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RECOGNITION OF NEOTYPE SPECIMENS FOR SPECIES DESCRIBED FROM THE ARNOT PIPE, BANKE, NAMAQUALAND, SOUTH AFRICA.

by

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ABSTRACT

Important palynological studies were completed by Scholtz (1985) on material from the Arnot Pipe on the farm Banke in Namaqualand, Northern Cape Province. The results comprised a rare record of early Tertiary vegetation in southern Africa. The body of Scholtz's research consisted of systematic, descriptive palynology including the description of one new genus and fifteen new species. Ongoing research into South Africa's Tertiary palynology requires that the type specimens from Arnot be used for comparative purposes. However, the microscope slides on which they were founded were not available for examination. Another set of slides, representing two of the seven samples taken at Arnot, was used to search for neotype specimens to replace the missing holotypes. Specimens representing all fifteen new species were found, but were often badly preserved, obscured by debris or trapped between air bubbles as the condition of the decade-old microscope slides had deteriorated. Only specimens in good condition were selected as neotypes, and comprehensively illustrated. Four of Scholtz's new species were transferred to alternative, more applicable, genera.

KEYWORDS: Palynology, Tertiary, Arnot

INTRODUCTION

An important palynological study was completed by Scholtz (1985) on material from the Arnot Pipe on the farm Banke, in Namaqualand, Northern Cape Province, South Africa (Figure 1). The study documented a rare record of early Tertiary vegetation in southern Africa. Such records are sparse because of the paucity of deposits and palynologically productive sites. With continuing research, additional sites are being discovered, creating a demand for comparative studies utilising the Arnot material, especially as far as the type specimens of the genera and species erected by Scholtz are concerned.

However, it was discovered that the Arnot microscope slides were not available as they had not been archived as documented by Scholtz (1985). Their absence, and particularly that of the type specimens, presented a problem for researchers. The current project to nominate neotype specimens was initiated following an extensive search to locate the slides that Scholtz worked on.

Traverse (1996) stated that the loss of type specimens is a common problem in palaeopalynology and it may occur in one of three ways. Firstly, the preservation may not have been adequate or the slides may have deteriorated despite the best attempts at preservation. Secondly, locating the type specimen on a strew slide may not be possible as grains may migrate within the mounting medium with time. Thirdly, researchers may not strictly obey the ICBN rules demanding that slides containing type specimens are archived in a recognised institution because strew slides may contain hundreds of specimens worthy of future research. This last appears to be applicable to Scholtz's slides.

The microscope slides used for the current study are duplicates of those used by Scholtz and prepared by him from the same macerated material but represent only two of the seven samples (52'-58' and Unprovenanced). They are currently archived in the Palaeontology Department at the South African Museum in Cape Town. The ICBN Code provides for neotypification to cater for situations where the holotype has been lost (Traverse 1996). According to Voss *et al.* (1983) in Section 2 on Typification, Article 7, point 8, "a neotype is a specimen or other element selected to serve as nomenclatural type as long as all of the material on which the name of the taxon is based is missing". The specimens nominated in this paper were regarded as being neotypes rather than lectotypes because a degree of uncertainty existed regarding in which sample the original types were found. If the original type had been found in Sample 52'-58', a lectotype must also be recognised from Sample 52'-58'. With the existing information, the exact derivation of the original type specimens could not be confirmed.

A second important facet of the current project was the redesignation of several of the new species to alternative genera. It was discovered during the course of the project that various species were not placed into the most appropriate genus and their transfer was recommended.

The project was successful in locating specimens which could be related to all fifteen new species described by Scholtz (1985). However, many of the

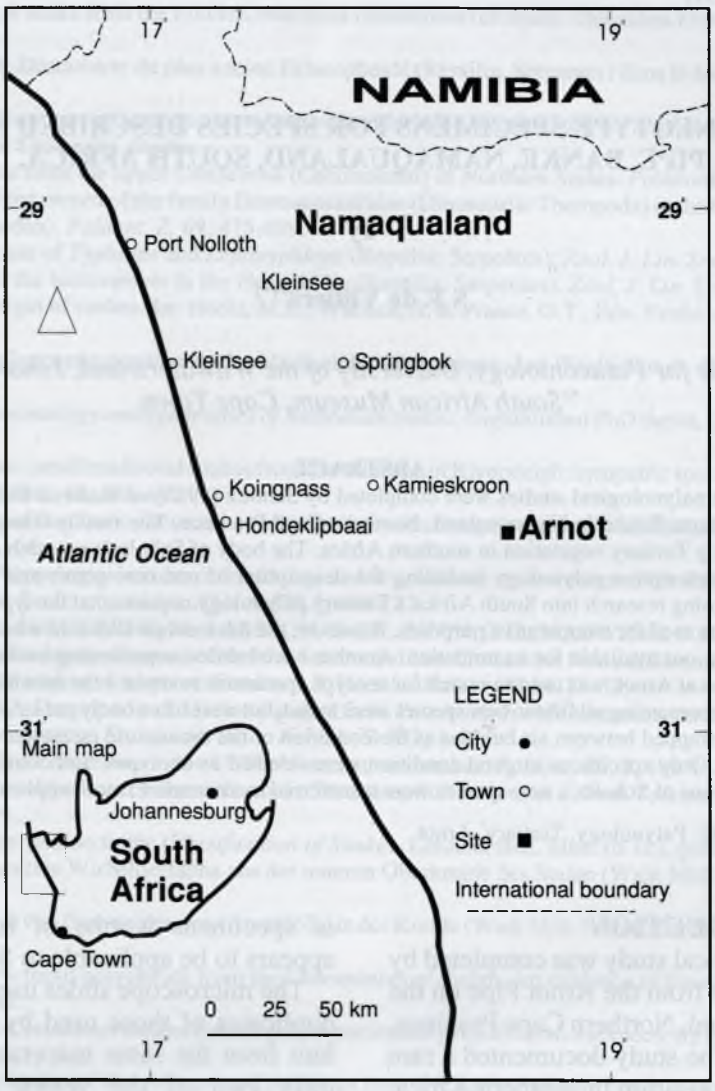


Figure 1. Locality Map

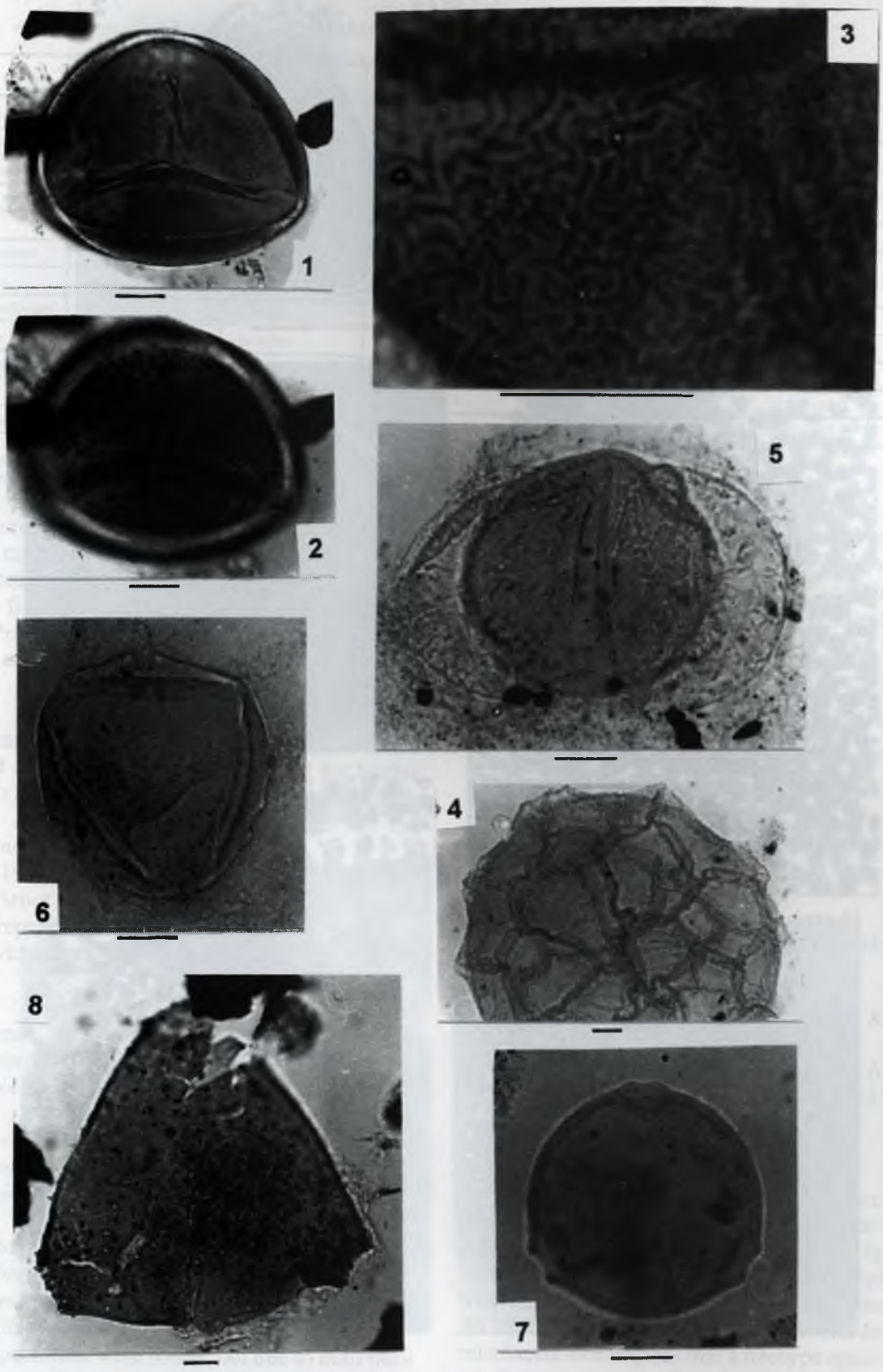
specimens were either badly preserved, obscured by debris or trapped between air bubbles. Only grains in good condition were considered as candidates for nomination as neotype specimens.

MATERIALS AND METHODS

As reported in Scholtz (1985), material was collected from an excavation at the Arnot Pipe during the 1930s by geologists. The samples were archived at the South African Museum and used for various palaeontological studies, including a palynological examination by Kirchheimer (1934).

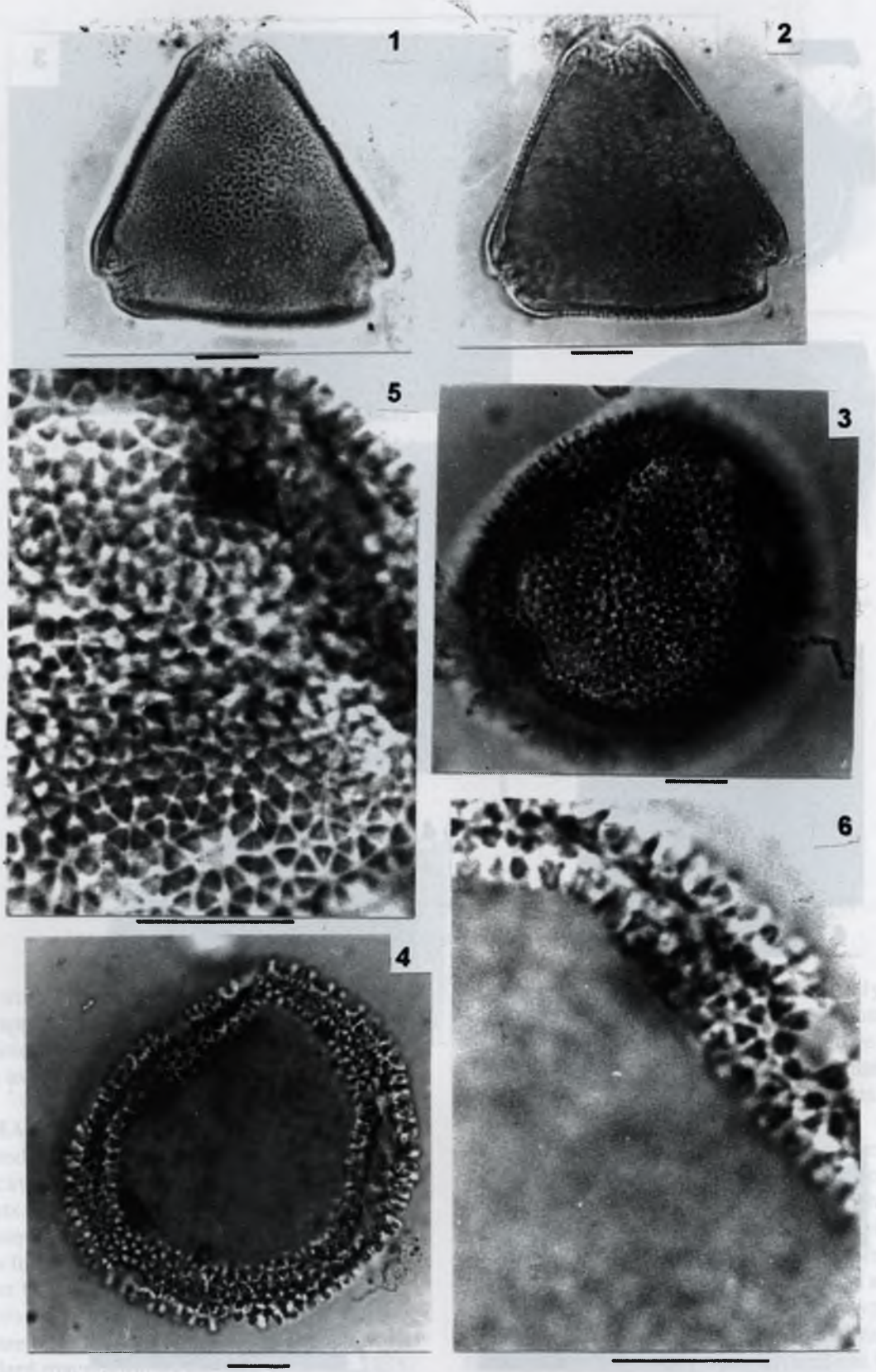
The microscope slides used for the current study were prepared by Scholtz from the above samples using standard maceration techniques (Scholtz 1985). They represent only two of the seven samples from Arnot (52'-58' and Unprovenanced). The slides had deteriorated somewhat since they were prepared a decade ago and contained many air pockets. They were not repaired or remounted for two reasons. Firstly, it was not known whether or not Scholtz had worked on these slides and already isolated important specimens. If the slides were remounted, the location of such specimens would be lost. Secondly, if the repair work was unsuccessful, the only available macerated material might be rendered unusable. It was thus decided to examine the slides before attempting any repair work, in the hope that representatives of the new species could be found and neotypes nominated with no further intrusive action.

The current microscope work was carried out using a Leitz Laborlux 12 POL light microscope equipped with a Wild MPS 51 camera with a Wild Photoautomat MPS 45 light monitor. Photomicrographs of specimens which represented Scholtz's new species were targeted. Each photographed specimen was assigned an individual specimen number. For example, the neotype specimen for *Reticulatasporites grandis* was photographed on film number 315 and the negative of the first shot in which it appeared is 39. The specimen number thus becomes 315-39. A record card was created for each specimen, containing data such as the number of the relevant slide, with its co-ordinates according to the Museum's Leitz microscope. The specimens were compared with the published illustrations and descriptions in Scholtz (1985) to determine whether they conformed to the species and the most representative specimen was chosen as the neotype.



All scale bars = 10µm

Plate 1. Light microscopy: 1. *Camarozonosporites bankiensis*. Psilate proximal face; 2. Same specimen, distal face with hamulate sculpturing; 3. Same specimen, detail of sculpturing; 4. *Reticulatasporites grandis*. Whole grain; 5. *Podocarpidites riembreekensis*. Whole grain, showing distal tenuitas; 6. *Triorites operculatus*. Polar view. Pores do not have operculae; 7. *Triorites sphericus*. Polar view; 8. *Triporopollenites namaquaensis*. Polar view of damaged specimen.



All scale bars = 10μm

Plate 2. Light microscopy: 1. *Propylipollis meyeri*. Polar view, showing sculpturing in polar area; 2. Same specimen, with focus on structure of pores; 3. *Grootipollis reuningii*. Whole grain, showing arrangement of pores; 4. Same specimen, focussing on structure of exine; 5. Same specimen, showing detail of sculpture adjacent to pores; 6. Same specimen, showing detail of exine structure.

TABLE 1
Register of Neotype Specimens

Original genus	New Genus	species name	Neotype specimen no	Sample	Slide no	Co-ordinates*	Plate
Camarozonosporites	No change	*bankiensis*	317-1	"Unprov."	11	5.5 x 126	1 (1, 2, 3)
Reticulatasporites	No change	*grandis*	315-39	"Unprov."	5	11.5 x 131.0	1 (4)
Podocarpidites	No change	*riembreekensis*	313-13	52'-58'	10	10.0 x 115.5	1 (5)
Triorites	No change	*operculatus*	313-24#	52'-58'	9	6.0 x 110.0	1 (6), 4 (1)
Triorites	No change	*sphericus*	315-24	"Unprov."	5	9.5 x 132.0	1 (7), 4 (2)
Triporopollenites	No change	*namaquensis*	315-13	"Unprov."	11	5.0 x 105.0	1(8), 4 (3)
Propylipollis	No change	*meyeri*	310-11	52'-58'	7	3.5 x 101.0	1 (1,2)
Tricolporopollenites	*Simpsonipollis*	*grandis*	314-39	52'-58'	10	15.0 x 120.0	3 (2)
Tricolporopollenites	*Rhoipites*	*brinkiae*	310-27	52'-58'	10	6.5 x 117.0	3 (3)
Tricolporopollenites	*Verrutricolporites*	*coetzeeae*	315-10	"Unprov."	11	3.0 x 132.5	3 (4), 4 (4)
Grootipollis	No change	*reuningii*	314-1	"Unprov."	4	14.0 x 103.0	2 (3-6), 4 (3)
Triporotetradites	No change	*sphericus*	311-26	52'-58'	7	17.7 x 110.5	3 (1)

** On microscope at South African Museum*
 # Not nominated as neotype

The microscope slides were redeposited in the Museum's collection, together with photomicrographs and data from each species. The negatives and specimen cards were filed in the palynological collection of the Bernard Price Institute for Palaeontology at the University of the Witwatersrand.

RESULTS

Specimens of all fifteen species under consideration were found and neotypes were nominated for twelve of them. No amendments to Scholtz's descriptions are suggested. A compilation of information on the nominated neotypes is given in Table 1.

Scholtz (1985) included SEM photographs of several of the new Arnot species, but the images were trimmed. They are reproduced in this paper from Scholtz's negatives without alteration.

Systematic palynology

Trilete spores
Camarozonosporites bankiensis
Neotype specimen 317-1 (Plate 1 nos 1, 2, 3)

Alete spores
Reticulatasporites grandis
Neotype specimen 315-39 (Plate 1 no 4)

Saccate pollen
Podocarpidites riembreekensis
Neotype specimen 313-13 (Plate 1 no 5)
Podocarpidites kamiesbergensis

Several specimens were found, but due to their poor condition none of them were chosen as the neotype. Microphotographs of the specimens and their location on the slides were archived.

Porate pollen
Triorites operculatus

Several specimens were found, but none of them were chosen as the neotype because their pores did not exhibit operculae, which is a diagnostic feature of the species. Scholtz (1985) mentioned in the original description that the operculum is sometimes absent from the pore. Specimen 313-24 (Plate 1 no 6) is a good example of the species, apart from the missing operculae.

NB. Plate 4 no 1 is the same as Scholtz (1985) Fig 13 I.

Triorites sphericus
Neotype specimen 315-42 (Plate 1 no 7)
NB. Plate 4 no 2 is the same as Scholtz (1985) Fig 13 H.

Triporopollenites namaquensis
Neotype specimen 315-13 (Plate 1 no 8)
NB. Plate 4 no 3 is the same as Scholtz (1985) Fig 14 A.

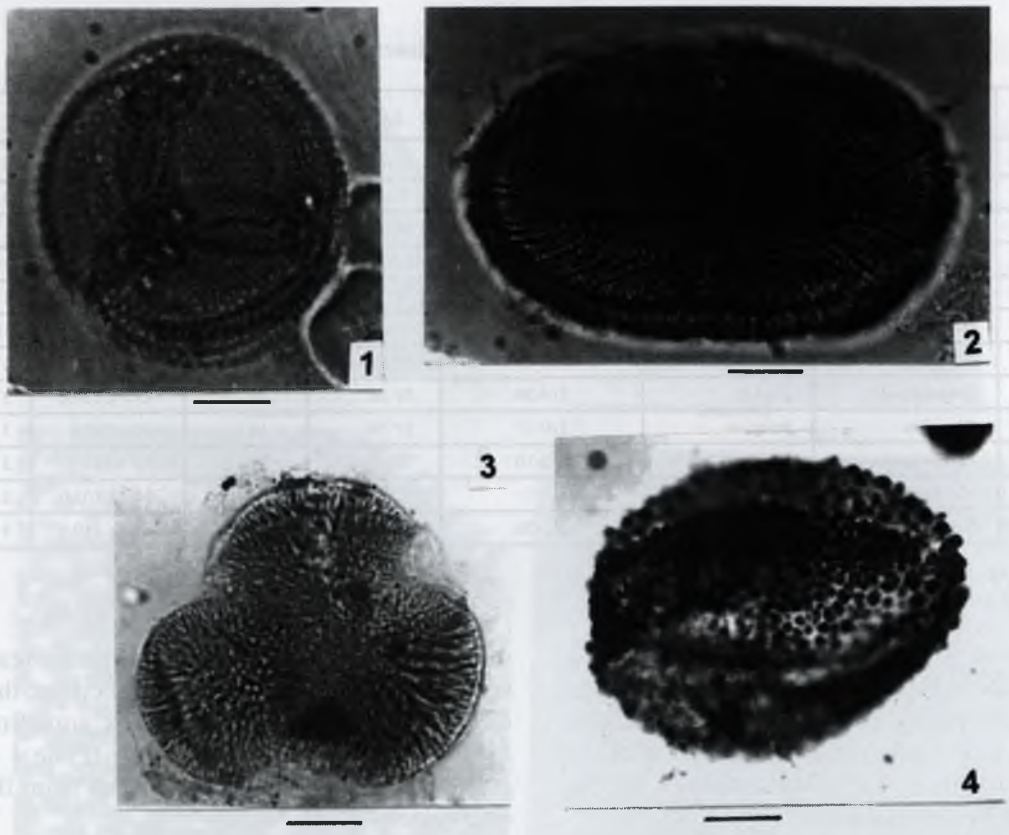
Propylipollis meyeri
Neotype specimen 310-12 (Plate 2 nos 1 & 2)
Grootipollis reuningii
Neotype specimen 314-1 (Plate 2 nos 3 - 6)
NB. Plate 4 no 3 is the same as Scholtz (1985) Fig 19 A.

Colpate pollen
Genus *Spinitricolpites*

Scholtz erected a new genus to accommodate spherical medium to large sized, tricolpate spiniferous pollen grains. The genus included the type species found at Arnot (*S. jennerclarkei*), and another species from New Zealand was transferred to it (*S. latispinosus*). As the type specimen for *S. jennerclarkei* has been misplaced, this implies that a neotype specimen for the whole genus must be found.

Spinitricolpites jennerclarkei

Specimens were found, but due to their poor condition none of them were chosen as neotypes. Microphotographs of the specimens and their location on the slides were archived. The lack of a well-preserved specimen in this case is more significant as it is required to represent a genus as well as a species.



All scale bars = 10μm

Plate 3. Light microscopy: 1. *Triporotetradites sphericus*. Whole grain, showing arrangement and structure of monads within tetrad; 2. *Simpsonipollis grandis*. Equatorial view, showing colpus and zonorate pores; 3. *Rhoipites brinkiae*. Polar view; 4. *Verrutricolporites coetzeeae*, showing verrucate sculpture.

Colporate pollen

Remarks. Scholtz (1985) does not comment on the reason for choosing to place several species within the genus *Tricolporopollenites*. There are two main reasons for challenging this designation. Firstly, according to Jansonius & Hills (1976), *Tricolporopollenites* may be considered a junior synonym of *Rhoipites*. *Tricolporopollenites* was erected in 1953 by Pflug & Thomson (Thomson & Pflug 1953) and *Rhoipites* in 1933 by Wodehouse. Secondly, *Tricolporopollenites* has a very widely circumscribed diagnosis. As the name suggests, it requires only that constituate forms possess three meridional colpi with pores. As such, it could accommodate all fossil tricolporate pollen species. By Tertiary times, palynofloras were dominated by tricolporate pollen, produced bymany families of dicotyledonous angiosperms. It is thus more useful to assign species to genera with more constrained diagnoses, which take into consideration relevant variations in aperture morphology, exine structure and sculpturing, and botanical affinities where possible.

Simpsonipollis grandis

Neotype specimen 314-39 (Plate 3 no 2)

This appeared in Scholtz (1985) as *Tricolporopollenites grandis* and should be transferred to *Simpsonipollis*. Srivastava (1975) established *Simpsonipollis* to accommodate tricolporate grains with a striate sculpture. Kemp & Harris (1977) make further comments on the validity of this genus. Scholtz (1985) indicated that the sculpturing was one of the diagnostic features of this species, so it should be placed within the genus which differentiates striate tricolporate pollen from all other types. However, striate tricolporate grains are common throughout the Tertiary and are produced by many modern families of dicot angiosperms (Muller 1968).

Rhoipites brinkiae

Neotype specimen 310-27 (Plate 3 no 3)

This appeared in Scholtz (1985) as *Tricolporopollenites brinkiae* and should be transferred to *Rhoipites* because *Tricolporopollenites* may be considered a junior synonym of *Rhoipites*. Therefore, this species reverts to the genus with priority.

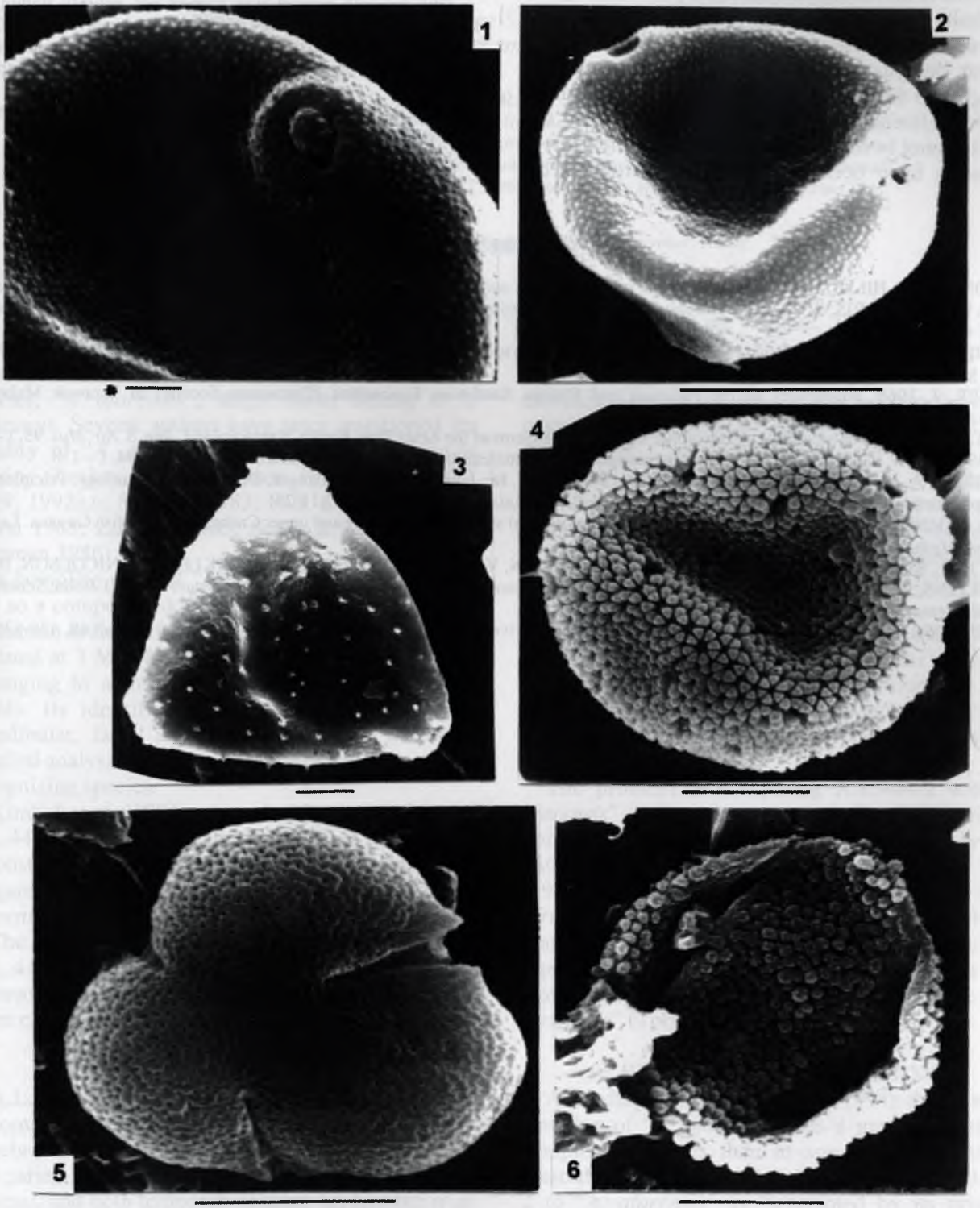
Rhoipites arnotiensis

No neotype nominated because the solitary specimen of the species found was in poor condition. This appeared in Scholtz (1985) as *Tricolporopollenites arnotiensis* and should be transferred to *Rhoipites* for the reason given above for *R. brinkiae*.

Verrutricolporites coetzeeae

Neotype specimen 315-10 (Plate 3 no 4) NB. Plate 4 no 4 is the same as Scholtz (1985) Fig 18 I.

This appeared in Scholtz (1985) as *Tricolporopollenites coetzeeae* and should be transferred to *Verrutricolporites* as this genus was established by van der Hammen & Wymstra (1964) to accommodate tricolporate pollen grains with a verrucate sculpture. As with *Simpsonipollis grandis*, the sculpturing is one of the diagnostic features of this species, so it should be placed within the genus which differentiates verrucate tricolporate pollen from other tricolporate pollen.



All scale bars = 10μu, except * = 1μm

Plate 4. SEM photography: 1. *Triorites operculatus*. Detail of pore with operculum; 2. *Triorites sphericus*. Polar view; 3. *Triporopollenites namaquensis* in Table 1. Polar view; 4. *Grootipollis reuningii*. Whole grain, showing arrangement of pores; 5. *Rhoipites brinkiae*. Oblique view; 6. *Verrutricolporites coetzeeae*, showing verrucate sculpture.

Pollen found as tetrads

Triporotetradites sphericus

Neotype specimen 311-27 (Plate 3 no 1)

DISCUSSION

This project intended merely to replace lost type specimens, not ratify the estimated Palaeocene age of sediments or the reconstruction of the palaeoflora given by Scholtz (1985).

Three of the new species found at Arnot remain without designated neotypes, although specimens belonging to the species are now archived and can be used for reference purposes. The slides used for this project cannot be repaired or remounted as the neotype specimens have been recorded with particular co-ordinates and the condition of the slides cannot now be altered. Neotype specimens for the remaining species await maceration of additional material from Arnot.

The possibility exists that the original slides will be rediscovered, and that the holotypes will thus be reinstated.

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