

***Encephalartos graniticolus* (Zamiaceae): a new species from the north-eastern Transvaal**

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*Encephalartos graniticolus* Vorster *et al.* is described. It resembles *E. eugene-maraisii* Verdoorn, *E. lehmannii* Lehm., and *E. princeps* R.A. Dyer on account of its stiff, pungent, glaucous fronds; but differs from all three by its almost sessile fronds of which the proximal leaflets are progressively reduced to dentate prickles towards the base. *E. graniticolus* also resembles both *E. eugene-maraisii* and *E. cupidus* R.A. Dyer by the isobilateral, amphistomal construction of the leaflets. From *E. eugene-maraisii* it differs by its bluish-green instead of russet-brown cones, the female cones being cylindrical and four to five in number instead of ovoid and two in number, and by the male cones not having the surfaces of the cone scales drawn out to form a lip and numbering five to eight instead of two. From *E. cupidus* it differs in being arborescent and altogether larger, and by the median leaflets of the adult plants being unarmad.

*Encephalartos graniticolus* Vorster *et al.* word beskryf. Dit toon ooreenkoms met *E. eugene-maraisii* Verdoorn, *E. lehmannii* Lehm., en *E. princeps* R.A. Dyer op grond van sy stywe, stekelpuntige, blougrys blare; maar verskil van al drie deur sy byna sittende blare waarvan die proksimale pinnae opeenvolgend kleiner word na die blaarbasis toe om uiteindelik getande dorinkies te vorm. *E. graniticolus* toon ook 'n ooreenkoms met beide *E. eugene-maraisii* en *E. cupidus* R.A. Dyer deur die isobilaterale, amfistomatale anatomiese bou van die pinnae. Van *E. eugene-maraisii* verskil dit deur die blouierig-groen in plaas van roesbruin keëls, die vroulike keëls wat silindries en vier tot vyf in getal is in plaas van eierond en twee per stam, en deur die manlike keëls waarvan die oppervlaktes van die keëlskubbe nie uitstulp om 'n lip te vorm nie en vyf tot agt in plaas van twee in getal is. Van *E. cupidus* verskil dit deur sy boomvormige groeiwyse en groter afmetings, en deurdat die mediane pinnae van die volwasse plante sonder tande is.

**Keywords:** *Encephalartos*, new species, Zamiaceae

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A critical study of the glaucous-fronded *Encephalartos* species of the Transvaal revealed the existence of a previously undescribed species:

***Encephalartos graniticolus* Vorster *et al.*, sp. nov.**

Plantae arborescentes. *Frondes* fere sessiles rigidae rectae glaucae pungentes; foliola matura inermia anguste elliptica proximaliter aculeis dentatis redacta. *Macrostrobitis* cylindracei, superficiebus squamularum glabris laevibus venetis. *Microstrobitis* glabri, superficiebus squamularum glabris laevibus venetis.

*E. eugene-maraisii* Verdoorn et *E. cupidus* R.A. Dyer frondibus isobilateralibus amphistomatophoris glaucis similis; sed ab *E. eugene-maraisii* macrostrobitis 4–5 cylindraceis venetis vice 2 ovoideorum ferrugineorum; microstrobitis venetis vice ferrugineorum et superficiebus squamularum sine rostro; ab *E. cupidus* habitu arborescenti multo majore, foliolis matura inermibus medianis differt.

TYPUS. — North-eastern Transvaal: Lillie Flora Reserve, ca. 10 km north of Mica. ♀, Vorster & Robbertse 2944a (PRE, holotypus; K, LE, MO, PRU).

Plants arborescent, unbranched but often suckering from bases. *Stem* erect or procumbent with age, up to 3 or occasionally 6 m tall and 300–400 mm in diameter. *Fronds* numerous in a dense crown, straight, rigid, almost sessile with petiole not more than 60 mm long, glabrous, glaucous, 1400–1700 mm long; leaflets directed towards apex of frond at angle of ca. 45° with rachis, opposing leaflets set at angle of ca. 140° to each other, not or only slightly overlapping, proximal leaflets gradually reduced to dentate prickles towards base of frond, median leaflets 170–240 mm long and 13–18 mm wide, very narrowly elliptic and slightly falcate, tapering to both ends with apices acute, pungent, and somewhat turned towards frond apex, with several teeth on both margins in young plants but entire in mature plants. *Cones* di-

morphous, glabrous, scale facets smooth, bluish-green; male cones 5–8 per stem, narrowly ovoid, 270–460 mm long and 90–120 mm wide, stalked on peduncle 100–170 mm long, median scales ca. 20 mm wide and 15 mm high with central facet slightly raised but not drawn out into a beak or lip; female cones 4–5 per stem, cylindrical, 300–600 mm long and 100–200 mm wide, appearing sessile but with peduncle up to 120 mm long hidden amongst cataphylls in stem crown, median scales rhombic to hexagonal with 6 lateral and 1 central facet, ca. 70 mm wide and 45 mm high with central facet usually ½ the horizontal diameter of scale; seeds ca. 200 per cone, ca. 45 × 30 mm, fleshy testa orange-brown, kernel 30–37 mm long and 15–21 mm wide, ellipsoid or ovoid with ends somewhat squared. (Figures 1&2).

**Flowering time**

At the beginning of February 1974 both male and female cones were plentiful and fully mature, and viable seeds from the previous season's coning were abundant. Early in March 1988 only a few immature cones could be found, and hardly any viable seed. Possibly the prolonged drought preceding the second observation lowered the level of the plants' energy reserves and so inhibited coning.

**Diagnostic features and affinities**

*E. graniticolus* superficially resembles *E. eugene-maraisii* Verdoorn (Verdoorn 1945), *E. lehmannii* Lehm., and *E. princeps* R.A. Dyer (Dyer 1965a, b) on account of its stiff, pungent, glaucous fronds and arborescent habit (Figure 2a). However, even vegetatively it is easily distinguished from all three by its almost sessile fronds of which the proximal leaflets are progressively reduced towards the base of the frond to form

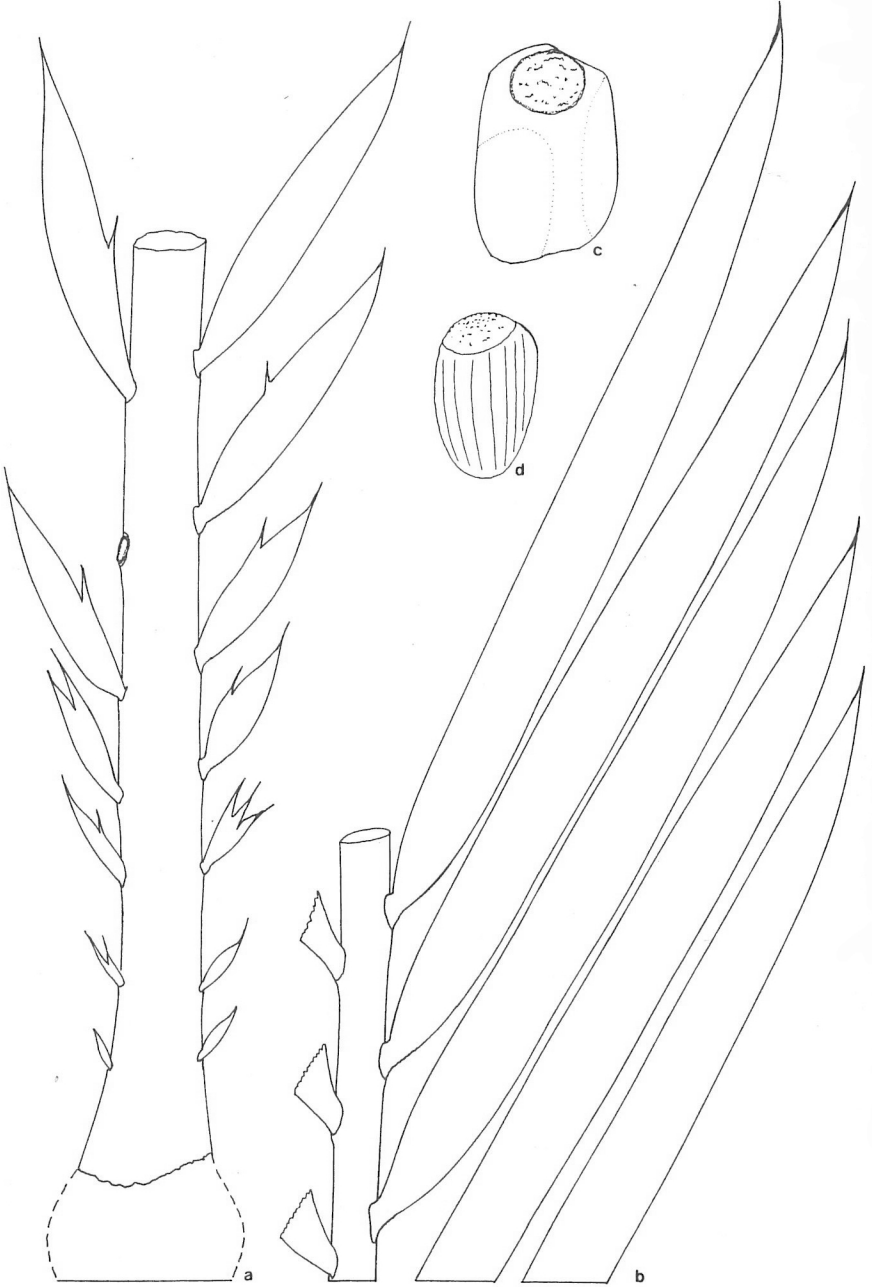


Figure 1 *Encephalartos graniticus*: (a) proximal part of frond, showing very short petiole and lower leaflets reduced to dentate prickles; (b) median leaflets; (c) seed; (d) seed kernel; all  $\times 1$ . After Vorster & Robbertse 2944a. Del. E.C. Vorster.

dentate prickles (Figure 1a), in contrast to the well-developed petiole in the other three species where the proximal leaflets may be somewhat reduced in size, but never in the adult

stage to dentate prickles. The orientation of the fronds is also diagnostic: in *E. graniticolus* the rachis is quite straight (Figure 2a), in *E. eugene-maraisii* the apices tend to curve

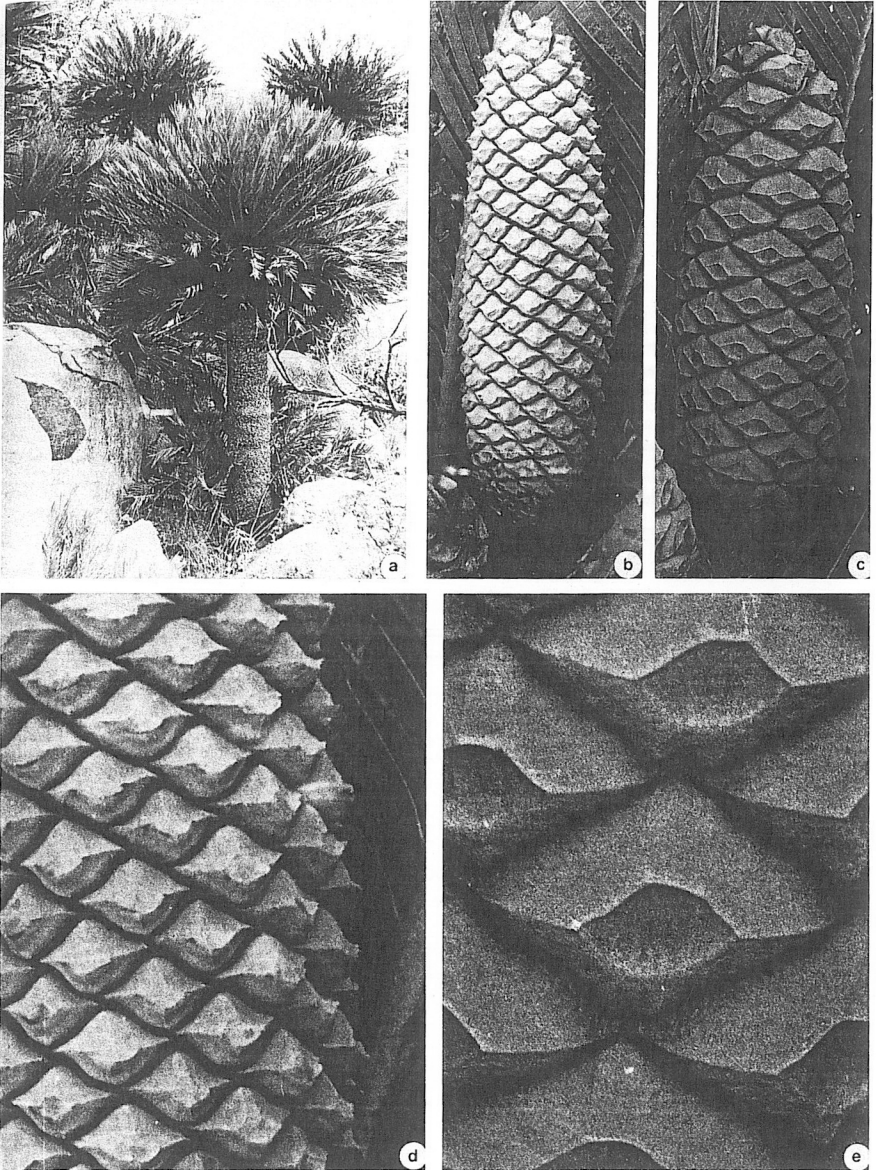


Figure 2 *Encephalartos graniticolus*: (a) plant in habitat, stem ca. 3 m tall; (b) male cone, ca. 400 mm long; (c) female cone, ca. 500 mm long; (d) detail of male cone, approximately life size; (e) detail of female cone, approximately life size. Photos: P. Vorster.

inwards, while in *E. lehmannii* and *E. princeps* the fronds recurve to some extent. The most profound differences are however to be found in the cones. In *E. graniticolus* the female cones number four to five per trunk, are cylindrical, glabrous, with the surfaces of the scales macroscopically smooth, and bluish-green (Figure 2c,e). By comparison *E. eugene-maraisii* usually bears two female cones per stem and these are ovoid, minutely pubescent, and russet-brown. In *E. lehmannii* a single ovoid female cone is produced with a very short but dense microscopical brown-black indumentum over the green scales with smooth facets. The female cones of *E. princeps* differ from all the previous species in that the surfaces of the scales are verrucose — up to three cones are borne and they are ovoid with a sparse whitish or brownish indumentum, and dull green in colour. The male cones also serve to distinguish *E. graniticolus*: in *E. eugene-maraisii*, *E. lehmannii*, and *E. princeps* the surfaces of the scales are drawn outwards and downwards to form a lip or beak, reaching its greatest development in *E. princeps*; but in *E. graniticolus* this development is not evident (Figure 2d).

*E. graniticolus* also resembles *E. cupidus* R.A. Dyer (Dyer 1971; Giddy 1974) on account of the very similar cones and the almost sessile fronds having the proximal leaflets reduced to prickles. The two species can be distinguished by habit and size: *E. cupidus* is a dwarf species with a partially underground spherical stem. (The original description claimed stems reaching a length of 750 mm, but we suspect this to be an error). *E. cupidus* is in fact not unlike a neotonous form of *E. graniticolus*, retaining teeth on both margins of the median leaflet throughout its life whereas only immature specimens of *E. graniticolus* exhibit this trait (see Figure 1b).

While it is not too difficult to distinguish these species from each other, it is quite another matter to assess interrelationships. It is tempting to lean on geographical distribution as an indication of interrelationships, i.e. to assume that spatial separation reflects phylogenetic separation. This admittedly dangerous assumption is here supported by leaf anatomical studies by Koeleman *et al.* (1981) who found that *E. graniticolus*, *E. eugene-maraisii*, and *E. cupidus* have isobilateral and amphistolateral leaflets compared to dorsiventral and hypostomal leaflets in *E. lehmannii* and *E. princeps*. Judging from morphological and anatomical evidence, *E. cupidus* shows by far the greatest similarity to *E. graniticolus*.

#### Geographical distribution and habitat

*E. graniticolus* occurs on a low granite hill, about 700 m above sea level, a few kilometers north of Mica in the low-velde of the north-eastern Transvaal (Figure 3). This area consists of plains covered with *Colophospermum mopane* (Kirk ex Bentham) Kirk ex J. Leonard, and interrupted by a series of granite hills. *E. graniticolus* grows on only one of these hills, as a thriving colony of some 600 plants, hence its specific epithet. This species has also been reported from another site near Gravelotte, but we have not seen any material from there. It remains a mystery why such an obviously thriving colony should be restricted to only one of a chain of apparently similar hills. On average this area receives a rainfall of 400 to 500 mm per annum, and summer temperatures rise very high amongst the granite boulders where *E. graniticolus* grows wedged into crevices, in the blazing sunshine (Figure 2a).

During our first visit in 1974, many plants had fronds

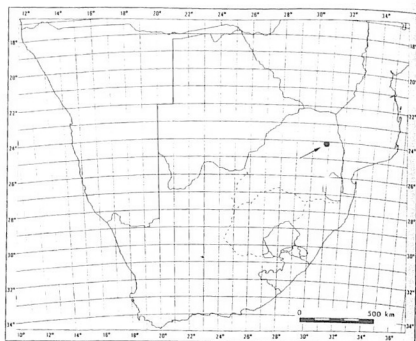


Figure 3 *Encephalartos graniticolus*: known geographical distribution.

eaten off by rock rabbits (*Procavia*), but more recently this effect appears to have diminished. It is laudable that the Transvaal Division of Nature Conservation declared this hill a nature reserve, fenced it, and stationed a permanent guard there soon after the presence of these cycads had become known. A considerable number of plants grown from seed in the Provincial Nursery were distributed to private collectors over the years, and recently some of these were re-planted at the site to augment the natural community.

#### Material studied

—2430: Lillie Flora Reserve, ca. 10 km north of Mica (—BB), Vorster & Robbertse 2944a (female) (K, LE, MO, PRE, PRU); idem. 2944b (male) (K, LE, MO, PRE, PRU); *J. Smuts n. sub PRE 32864* (PRE, 3 sheets, photocopies!).

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