Encephalartos dedekindii (Zamiaceae)

a new species from the KwaZulu Natal Province

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Encephalartos dedekindii was described from the KwaZulu Natal Province. It resembled *E. laevifolius* Stapf & Burtt-Davy in having slender and spineless petioles with a whitish hair-like indumentum when young, and relatively narrow and entire leaflets which are abaxially finely ribbed. It differed from *E. laevifolius* and related species in its dissimilar shaped and coloured large female cones, rough textured bullae, conspicuously different leave deployment, its significantly longer petioles and leaves, the unique arrangement of leaflets on the rachis, and the unique arrangement of leaves in the crown, having more robust stems, and the reproduction cycle being out of synchronization with *E. laevifolius*.

Keywords: Zamiaceae, Encephalartos, Dedekind cycad, dedekindii, laevifolius, Tugela Ferry, KwaMunye, Sigubundo.

Thorough the research of the distinctive morphological properties of the different populations and forms of the species *E. laevifolius*, the existence of a distinct new species of *Encephalartos* (Zamiaceae) was found.

Encephalartos dedekindii Minnaar, sp. nov.
Plantae arborescentes, truncus ad 2.2 m altus, petiolus 28 - 32 cm longa, foliis 140 – 160 cm longa et plana, foliola integra et 130 – 160 mm longa et 4 - 7 mm lata, folia cursus spathulate, megastrobilis ovile, bullae textura aspera, pedunculati, Microstrobili incognitae. Encephalarlos laevifolio Stapf & Burtt-Davy similis.

TYPUS.- KwaZulu Natal: a single female plant from the steep south facing slope of the Sigubundo mountain top, near the Tugela Ferry town-settlement.
Minnaar *2984* (PRE, holotypus; K, isotypus).

Geographical distribution and habitat

The species *E. dedekindii,* is known from a single large female plant shown in habitat in Figure 3, which was found in Kwa-Zulu Natal near the Tugela Ferry town settlement between Dundee and Greytown (see map Figure 1). The plant was discovered nearly at the top of the steep 300m south facing rise of the Sigubundo Mountain, locally better known as the KwaMunye Mountain. It grew in open short grassland savanna in direct sunlight amongst the sandstone ridges at an altitude of about 1200m (Figure 2).

Discovery and Conservation status

The single female *E. dedekindii* plant was found, arborescent, unbranched but often suckering from base to form clumps of stems. Long feathery, glossy green leaves sprout from the crowns, often deflexed down-wards at their long petioles.

Mutilated pieces of a second much smaller plant were found at the top of the mountain. No sign of any other such plants or male cones or seedling offspring was ever found, even though the larger area surrounding the plant has been visited and explored regularly since 1990. The lack of evidence of any male plants, indicates that the conservation status of the species is extremely precarious.

Figure 1. Map showing approximate location of the original habitat of *E. dedekindii*.

Figure 2. Habitat of *E. dedekindii* at the southern slope between the peaks of the Sigubundo mountain.

It is indeed a pity that the plant had to be removed as a matter of urgency, before it could be studied *in situ*, due to the evidence of significant damage to the base of the primary plant, caused by local muti-collectors. The complete destruction of the secondary and smaller plant at the top of the

Figure 3. A rare photo of *E. dedekindii* in habitat, the photo taken just before removal

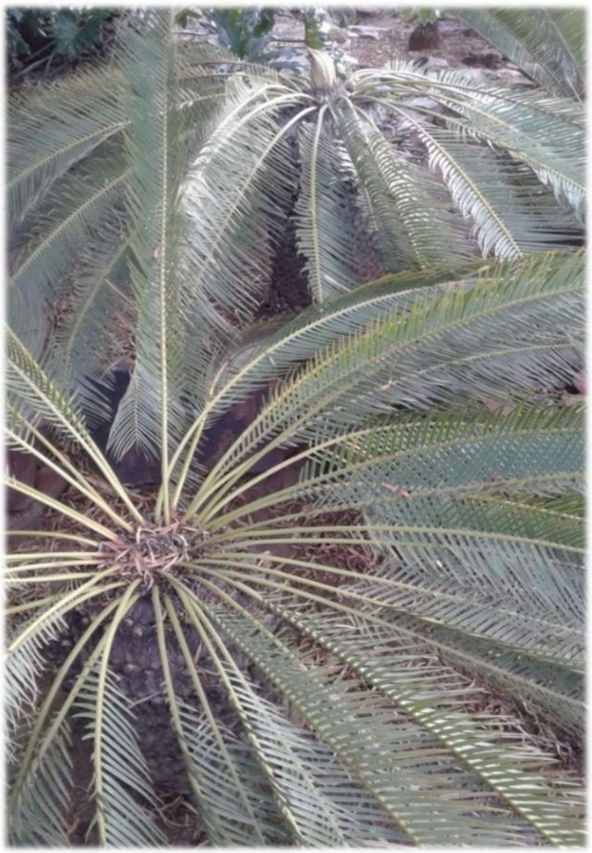

Figure 4. Crown arrangement of *E. dedekindii* after leaves have matured, showing the curved petioles and leaves deflexed significantly downwards.

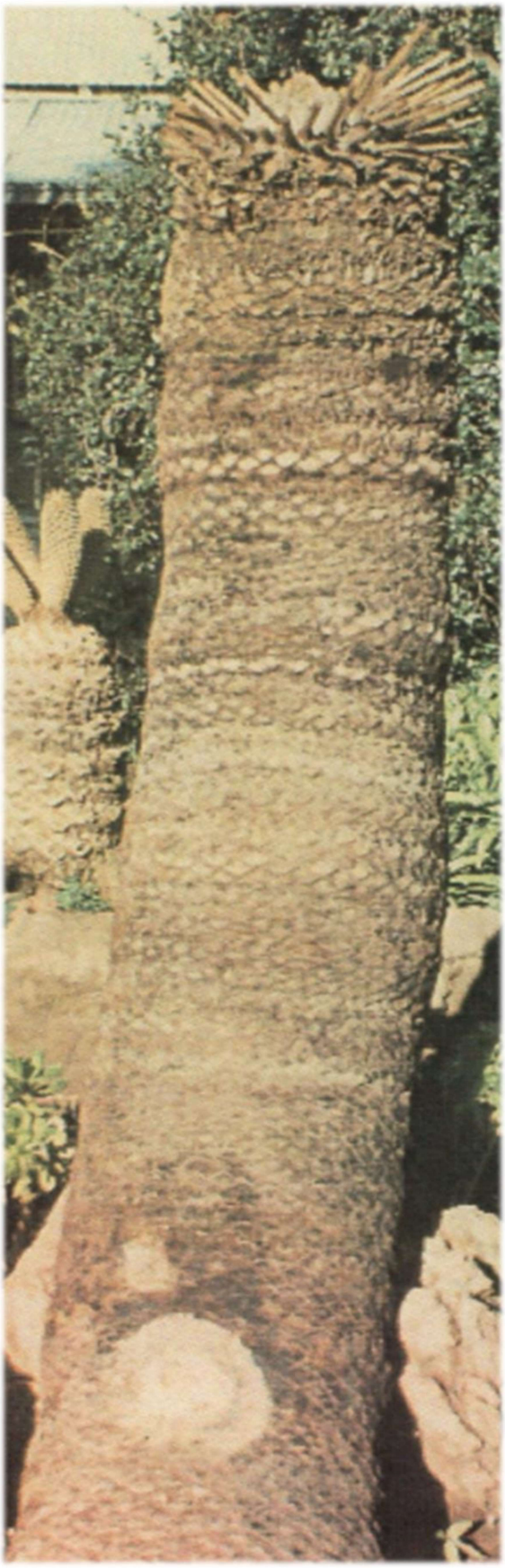

Figure 5. The main stem of the original *E. dedekindii* plant, evident of damage due to fresh muti collection and transplantation.

mountain, led to the fear that the entire specie was most certainly bound to be harvested for muti. The original plant's main trunk (Figure 5) did not survive the mutilation of the muti-collection, combined with relocation effort.

The remaining parts of the original plant found its way to a private collection. The largest surviving stem was relocated to the CBI in 2005 for research and conservation purposes. In the view of the disastrous relocation efforts of other Encephalartos populations in the name of conservation, it is recommended that the details of exact locations of such species must be protected and withheld on a need-to-know basis.

Affinities and similarity

A series of outlaying populations of plants habituated in Swaziland, and in South Africa in the Limpopo, Mpumalanga, and KwaZulu Natal provinces, have been assigned to *E. laevifolius.* Of all the known species, these plants are the closest related to *E. dedekindii*. Therefore, diagnostic features of *E. dedekindii* is often compared to those of *E. laevifolius*.

The possibility was considered, that *E.dedekindii* represents a hybrid, with *E. laevifolius* as one of the parents, comprising in addition to the group *E. lanatus* Stapf & Burtt-Davy, *E. humilis* Verdoorn, *E. friderici guilielmi* Lehm., *E. cycadifolius* Jacq. & Lehm. and potentially *E. ghellinckii* Lehm. There are however no suitable putative parents growing near the original location of *E. dedekindii*, and it shows no similarity to any species outside the *E. laevifolius* group. The reproductive cycle of *E. dedekindii* is furthermore out of synchronization with that of any of the candidate species mentioned herein, and other species has clearly no similar features, so that the possibility of natural hybridizing was highly unlikely.

Diagnostic features

The largest main stem appeared erect and slightly leaning, about 2.2 m tall and about 42 cm wide, covered by relatively small remains of leaf bases; crown not woolly but cataphylls initially covered by a thin, light brown, felt-like indumentum (see Figure 5).

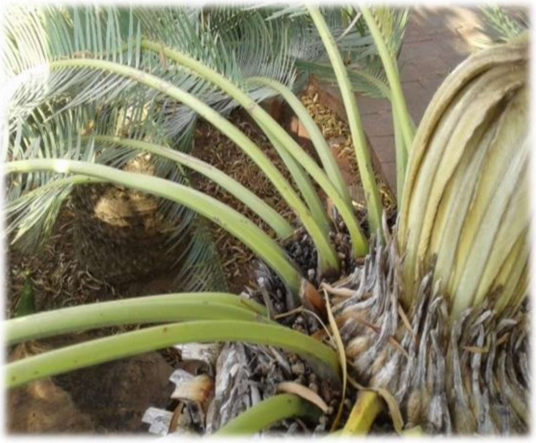

Figure 6. Detailed picture of leaves of *E. dedekindii,* bend at the petiole so that most of the leaves deflex downward as the crown flushes new growth.

Figure 7. Linear format of deploying *E. laevifolius* leaves.

The leaves of *E. dedekindii* deploys with rachii gradually recurved ventrally so that the apices of the leaves point upwards, and as the crown matures, the rachii gradually bend abaxially into arches so that the leave apices deflexed downwards (Figure 4,6).

Figure 8. Deployment detail of a whorl of *E. dedekindii* leaves.

Figure 9. Spatulatae form of deploying *E.dedekindii* leaves.

Leaves of *E. laevifolius* deploy in a pointed linear structure as in Figure 7, while leaves of *E. dedekindii* deploys in a pale–yellow

spatulate form, slightly ventrally spoon-like and cupped at the apex (Figure 8,9).

It is evident from the numerous locality-type samples found at the herbaria that there is indeed a significant variation in the length/width ratio of the leaflets between different populations of *E. laevifolius* and even amongst different individual plants within a given population, but nowhere do they differ from the original description by Stapf and Burt-Davy to the extent of *E. dedekindii* and occasionally the plants from Swaziland with their exceptionally long and narrow leaflets.

Figure 10. Comparison of length/width ration of typical medial leaflets of *E. laevifolius* (top) and *E. dedekindii* (botom)

Figure 10 compares typical leaflets of *E. laevifolius* with *E. dedekindii*. It can be seen that except for the Swaziland forms, the leaflets of *E. dedekindii* are significantly longer and thinner than those of *E. laevifolius*. The average median pinna dimensions are shown in Figure 11.

Basal leaflets of *E. dedekindii* are much reduced in size but not to prickles; adjacent leaflets on same side of rachis are spaced by

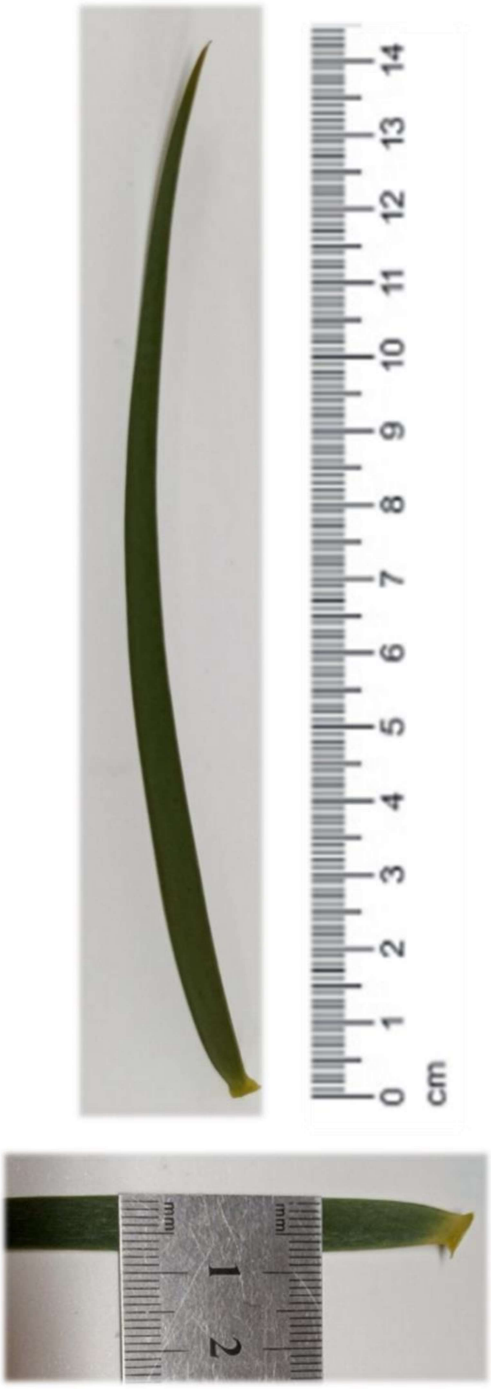

Figure 11. Typical median leaflet dimensions of *E. dedekindii*

10–14 mm, while the gap gradually vanishes towards the distal pinas, which never overlap, and their flat surfaces are always in the same plane without exception. (Figures 12,13,14, 15). In contrast, leaflets of *E. laevifolius* are mostly un-keeled at the petiole side, progressively more keeled from the mid-section to the apex side of the leaf, as an open venetian blind.

Figure 12. Typical leaf of *E. dedekindii* showing pinna arrangement.

Figure 13. Typical proximal section of *E. dedekindii* leaf.

Figure 14. Typical median section of *E. dedekindii* leaf.

Figure 15. Typical distal section of *E. dedekindii* leaf.

Leaves of *E. dedekindii* often feature what appears to be a distinct axial twist at the leaf apex (Figures 12,15).

Leaflets differs from E. *laevifolius* and related species in its conspicuously longer and narrower, light green and 140 -165 cm long, 5-8 mm wide, ventrally falcate, and often arching upwards. Leaflet margins are entire and apices acute and pungent, dorsally finely ribbed with 12-14 veins.

The petioles of *E. dedekindii* are rigid, naked, and smooth, yellowish, lightly hirtellous when young, but glabrous at maturity, dorsally terete with obtuse ridges, one ventrally and one on each side of the rhagis, more profound at the proximal side and gradually less at the distal side of the leaf, significantly longer at 28 - 32 cm and thicker at 9 - 12 mm than *E. laevifolius*.

Figure 16. Mature megasporophyl of *E. dedekindii* in full sun.

Figure 17. Mature megasporophyl of *E. dedekindii* in shade.

Figure 18. Bulla texture and colour comparison, *E. dedekindii* (top) *E. laevifolius*.

Female cones, Megastrobilii, up to 6 per crown seen, ovoid, about 47 cm long, and 15 cm in diameter at a third from the top, and 19 cm in diameter at a third from the bottom, fresh mass 7.2 kg (see Figures 16,17).
Male cones, Microstrobilii unknown.

About 160 bullae per cone, 60 mm wide and 25 mm high and 45 mm deep, side facets bright lime green and rough, unlike those of *E. laevifolius*, which are smooth (see Figure 18). Bulla facial facets are rhombic, 20 mm wide and 10 mm high, drawn to a hight of about 10 mm, crater-like, covered by thick brown-pink tomentose (see Figures 20-23).

Peduncle oval cross sectioned, width about 5.5 cm and thickness 4 cm, about 6-8 cm long but hidden amongst cataphylls so that cones appear sessile.

Figure 19. Detail of colour and dimensions of fresh and fertile *E. dedekindii* seed.

Seed**,** up to 320 from a single cone, distal 3.5% seed sterile, red-brown when fertile, sarcotesta pale-yellow when unfertile, slightly oval, average length 32 mm and width 22 mm, average weight of a fertile seed is 8.5 g and a seed's sarcotesta weighs an average of 3.5 g, (Figure 19).

Figure 20. Mounting side of *E. dedekindii* bulla and seed.

Figure 21. Face side of *E. dedekindii* bulla and seed.

Figure 22. Ventral side of *E. dedekindii* bulla and seed.

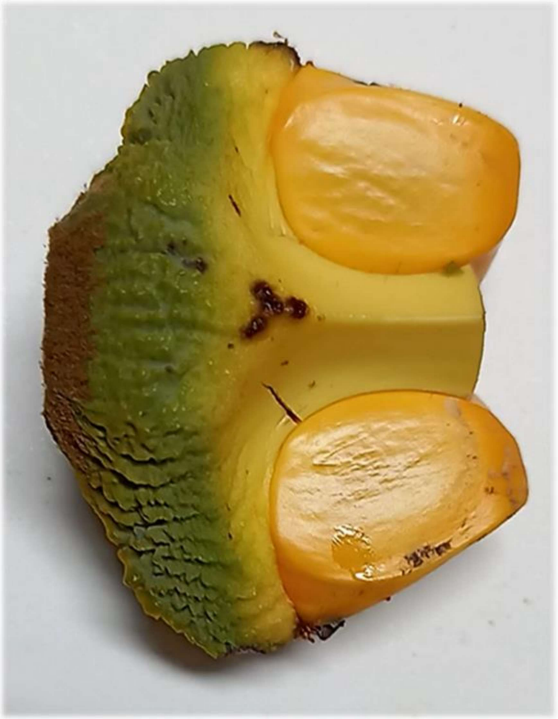

Figure 23. Dorsal side of *E. dedekindii* bulla and seed.

Phenology

The megastrobili of *E. dedekindii* start to emerge in May, opens during September for pollination, and disintegrate to shed seed during December. The timing of the reproductive cycle of *E. brevifololatus* is the same. The reproductive cycle of the *E. laevifolius* group, however, is about 4 months later, which rules out common ancestry. The cones of this group mature throughout winter, pollination happens in summer, and shedding of seed during the following autumn.

Material examined

1] Mr Reinwald Dedekind who discovered the plant, and his nephew mr Egmund Dedekind supplied research material such as photographic material, field notes, telephonic discussions, and electronic mail.

2] Mrs Marit Röhrs donated the main surviving stem of *E. dedekindii* where the species growth, reproductive cycles, and morphological features such as stem, leaf, cone, seed, *etcetera*, could be studied.

3] The South African National Biodiversity Institute (SANBI) supplied scanned herbarium records for specie comparison purposes.

Acknowledgements

Full credit for the discovery of this species is due to mr Reinwald Dedekind, who grew up and farmed in the region of the original locality. He discovered the plant in the late 1980's, relocated it with the assistance of mr Ronald Wohlberg, brought it under the attention of the cycad community and SANBI, and provided the study material and samples. The largest surviving stem of the plant was donated to the CBI by mr Wohlberg's daughter mrs Marit Röhrs in 2005, in memory of her late father. The continuing research of which this manuscript is a result of the effort of dr Derik Minnaar.

References

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3] South African National Biodiversity Institute (SANBI), Herbarium records scans.