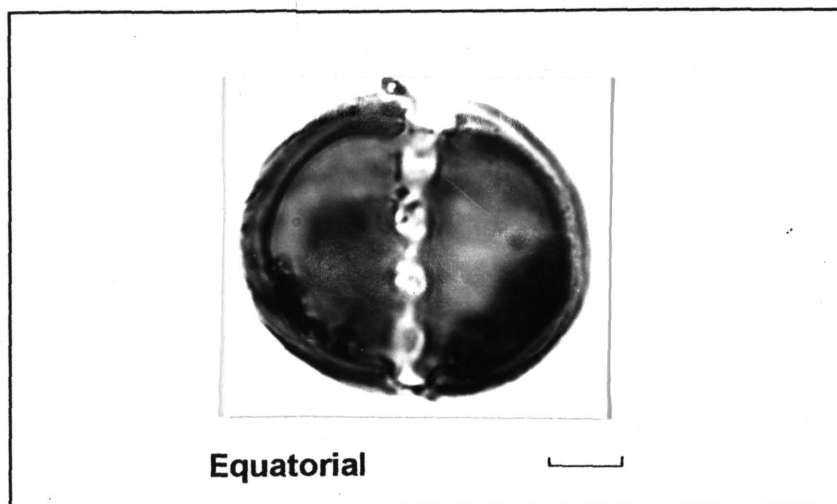
Stephanocolporate pollen B



Polar



Equatorial



Equatorial

Scale bar = 10 μ

Figure 3.121

Pollen Colporate Stephanocolporate

Specimens studied (1)

Spec no	Polar length (μ)
Bold type = illustrated specimen	
87-2	52

Illustrated specimen

(87-2) LM. Focus on pores

Description

Amb shape	Prolate(elliptical) in equatorial view Poles rounded
Colpi	Many; meridionally aligned Long, narrow and closed
Pores	Many; within each colpus at equator Circular; becoming zonorate Forms 'bright band' at equator
Exine	Ektexine > 2 μ . Columellae fine Endexine 1 μ
Sculpturing	Finely reticulate; mesh <0.2 μ

Literature

The west coast specimen could not be identified

Remarks

Only one specimen of this type was found. It is differentiated from other stephanocolporate pollen by the great number of colpi and pores.

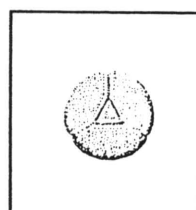
Botanical affinities Unknown (Angiospermae)

Distribution Very rare. One specimen was found at Koinaas

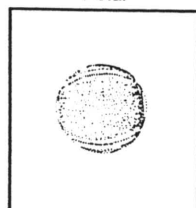
Age bracket Unknown

Cupaniedites major Cookson & Pike 1954

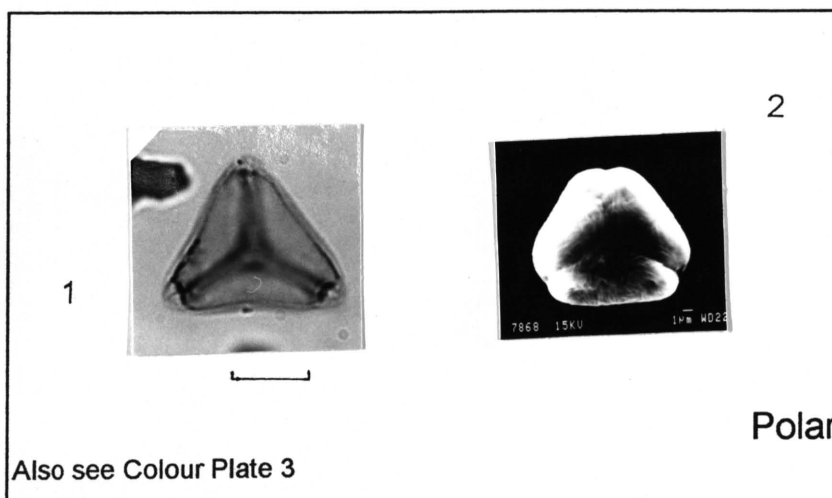
Type species *C. major* Cookson & Pike 1954



Polar



Equatorial



Scale bars =10 μ

Figure 3.122

Pollen Colporate Syncolporate

Specimens studied (35)

Average (μ)
Diameter (34 specimens) 20

Range (μ)
Diameter (34 specs) 15-33

Illustrated specimens

1. (113-23) LM. Focus on anastomosing colpi
2. (250-17) SEM. Fine sculpturing seen

Description

Amb shape	Triangular in polar view, sides straight May be slightly concave or convex Angles sharp, not rounded
Colpi	Three; angulaperturate anastomose at pole but do not form polar triangle Not bordered but may be thickened
Pores	Three; within colpi at equator Not well seen due to apical position
Exine	Exine 1-2 μ . Structure not well seen
Sculpturing	Mostly psilate. May be scabrate, faintly striate or weakly verrucate. Fine reticulum seen under SEM

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Cupaniedites</i>	Jansonius & Hills 1976		p 679	n/a	n/a
<i>Cupaniedites major</i>	Cookson & Pike 1954 p 212		Pl 2 fig 83-85	Australia	Eocene
<i>Cupaniedites major</i>	Couper 1960 p 58		Pl 8 fig 21	New Zealand U Eo-U Mio	

Remarks

Specimens were placed in this group if they were syncolporate but lacked a polar island. They resemble the published illustrations of *C. major* well.

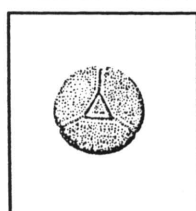
Botanical affinities Sapindaceae, tribe Cupanieae, especially *Cupaniopsis wadsworthii*, a rainforest tree from Australia (Cookson & Pike 1954)

Distribution Well known. Known in all levels from all sites.

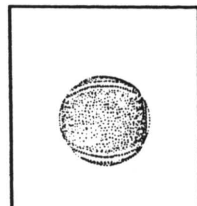
Age bracket Eocene-Miocene

Cupaniedites orthoteichus Cookson & Pike 1954

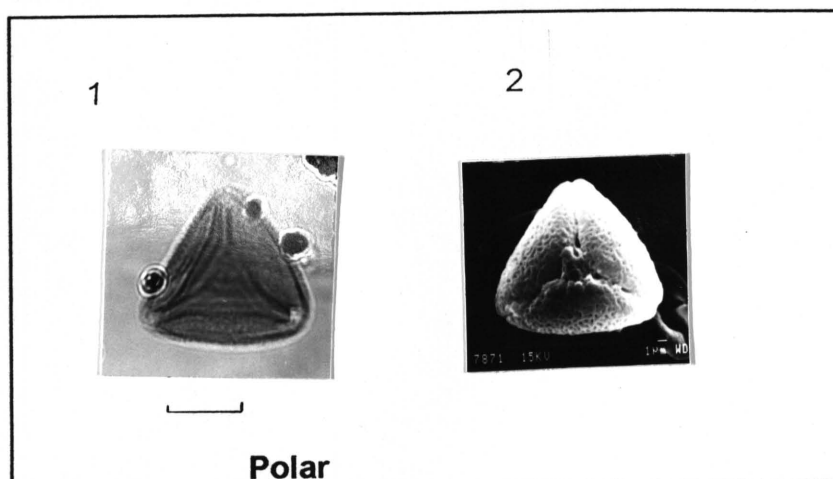
Type species *C. major* Cookson & Pike 1954



Polar



Equatorial



Polar

Scale bars = 10 μ

Figure 3.123

Pollen Colporate Syncolporate

Specimens studied (12)

Average (μ)

Diameter (12 specimens) 19

Range (μ)

Diameter (12 specs) 16-29

Illustrated specimens

1. (167A-21) LM focus on polar triangle
2. (250-20) SEM. Perforated tectum seen

Description

Amb shape	Triangular in polar view, sides straight to convex Angles relatively sharp
Colpi	Three; angulaperturate anastomose at pole, forming polar triangle May have narrow border
Pores	Three; within colpi at equator Not well seen due to apical position
Exine	Exine 1-2 μ . Structure not well seen
Sculpturing	Mostly psilate. May be reticulate Fine reticulum seen under SEM

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Cupaniedites</i>	Jansonius & Hills 1976		p 679	n/a	n/a
<i>Cupaniedites orthoteichus</i>	Cookson & Pike 1954	p 210	Pl 2 fig 73-78	Australia	Eocene
<i>Cupaniedites orthoteichus</i>	Couper 1960	p 58	Pl 8 fig 19,20	New Zealand	Palaeo-Plio
<i>Cupaniedites orthoteichus</i>	Boltenhagen 1967	p 349	Pl 4 Fig 3-5	Africa	U Cretaceous
<i>Cupaniedites orthoteichus</i>	Stover & Evans 1973			Australia	U Cret-Eocene
<i>Cupaniedites orthoteichus</i>	Hos 1974	p 9	Fig 28		
<i>Cupaniedites orthoteichus</i>	Kemp & Harris 1977		none	Ninetyeast Ridge	U Eo-U Mio
<i>Cupaniedites orthoteichus</i>	Martin 1978	p 191	Fig H		
<i>Cupaniedites orthoteichus</i>	Coetzee & Rogers 1982		Pl 1 no 8	South Africa	Miocene
<i>Cupaniedites orthoteichus</i>	Stover & Partridge 1982		Pl 2 no 13		
<i>Cupaniedites orthoteichus</i>	Pocknall 1985		Fig 25,26	New Zealand	Tertiary

Remarks

Specimens were placed in this group if they were syncolporate, with psilate or faint sculpture and a polar island. They differ from *C. major* in possessing the polar island. Syncolporate grains which could not be confidently placed were recorded as *Cupaniedites* sp. Kemp & Harris (1977) remark on the usage of *Cupaniedites*, *Duplopollis* and *Syncolporites*. They state that the three genera are very similar, but *Duplopollis* is a junior synonym of *Cupaniedites* and *Syncolporites* is invalid under the ICBN.

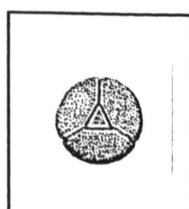
Botanical affinities Sapindaceae, tribe Cupanieae (Cookson & Pike 1954)

Distribution Little known. Found in all levels at all sites.

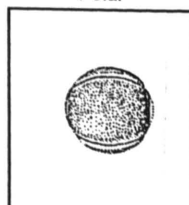
Age bracket U Cretaceous - Tertiary

?Gothanipollis sp Krutsch 1959

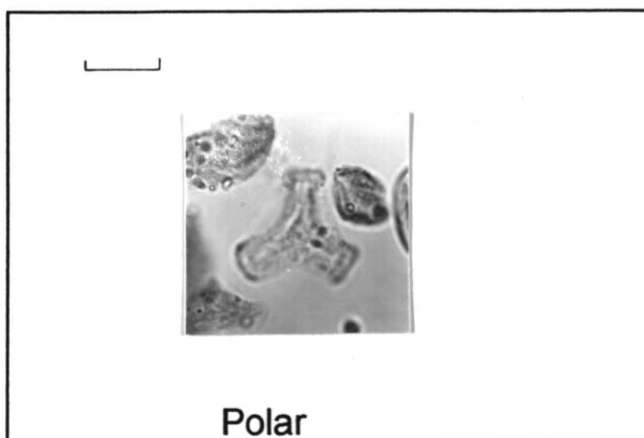
Type species *G.gothanii* Krutsch 1959



Polar



Equatorial



Polar

Scale bar = 10 μ

Figure 3.124

Pollen Colporate Syncolporate

Specimens studied (1)

Spec no	Eq diam (μ)
Bold type = illustrated specimen	
13-42	11

Illustrated specimen

(13-42) LM. Badly preserved specimen

Description

Amb shape	Concave triangular in polar view
Colpi	Not well seen Angulaperturate, possibly gaping
Pores	Not well seen Three pores, appear to be complex apertures sunken and rimmed Placed equatorially, angulaperturate
Exine	1- 2 μ thick, nexine thicker than sexine, especially close to apertures
Sculpturing	Scabrate - possibly verrucate

Literature

Author	Description	Illustration	Geog loc	Age
Stover & Evans 1973 p 254		PI 17 fig 13-16	Australia	M.Eo - Oligocene
Jansonius & Hills 1976 p 1152				
Kemp & Harris 1977 p 47		PI 7 fig 14-17	Ninetyeast Ridge	Eocene
Martin 1978	p 190	Fig T	Australia	Tertiary
Stover & Partridge 1982 PI 1 fig 8			Australia	Below M. Eocene
Pocknall & Mildenhall 1984 p 33		PI 14 fig 1	New Zealand	
Pocknall & Mildenhall 1984 p 33		PI 14 fig 2-5	New Zealand	Eocene

Remarks

Only one grain of this type was found in the west coast sediments. It is not well preserved or well photographed. It appears similar to the published illustrations mentioned above, as well as to *Triorites edwardsii* in the literature consulted.

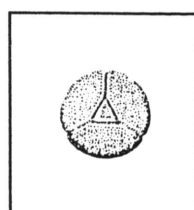
Botanical affinities Loranthaceae (Martin 1978)

Distribution Very rare. A single specimen was found, in 12-2 from the Main Peat Horizon at Koingnaas

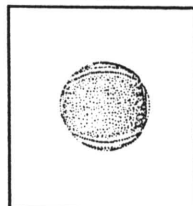
Age bracket Tertiary

Myrtaceidites oceanicus Kemp 1977

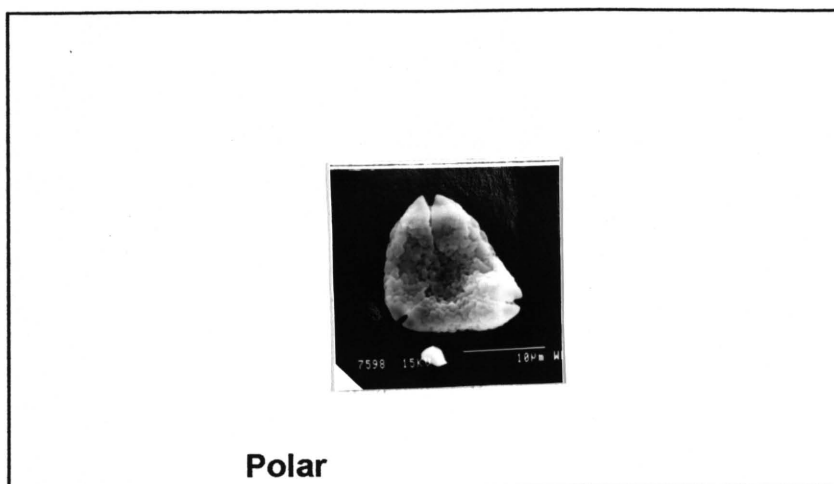
Type species *M. mesonesus* Cookson & Pike 1954



Polar



Equatorial



Polar

Scale bar = 10 μ

Figure 3.125

Specimens studied (2)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
8--9	19
245-22	20
Average	20

Illustrated specimen

(245-22) SEM showing verrucate sculpture

Description

Amb shape	Triangular in polar view, sides straight. Angles relatively sharp
Colpi	Three; angulaperturate anastomose at pole, forming weak polar triangle
Pores	Three; within colpi at equator Not well seen due to apical position
Exine	Exine 2-4 μ . Structure not well seen
Sculpturing	Verrucate; elements 1 μ diameter Very flat, not more than 0.2 μ

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Myrtaceidites</i>	Jansonius & Hills 1976		p 1739	n/a	n/a
<i>Myrtaceidites oceanicus</i>	Kemp & Harris 1977 p 45		Pl 7 fig 18-22	Ninetyeast Ridge Eo-Mio	

Remarks

Specimens were placed in this group if they were syncolporate, with verrucate sculpture. They were differentiated from all other syncolporate grains by the nature of the sculpturing.

Botanical affinities Not stated by Kemp & Harris (1977)

Distribution Very rare. Two specimens found, one from Koinaas, one from Langkrip.

Age bracket Eocene-Miocene

Pollen Colporate Syncolporate

Myrtaceidites parvus Cookson & Pike 1954

Type species *M. mesonesus* Cookson & Pike 1954

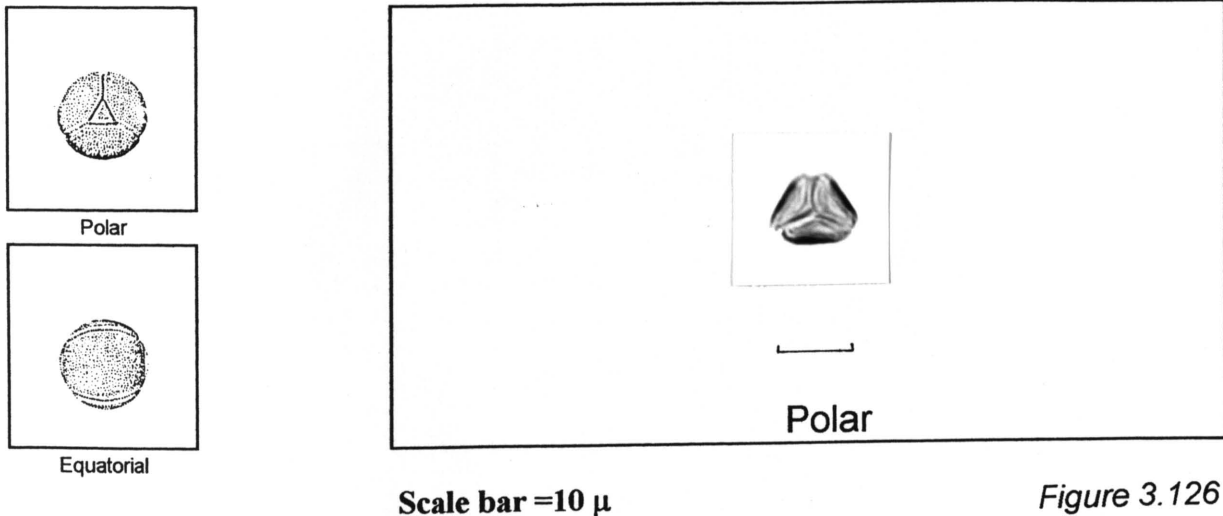


Figure 3.126

Pollen Colporate Syncolporate

Specimens studied (5)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
19--9	12
112-36	13
214-29	9
219-32	9
236-3	13
Average	11

Description

Amb shape	Triangular in polar view, sides straight. Angles rounded Grains typically very small
Colpi	Three; angulaperturate anastomose at pole, may or may not form polar triangle
Pores	Three; within colpi at equator Not well seen due to apical position
Exine	Exine 1 μ. Structure not well seen
Sculpturing	Psilate

Illustrated specimen

(219-32) NOR-LM. Grain is very small - typical for this type.

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Myrtaceidites</i>	Jansonius & Hills 1976		p 1739	n/a	n/a
<i>Myrtaceidites parvus</i>	Cookson & Pike 1954 p 206		Pl 1 fig 29-31	Australia	Eo-Pliocene
<i>Myrtaceidites parvus</i>	Martin 1973 p 22		Fig 94, 95	Australia	
<i>Myrtaceidites parvus</i>	Hos 1974 p 9		Fig 38		
<i>Cupaniedites</i> sp cf <i>orthoteichus</i>	Coetzee 1983 p 349		Fig 2 no 12	South Africa	Tertiary

Remarks

Specimens were placed in this group if they were very small syncolporate grains.
The grains identified by Coetzee (1983) appear to be identical to *M. parvus*.

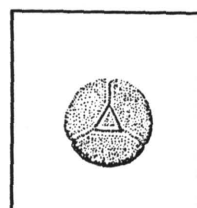
Botanical affinities Myrtaceae (Cookson & Pike 1954)

Distribution Very rare. Five specimens found from Koingnaas and Somnaas/Noup.

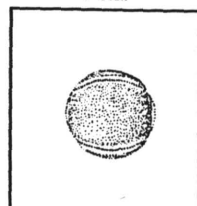
Age bracket Eocene-Pliocene

Porosipollis sp Krutzsch 1969

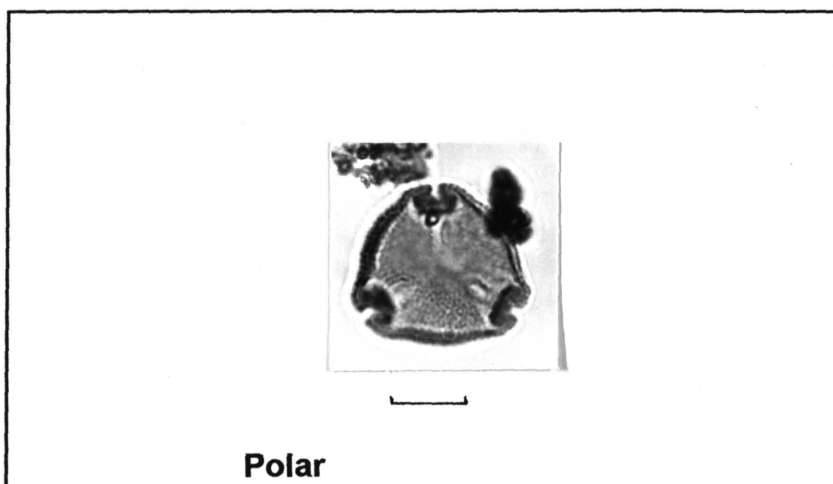
Type species *P. porosus* Krutzsch 1969



Polar



Equatorial



Polar

Scale bar = 10 μ

Figure 3.127

Pollen Colporate Syncolporate

Specimens studied (1)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
186-32	20

Illustrated specimen

(186-32) LM. Thickened costae pori and reticulate sculpture well seen.

Description

Amb shape	Roundly triangular in polar view Sides convex
Colpi	Three; angulaperturate anastomose at pole, do not form polar triangle
Pores	Three; within colpi at equator Distinct, wide costa pori seen
Exine	Ektexine 2 μ . columellate Endexine thinner
Sculpturing	Coarsely reticulate

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Porosipollis</i>	Jansonius & Hills 1976		p 2125	USSR	Senonian-Palaeocene

Remarks

Only one specimen of this type was found. It was differentiated from other syncolporate grains by the thickened exine adjacent to the pores.

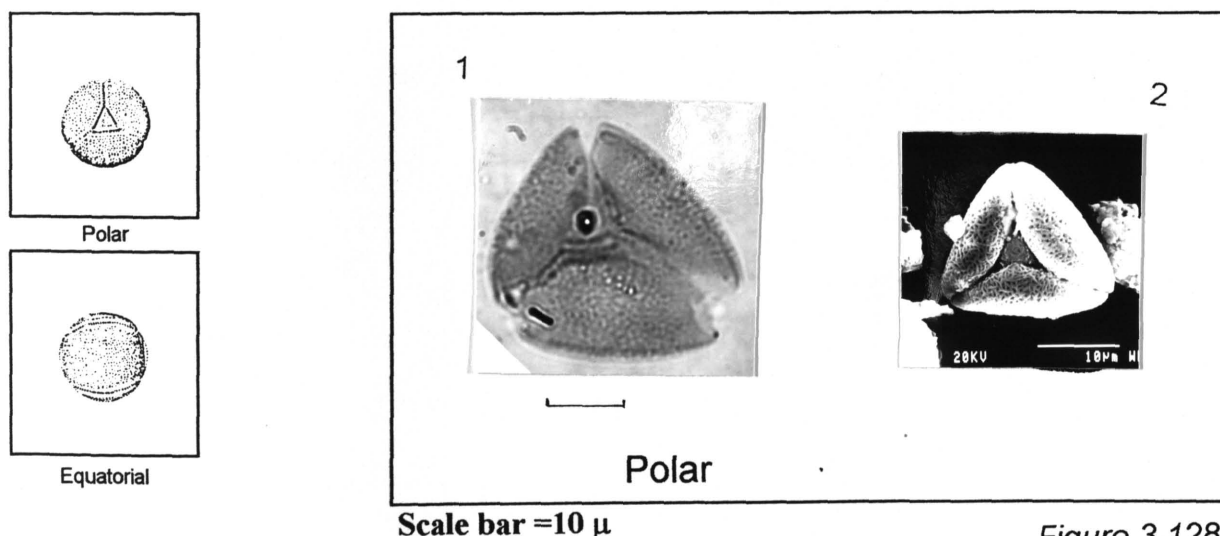
Botanical affinities Not stated (Jansonius & Hills 1976)

Distribution Very rare. One specimen was found from Langklip.

Age bracket Senonian - Palaeocene

Retisyncolporites sp Gonzalez Gusman 1967

Type species *R. aureus* Gonzalez Gusman 1967



Pollen Colporate Syncolporate

Specimens studied (6)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
84-18	24
86-27	34
102-5	30
111-13	24
112-31	19
268-15	20
Average	26

Description

Amb shape	Triangular in polar view, sides straight. Angles rounded
Colpi	Three; angulaperturate anastomose at pole, forming polar triangle
Pores	Three; within colpi at equator Not well seen due to apical position
Exine	Exine 1-3μ. Ektexine robustly columellate. Endexine thinner
Sculpturing	Reticulate. Lumina >1μ under SEM Muri as wide as lumina

Figure 3.128

Illustrated specimens

1. (86-27) LM. Focus on polar island and structure of exine
2. (268-15) SEM. Surface of reticulum shown.

Literature

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Retisyncolporites</i>	Jansonius & Hills 1976		p 2397	S America	M Eocene

Remarks

Specimens were placed in this group if they were syncolporate and possessed a coarse reticulum.

Botanical affinities Unknown (Cookson & Pike 1954)

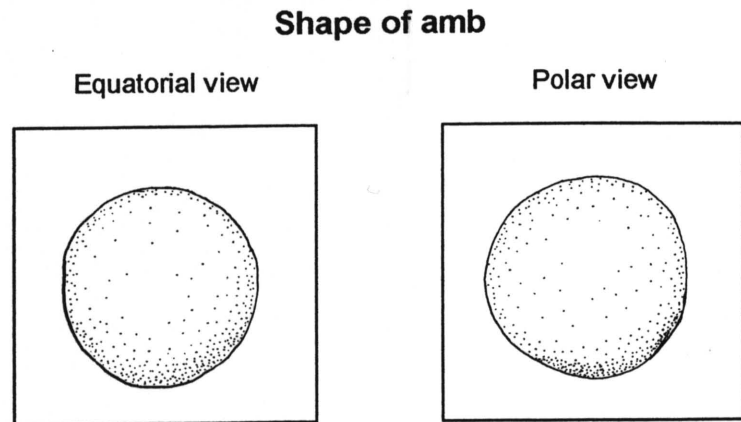
Distribution Very rare. Six specimens were found from Koinaas.

Age bracket M Eocene

Inaperturate pollen

Graphic glossary of technical terms

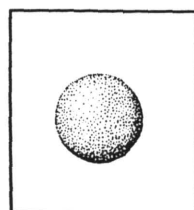
Figure 3.129



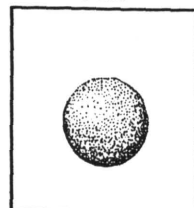
Definition:

Having no openings whatsoever (Kremp 1965)

Pollen
Inaperturate

Type species *A. australis* Cookson ex Couper 1953

Polar



Equatorial

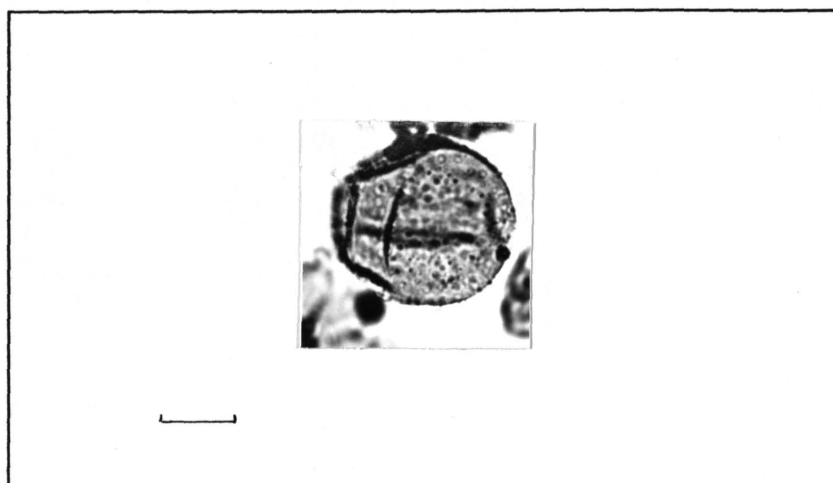
Scale bar = 10 μ

Figure 3.130

Pollen Inaperturate

Specimens studied (20)

Averages (μ)
Diameter (20 specimens) 28

Ranges (μ)
Diameter (20 specs) 20-42

Description

Amb shape	Large spherical grains Invariably crumpled
Apertures	None observed
Exine	Thin approx 1 μ . Structure not well seen
Sculpturing	Granulate; elements closely packed Some grains with small echinae

Illustrated specimen(170-3) Light microscopy. Specimen measures 25 μ . Surface covered with small echinae.**Literature**

Genus/species	Author	Description	Illustration	Geog loc	Age
<i>Araucariacites</i>	Jansonius & Hills 1976		p 151	n/a	n/a
<i>Araucariacites australis</i>	Dettmann 1963 p 105		Pl 26 fig 15	Australia	U Mesozoic
<i>Araucariacites australis</i>	Harris 1965 p 88		Pl 26 fig 24		
<i>Araucariacites australis</i>	Muller 1966		Pl 2 fig 10	Malaysia	
<i>Araucariacites australis</i>	Brenner 1968 p 359		Pl 13 fig 1-4		
<i>Araucariacites australis</i>	Martin 1973 p 16		Fig 64	Australia	
<i>Araucariacites australis</i>	Khan 1976 p 783		Fig 1		
<i>Araucariacites australis</i>	Kemp & Harris 1977 p 25		Pl 4 fig 15, 16	Ninetyeast Ridge	
<i>Araucariacites australis</i>	McLachlan & Pieterse 1978				

Remarks

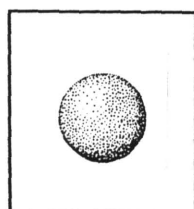
Specimens were placed in this group if they were thin, spherical grains with a granulate or finely echinate surface. They were always folded or crumpled.

Some of the west coast grains show small spines (echinae) rather than the granulae mentioned in the published descriptions. A complete range of forms between granulae and echinae was seen.

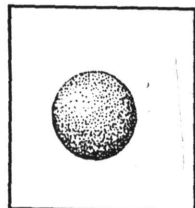
Botanical affinities Araucariaceae (Dettmann 1963)

Distribution Little known. Found in all levels at Koinaas and Langklip.

Age bracket U Mesozoic onwards



Polar



Equatorial

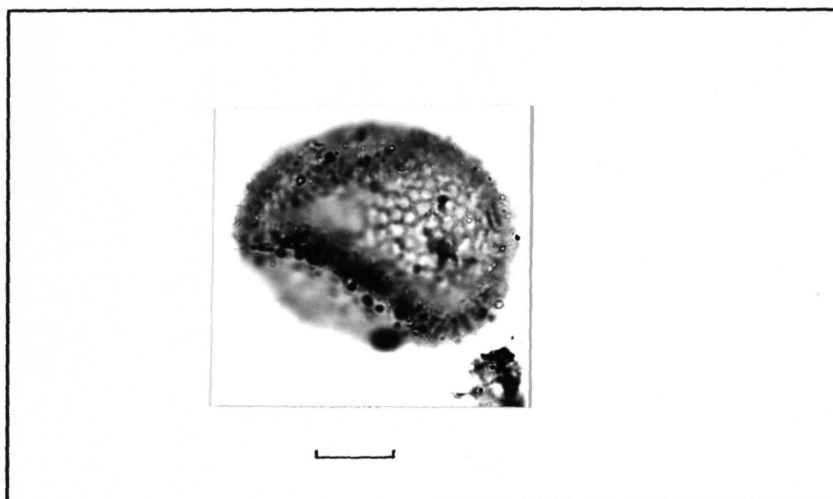

Scale bar = 10 μ

Figure 3.131

Specimens studied (2)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
129-19	41
133-42A	37
Average	39

Description

Amb shape	Large circular (spherical) grains May be folded
Apertures	None observed
Exine	Ektexine <5 μ with tall columellae Endexine thinner
Sculpturing	Coarsely reticulate. Lumina approx 2 μ diameter, regular in shape. Muri >0.5 μ thick

Illustrated specimen

(129-19) LM. Network of reticulum shown. Grain folded

Literature

The west coast specimens could not be identified according to the literature consulted

Remarks

Specimens were placed in this group if they were large inaperturate grains, possibly folded, with a coarse reticulum.

Botanical affinities Unknown

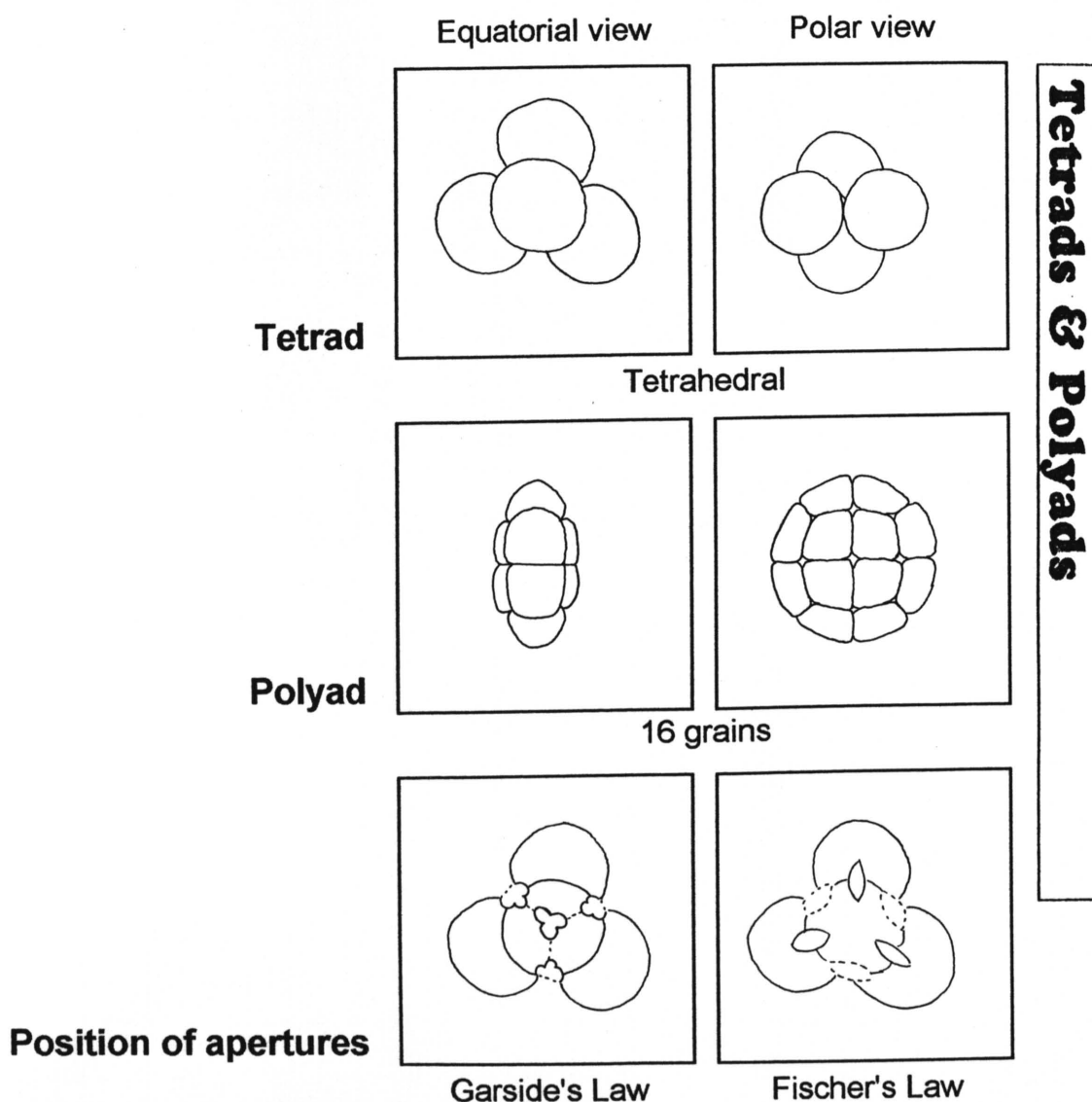
Distribution Very rare. Two specimens were found from the Channel Peats, Koningnaas

Age bracket Unknown

Tetrads and Polyads

Graphic glossary of technical terms

Figure 3.132



Definitions:

Tetrads: A group of four united pollen grains or spores (Punt et al.1994)

The exact arrangement of grains may vary

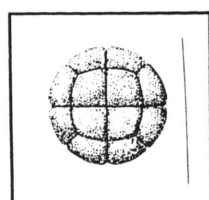
Polyads: Comprising more than four grains

Fischer's Law: arrangement commonly seen in tetrads of triaperturate grains whereby apertures form in pairs at six points in the tetrad (Punt et al.1994)

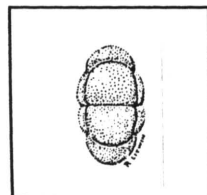
Garside's Law: unusual arrangement in tetrads of triaperturate pollen grains whereby apertures form in groups of three, at four points in the tetrad. Usually seen in Proteaceae.

Acaciapollenites sp Mildenhall 1972

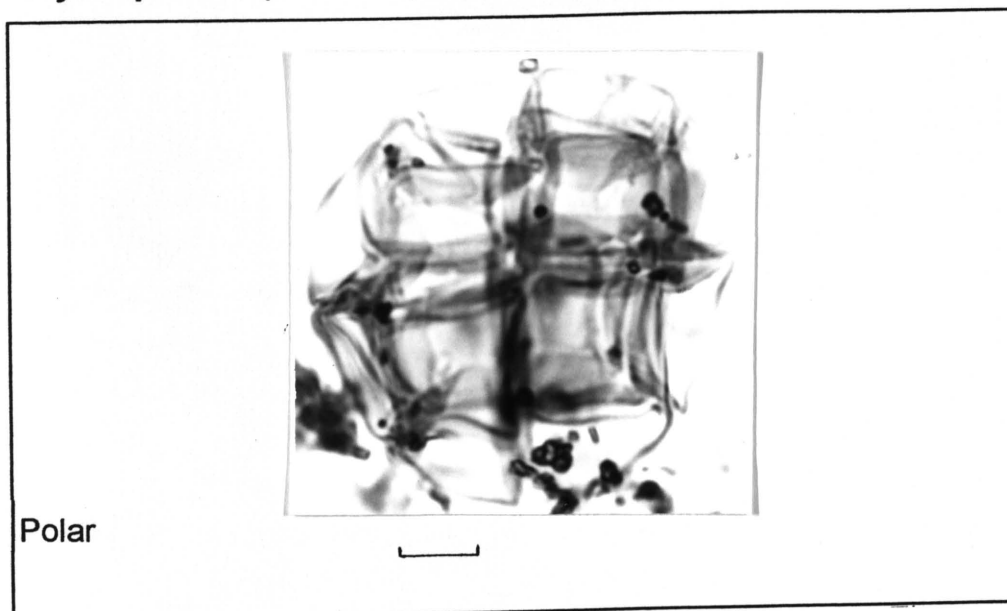
Type species *A. myriosporites* (Cookson) Mildenhall 1972



Polar



Equatorial



Polar

Scale bar = 10 μ

Tetrads & Polyads

Figure 3.133

Specimens studied (2)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
161-32A	60
164-16	59
Average	59.5

Illustrated specimen

(164-16) LM showing arrangement of individual cells in polyad

Description

Polyad	Obligate 16 individual cells, approximately square in centre (15 μ diam) peripheral cells elongate.
Amb	Circular in polar view 59.5 μ in diameter
Exine	Each individual cell - 1 μ thick Vestigial quadrangular furrow running parallel to the amb on the distal surface of each cell
Sculpturing	Psilate
Apertures	Inconspicuous, if present

Literature

Author	Descript.	Illustration	Geographical location	Age
Cookson 1954	p 55	Pl 1 fig 1, 5-8		
Mildenhall 1972	p 490	fig 1-13	Australia	Miocene-Pliocene
Martin 1973	p 20	Fig 79	Australia	?Pliocene
Jansonius & Hills 1976		p 19	n/a	n/a
Martin 1978	p 188	Fig 6 G	Australia	not stated
Partridge 1978	p 955	Pl 2 Fig 13	off Angolan coast	late Miocene
Pocknall & Mildenhall 84,	p 45, PI 26	Fig 6	Southland, New Zealand	early Miocene-Pleisto
Pocknall 1982	p 280	Fig 54	Southland, New Zealand	late Oligocene

Remarks

Illustrated specimen is similar to *A. myriosporites* in Martin 1973, Jansonius & Hills 1976, Martin 1978, Pocknall & Mildenhall 1984, & Pocknall 1982. It does not resemble the illustration in Partridge 1978.

Too few specimens were found to make a specific identification.

Botanical affinities Leguminosae, subfamily Mimosaceae, especially the tropical rainforest genera *Archidendron* and *Pithcellobium* (Pocknall 1982)

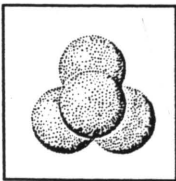
Acacia (van der Hammen 1956)

Distribution Langkrip. Very rare. Two specimens found in 35-2

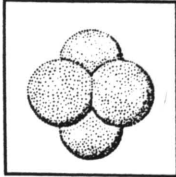
Age bracket Late Oligocene-Pleistocene

Dicotetradites sp Couper 1953

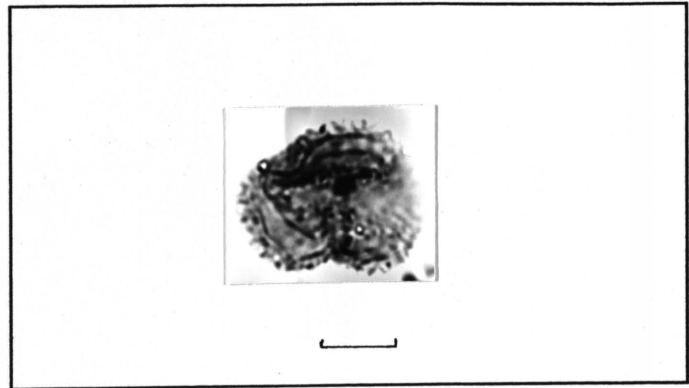
Type species *D. clavatus* Couper 1953



Polar



Equatorial



Scale bars = 10 μ

Figure 3.134

Tetrads & Polyads

Specimens studied (1)

Spec no	Diam (μ)
Bold type = illustrated specimen	
90-19	20

Illustrated specimen

(90-19) LM. Badly preserved specimen

Description

Tetrad	Tetrahedral Probably exhibits Fischer's Law Monads are subspheroidal
Amb	Subcircular 20 μ in diameter
Exine	3-4 μ thick Nexine less than 1 μ Sexine 2-3 μ Thickest at poles of monads
Sculpturing	Robust clavae - baculae Columellae 1 μ thick and 2-3 μ high
Apertures	Colpi and/or pores inconspicuous

Literature

Author	Descript.	Illustration	Geographical location	Age
Couper 1953	p 63	Pl 8 fig 125	New Zealand	Eocene
Couper 1960	p 62	Pl 10 fig 2	New Zealand	U Eocene
Jansonius & Hills 1976		781	n/a	n/a
Scholtz 1985	p 82	Fig 20 F-G,N	South Africa	? Palaeocene

Remarks

The genus *Dicotetradites* was proposed for the reception of tetrads of dicotyledenous pollen that cannot be more accurately placed (Couper 1953). Couper also noted that the exine was very variable in the nature of the sculpturing. Jansonius & Hills (1976) stated that if the sculpture is not thought to warrant generic separation, *Dicotetradites* must be considered as a junior synonym of *Ericipites*.

Illustrated specimens are similar to *D. clavatus* Couper 1953

& *Dicotetradites* sp Scholtz 1985. The marked colpi seen in illustrations of the type species cannot be determined in the Koingnaas specimen.

It is also rather smaller, 20 μ diameter not 48 μ

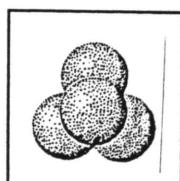
Botanical affinities Unknown (Couper 1953). ? Epacridaceae (Scholtz 1985)

Distribution Very rare. Single specimen found above the Main Peat Horizon, Koingnaas.

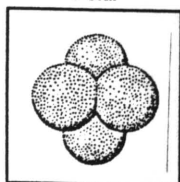
Age bracket Palaeocene-Eocene

Ericipites sp Wodehouse 1933

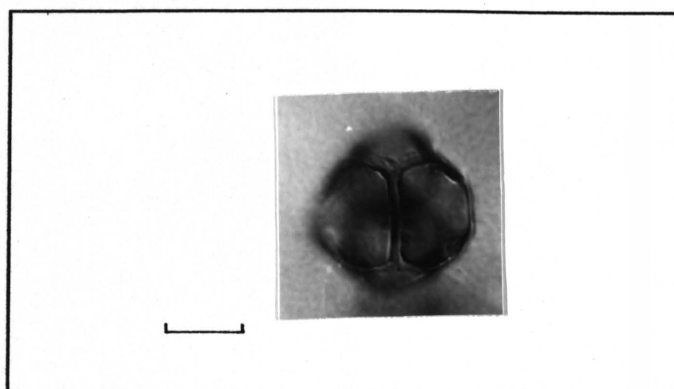
Type species *E. longisulcatus* Wodehouse 1933



Polar



Equatorial



Scale bar = 10 μ

Figure 3.135

Tetrads & Polyads

Specimens studied (5)

Spec no	Diam (μ)	Exine (μ)
Bold type = illustrated specimens		
188-28	30	2
188-37	27	2
190-17	35	2
214-41	34	2
276-39	25	2
Averages	30	2

Description

Tetrad	Tetrahedral. Exhibits Fischer's Law Monads are subspheroidal
Amb	Subtriangular to subcircular 30 μ in diameter
Exine	2 μ thick
Sculpturing	Smooth to granular
Apertures	Colpi are thin & tapering (3 μ wide) extend 3/4 distance to poles. Thickened at edges, widen to enclose small inconspicuous pores.

Illustrated specimen

(214-41) NOR-LM showing arrangement of individual grains in tetrad

Literature

Author	Descript.	Illustration	Geographical location	Age
Wodehouse 1933	p 517	Fig 52	Colorado, USA	M Eocene
Harris 1965	p 97	Pl 29 fig22,23	Australia	Palaeocene
Martin 1973	p 27	not illustr	S E Australia	Eocene-Pliocene
Jansonius & Hills 1976		961	n/a	n/a
Martin 1978	p 188	fig 5V, 5W	Australia	not stated
Christopher et al 1980	none	Pl 5 no 17	Georgia, USA	Palaeocene
Muller 1981	p 41	not illustr	worldwide	Maastrichtian - Recent
Scholtz 1985	p 80	Fig 20 A-E	South Africa	? Palaeocene

Remarks

Illustrated specimens are very similar to *E. scabratus* Harris 1965 & *Ericipites* sp A Scholtz 1985.

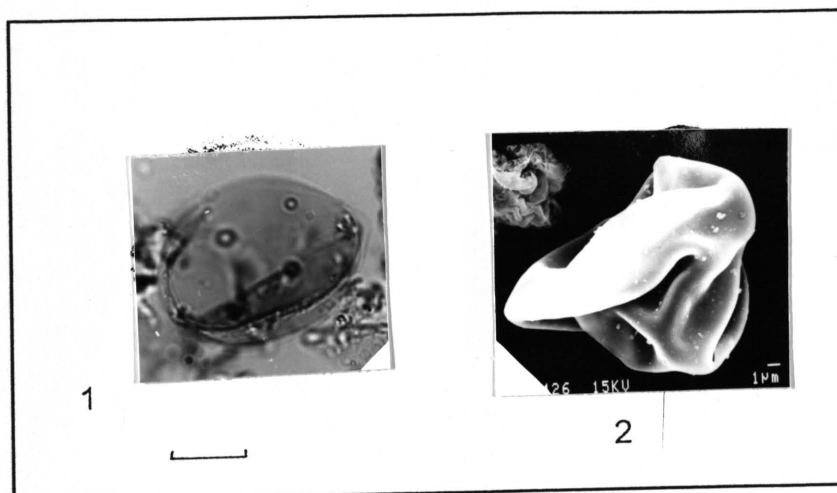
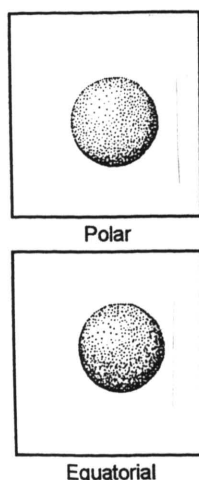
Botanical affinities Order Ericales (Muller 1981). See discussion in Muller and Scholtz (1985)

Southern hemisphere - ? Family Epacridaceae, as well as Ericaceae.

Empetraceae & *Carpodetus* (Saxifragaceae) produce similar pollen (Erdtman 1952)

Distribution Somnaas-Noup. Little known.

Age bracket Maastrichtian-Recent.



Scale bars = 10 μ

Figure 3.136

Specimens studied (30)

Average (μ)
Diameter (30 specimens) 29

Range (μ)
Diameter (30 specs) 12-52

Description

Amb shape	Large spherical grains Invariably crumpled
Apertures	None observed
Exine	Very thin approx 0.1 μ . No structure seen
Sculpturing	Psilate

Illustrated specimens

1. (23-21) LM . Specimen partly obscured by debris, and folded.
2. (242-18) SEM. Psilate surface seen. No apertures detected.

Literature

The west coast grains could not be identified according to the literature consulted

Remarks

Specimens were placed in this group if they were thin, spherical grains with a psilate surface. They were always crumpled.

Some doubt exists as to whether these grains are pollen, algal or fungal spores or dinoflagellate cysts. They are most likely to be inaperturate pollen because they are similar to grains identified as *Inaperturopollenites* by McLachlan & Pieterse (1978). These authors worked on material of similar age from a geographically close source. They have been discounted as dinoflagellate cysts due to the absence of an archaeopyle or plates. Traverse (1988) mentions that 'baggy' dinoflagellate cysts of this age are easily confused with inaperturate pollen. No fungal or algal spores of similar morphology have been featured in the literature consulted.

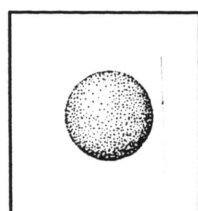
In two samples, these grains were dominant (more than 50% of the total). In these cases, a separate tally was kept of their numbers, not included in the sample statistics.

Botanical affinities Unknown

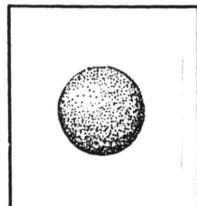
Distribution Significant. Found at all levels in all sites.

Age bracket Unknown

Incertae sedis B



Polar



Equatorial

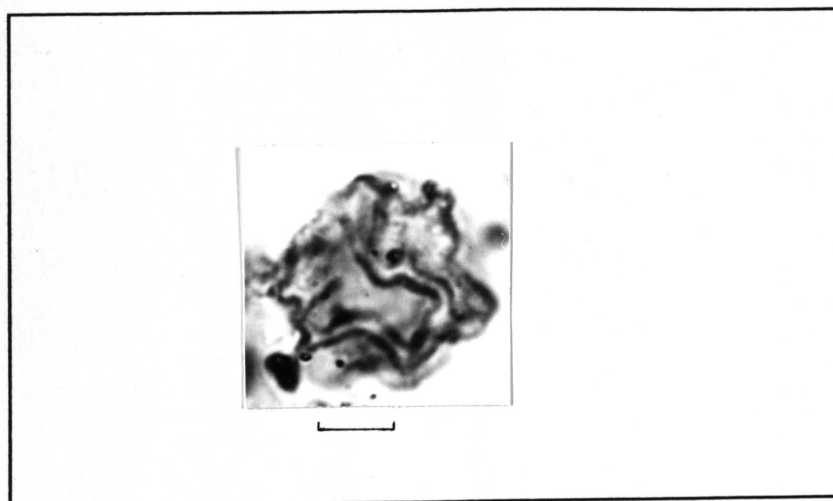
Scale bar = 10 μ

Figure 3.137

Incertae sedis

Specimens studied (1)

Spec no	Diameter (μ)
Bold type = illustrated specimen	
89-31	30

Illustrated specimen

(89-31) LM. Structure of exine shown

Description

Amb shape	Large circular/polygonal (spherical) grain
Apertures	None observed
Exine	Thick. Structure not well seen
Sculpturing	Hamulate. Exine folded into a type of reticulum. 'Lumina' approx 10 μ diameter, irregular in shape. 'Muri' 5 μ thick

Literature

The west coast specimen could not be identified according to the literature consulted

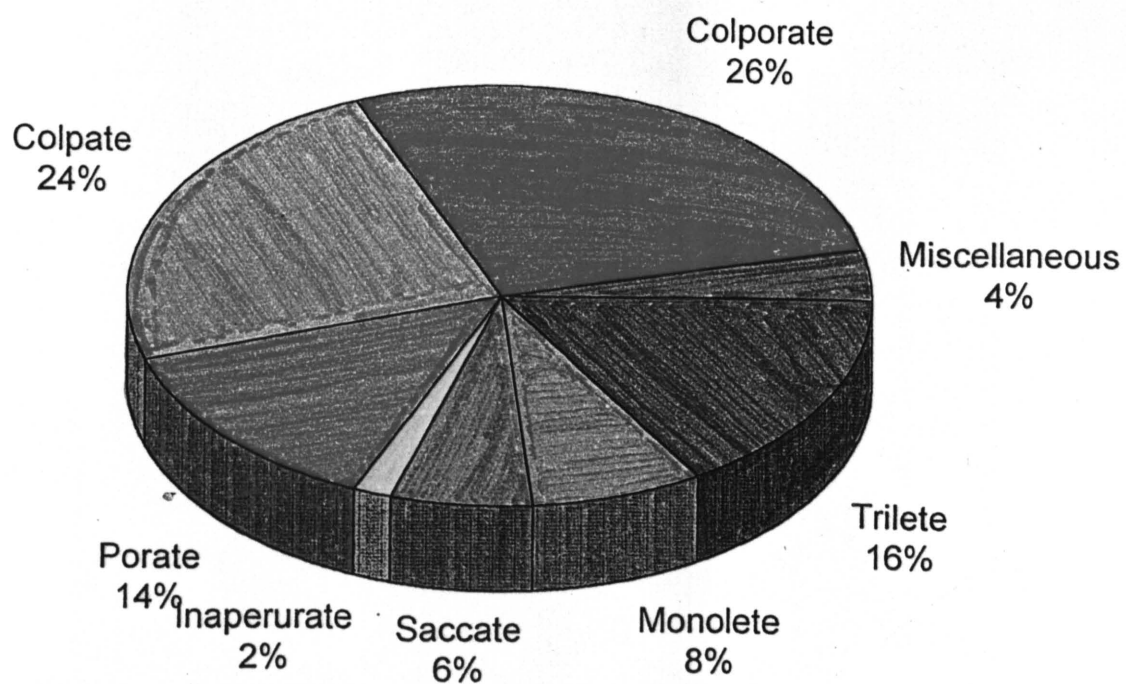
Remarks

Only one specimen of this type was found.

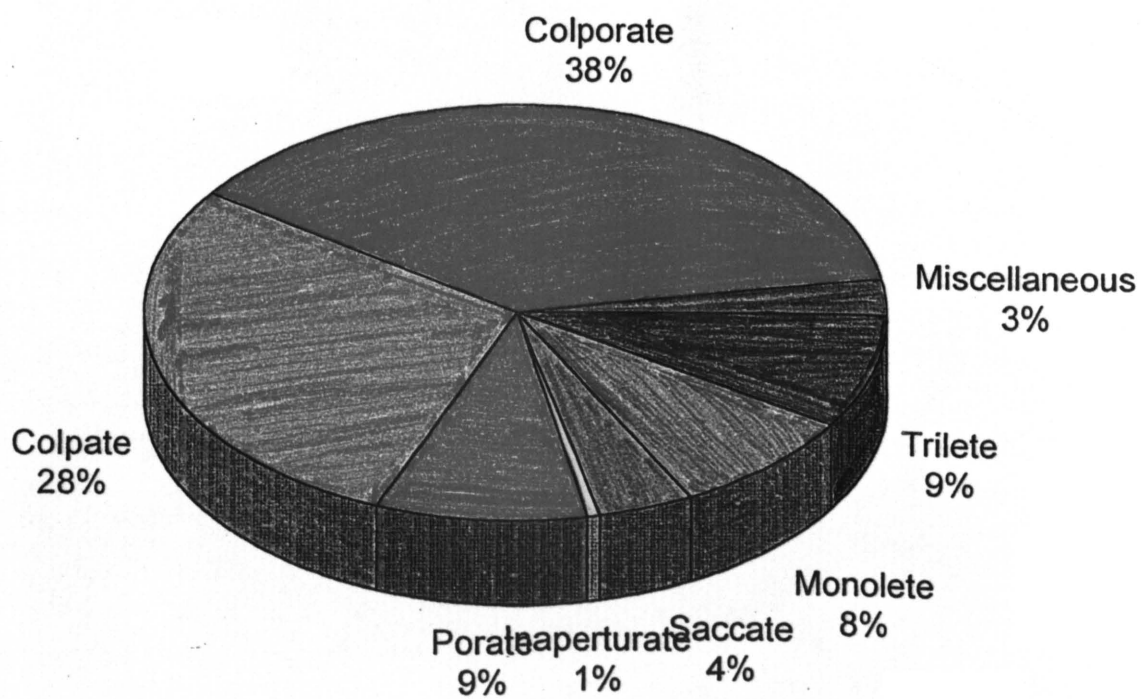
Botanical affinities Unknown

Distribution Very rare. One specimen was found from above the Main Peat Horizon, Koinaas

Age bracket Unknown



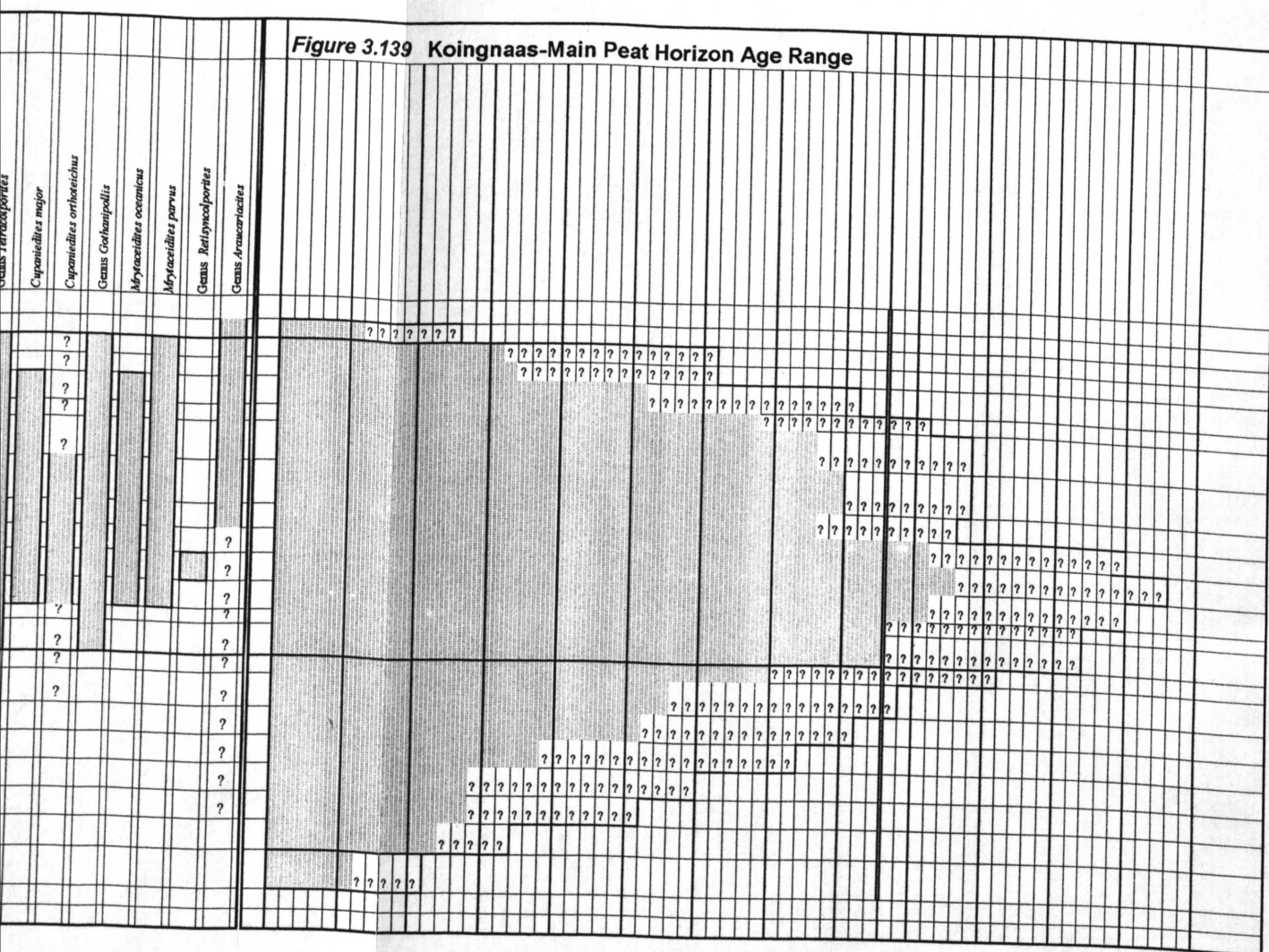
a Palynomorph type per taxonomic group



b Individual palynomorphs per taxonomic group

Figure 3.138 Variety of palynomorphs

[illegible]



Koingnaas - Channel Peats Age Range

AGE	Mya	TAXON	Genus <i>Polypodiaceisporites</i>	<i>Polypodiaceisporites retirugatus</i>	<i>Stereisporites</i> subgen <i>Cingulitites</i>	Genus <i>Cyath</i>
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Koingnaas - Channel Peats Age Range									
AGE	Mya	TAXON	Genus <i>Polypodiaceae</i> sp. 1	Genus <i>Polypodiaceae</i> sp. 2					

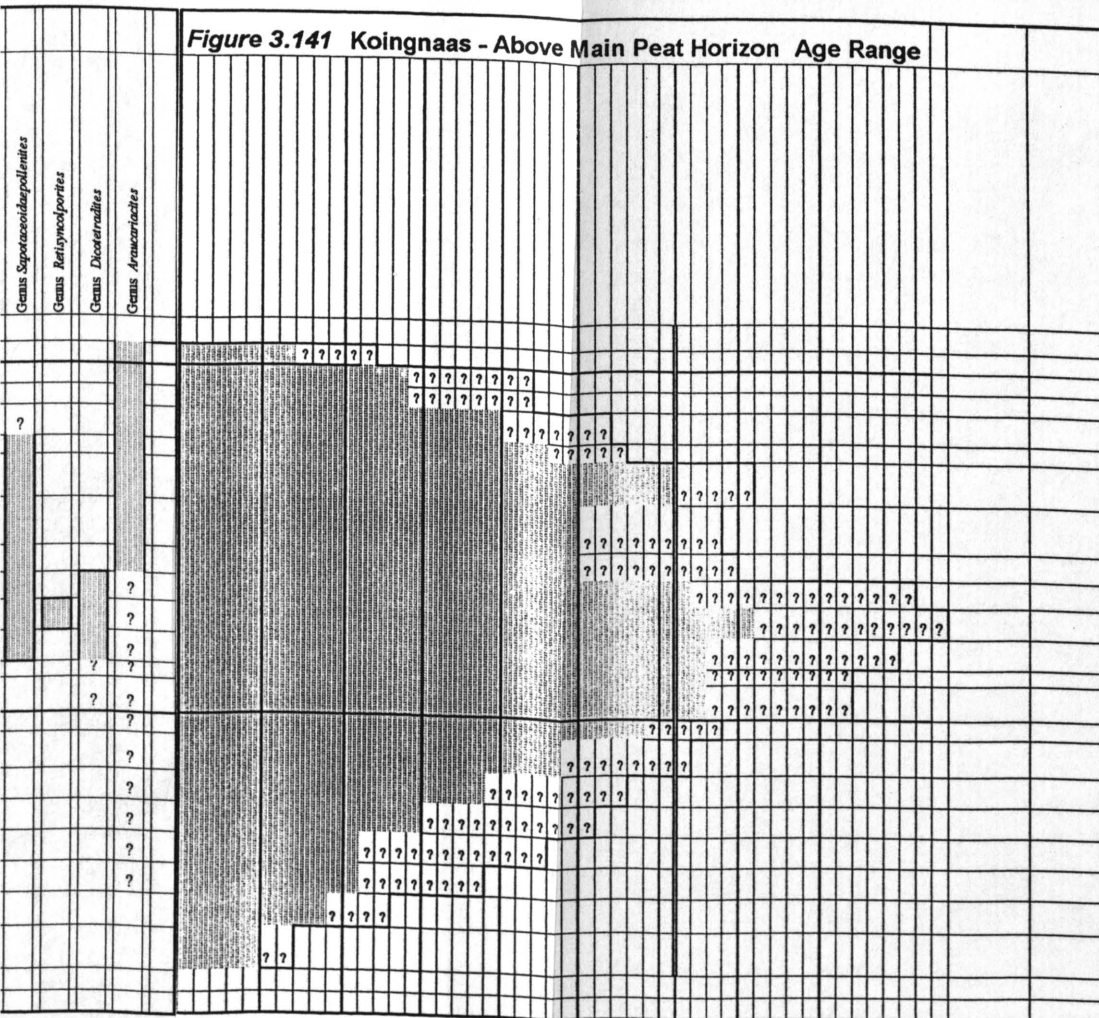
Koingnaas - Channel Peats Age Range									
AGE	Mya	TAXON	Genus <i>Polypodiaceae</i> sp. 1	Genus <i>Polypodiaceae</i> sp. 2					

[illegible]

Koingnaas-Above Main Peat Horizon		Age Range
1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55		

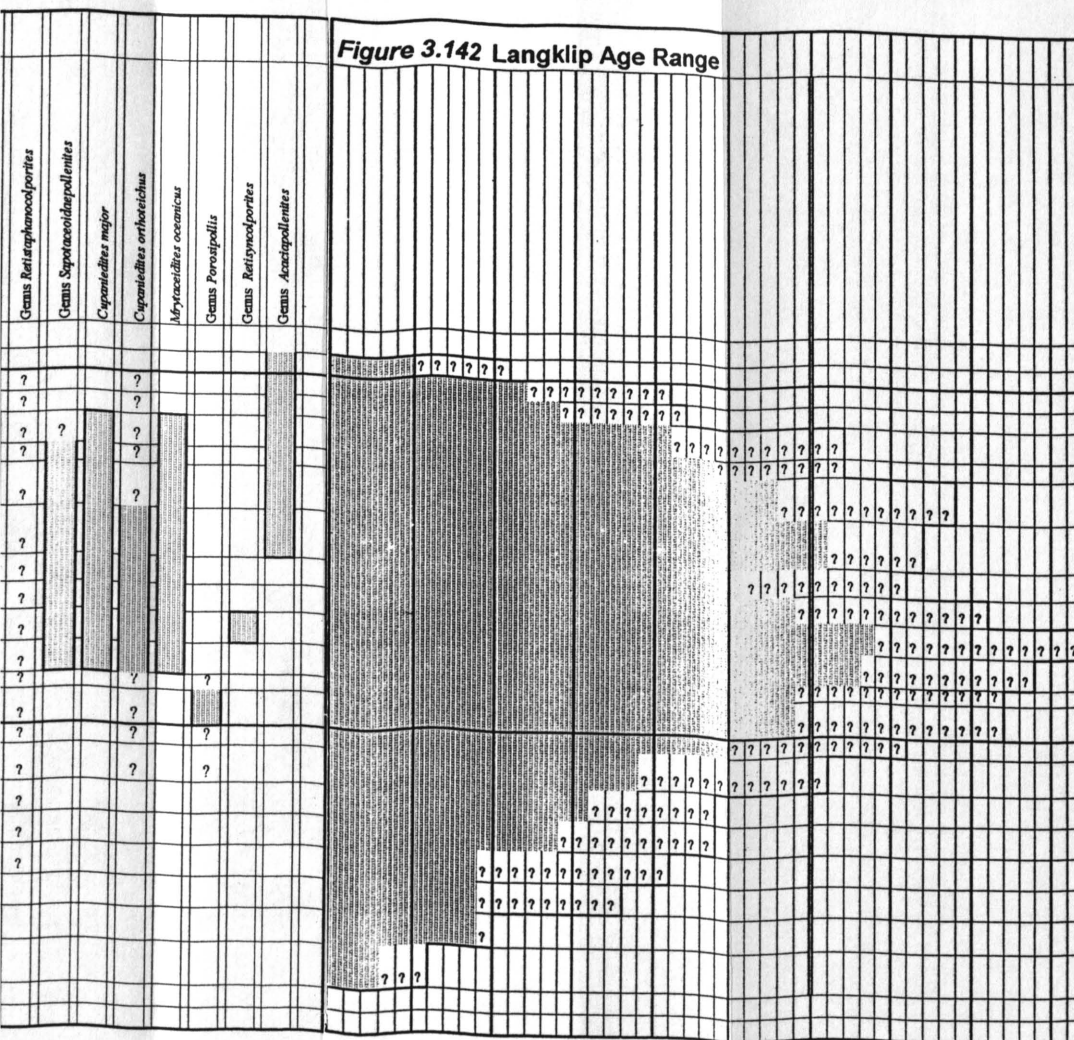
AGE		Mya	TAXON	Genus <i>Polypodiaceae</i> sp. A	Genus <i>Polypodiaceae</i> sp. B	Genus <i>Polypodiaceae</i> sp. C	Genus <i>Polypodiaceae</i> sp. D	Genus <i>Polypodiaceae</i> sp. E	Genus <i>Polypodiaceae</i> sp. F	Genus <i>Polypodiaceae</i> sp. G	Genus <i>Polypodiaceae</i> sp. H	Genus <i>Polypodiaceae</i> sp. I	Genus <i>Polypodiaceae</i> sp. J	Genus <i>Polypodiaceae</i> sp. K	Genus <i>Polypodiaceae</i> sp. L	Genus <i>Polypodiaceae</i> sp. M	Genus <i>Polypodiaceae</i> sp. N	Genus <i>Polypodiaceae</i> sp. O	Genus <i>Polypodiaceae</i> sp. P	Genus <i>Polypodiaceae</i> sp. Q	Genus <i>Polypodiaceae</i> sp. R	Genus <i>Polypodiaceae</i> sp. S	Genus <i>Polypodiaceae</i> sp. T	Genus <i>Polypodiaceae</i> sp. U	Genus <i>Polypodiaceae</i> sp. V	Genus <i>Polypodiaceae</i> sp. W	Genus <i>Polypodiaceae</i> sp. X	Genus <i></i>
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Figure 3.141 Koingnaas - Above Main Peat Horizon Age Range



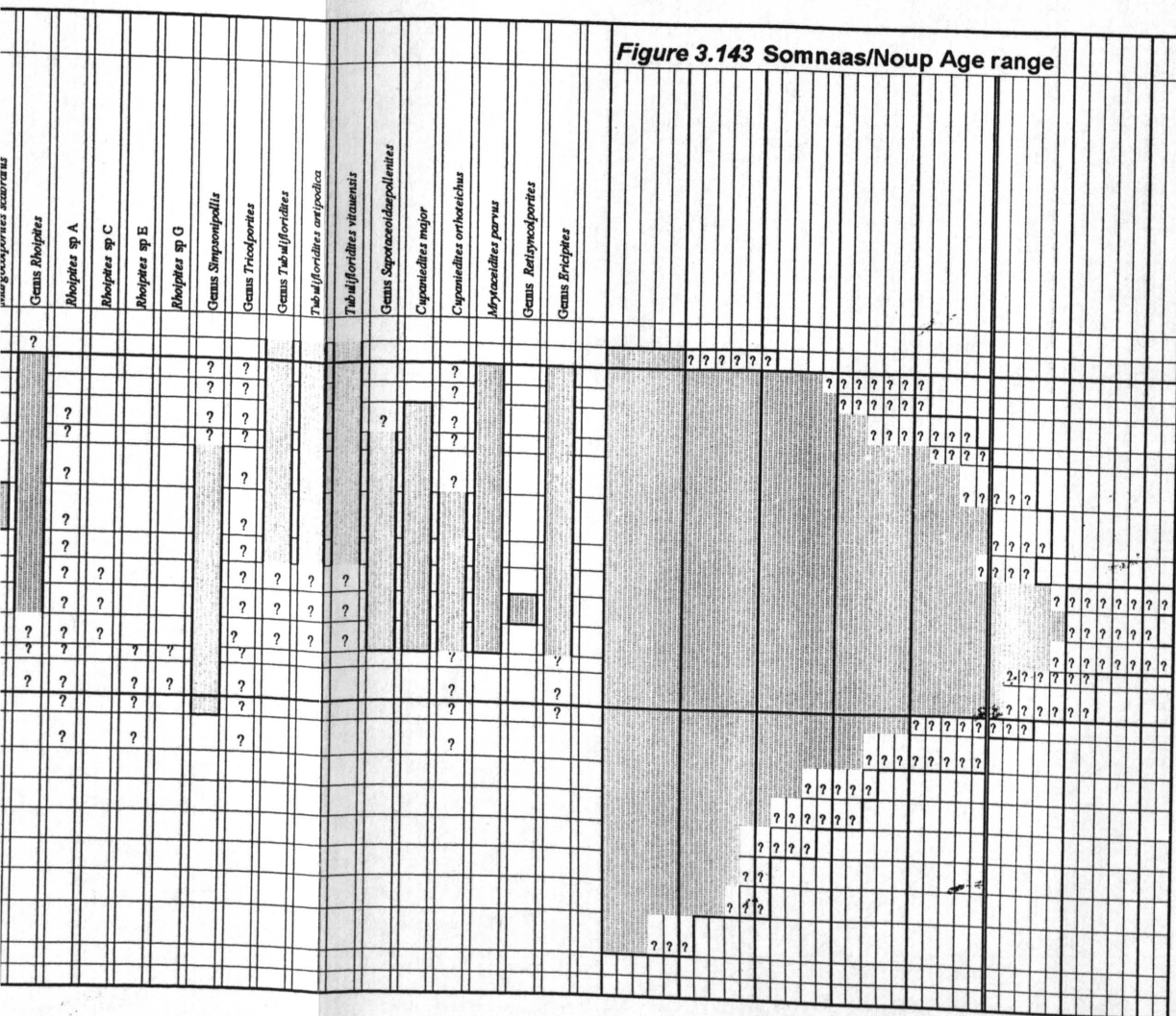
Langklip Age Range

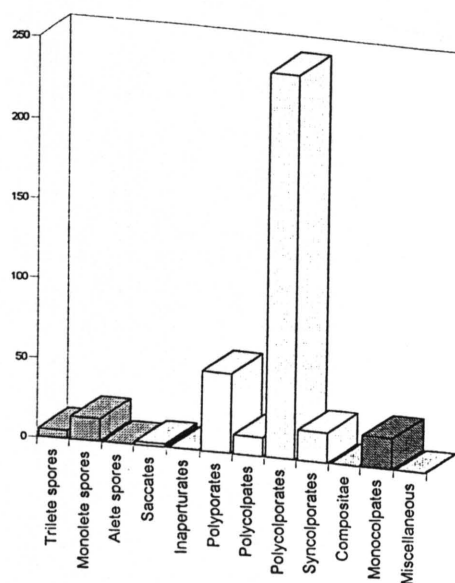
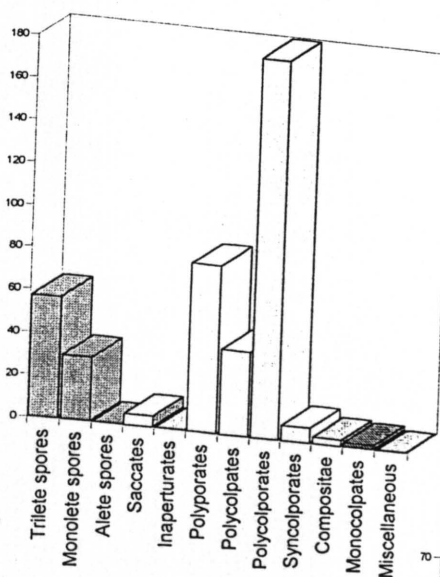
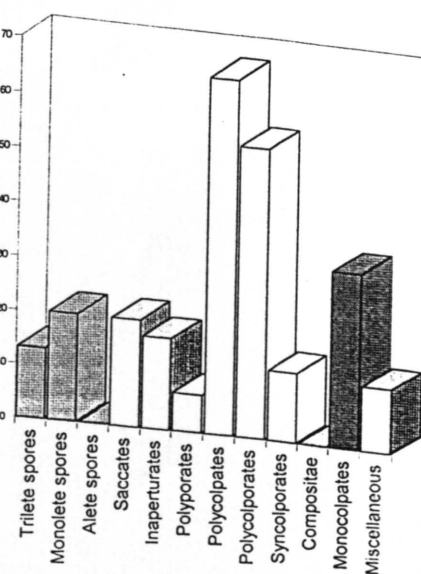
Langlip Age Range		TAXON		AGE		Mya	
		Genus <i>Polypodiaceosporites</i>					
		<i>Polypodiaceosporites reitugatus</i>					
		<i>Polypodiaceosporites</i> sp. cf. <i>tumidatus</i>					
		<i>Polypodiaceosporites</i> sp. A					
		Genus <i>Cyathidites</i>					
		<i>Cyathidites curatilis</i>					
		Genus <i>Deltoideospora</i>					
		Genus <i>Distaphyllidites</i>					
		Genus <i>Lygodiumsporites</i>					
		<i>Permonadites bowenii</i>					
		Genus <i>Laevigatosporites</i>					
		Genus <i>Polypodiisporites</i>					
		<i>Polypodiisporites</i> sp. A					
		Genus <i>Alisporites</i>					
		Genus <i>Podocarpidites</i>					
		<i>Podocarpidites marwickii</i>					
		<i>Podocarpidites</i> sp. A					
		<i>Podocarpidites</i> sp. B					
		<i>Podocarpidites</i> sp. C					
		Genus <i>Criocriporites</i>					
		Genus <i>Echtrioprites</i>					



Somnaas/ Noup Age Range

TAXON		AGE		Mya	
<i>Polypodiaceapollenites retrugatus</i>					
<i>Polypodiaceapollenites</i> sp A					
Genus <i>Cyathidites</i>					
<i>Cyathidites australis</i>					
Genus <i>Dicropophyllidites</i>					
<i>Omnidacitites wellmanii</i>					
Genus <i>Lavigatopollenites</i>					
Genus <i>Polypodiopollenites</i>					
Genus <i>Podocarpidites</i>					
<i>Podocarpidites marwickii</i>					
<i>Podocarpidites</i> sp A					
<i>Podocarpidites</i> sp B					
Genus <i>Cricotipollenites</i>					
Genus <i>Propylipollis</i>					
Genus <i>Proteacidites</i>					
Genus <i>Thurites</i>					
Genus <i>Liliacidites</i>					
Genus <i>Monodiploporipollenites</i>					
Genus <i>Sriamonomocarpites</i>					
Genus <i>Cupulifroidipollenites</i>					
Genus <i>Echitricolpites</i>					
Genus <i>Sriatopollis</i>					
<i>Tricolpites confusus</i>					
<i>Tricolpites cooksonae</i>					
<i>Tricolpites gillii</i>					
<i>Tricolpites micromunus</i>					
<i>Tricolpites</i> sp					
Genus <i>Margocolpites</i>					
<i>Margocolpites acabratus</i>					
Genus <i>Rhoipites</i>					
<i>Rhoipites</i> sp A					
<i>Rhoipites</i> sp C					
<i>Rhoipites</i> sp B					
Pleistocene	1.8	?			
late Pliocene	3.2	?			
early Pliocene	5				
late Miocene	11				
mid Miocene	14.5				
early Miocene	22.5				
late Oligocene	32				
early Oligocene	37.5				
late Eocene	43	?			
mid Eocene	49	?			
early Eocene	55	?			
late Palaeocene	58				
early Palaeocene	65				
Maastrichtian	69				
Campanian	76				
Santonian	82				
Coniacian	88				
Turonian	94				
Cenomanian	100				
Lower Cretaceous	141				
earlier sediments		?	?		
A:\somnagea.xls					



Pattern 1 (Sample 35-3)**Pattern 2 (sample 12-30)****Pattern 3 (Sample 12-23)***Figure 3.144 Comparison of typical palynoflora patterns.*