ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 63 SEPTEMBER 2000 ISSN 1012-9987

CYCAD SOCIETY OF SOUTH AFRICA

BROODBOOM VERENIGING VAN SUID-AFRIKA

Council members / Raadslede

President
Dr. Piet Vorster
Botany Department / Departement Plantkunde
University of / Universiteit van Stellenbosch
Private Bag / Privaatsak X1, 7602 Matieland
Tel.: 021-8083056; Fax/Faks: 021-8083607
E-mail/E-pos: pjvor@land.sun.ac.za

Secretary-treasurer / Sekretaris-tesourier,
Back copies officer / Beampte vir vorige uitgawes
Prof. Guillaume Theron
P.O. Box / Posbus 1790
0027 Groenkloof (Pretoria)
Tel.: 012-3433929 (only available between / slegs beskikbaar tussen 17h00 and/en 19h00)
Fax/Faks. 012-3477807
E-mail / E-pos: GTheron@nsnper1.up.ac.za

Accountant & Auditor /
Rekenmeester & Ouditeur
Werner Diedericks
P.O. Box / Posbus 17081
0027 Groenkloof (Pretoria)
Tel. 012-4606123
(only available between / slegs beskikbaar tussen 06h00 and/en 18h00)

Editor of "*Encephalartos*"
Redakteur van "*Encephalartos*"
Isabella Claassen
P.O. Box / Posbus 25688
0105 Monumentpark (Pretoria)
Tel. & Fax/Faks: 012-3477807

Regional officers / Streeksverteenwoordigers

Lowveld / Laeveld

Leon van Rooy
P.O. Box / Posbus 1019
1240 Witrivier
Tel.: 013-7512419

Natal

Danie Nel
P.O. Box / Posbus 45
3730 Umlaas Road
Tel.: 0332-510478
Cell: 082 9254540
082 9246969

Northern Province Cycad Working Group / Noordelike Provinsie Broodboom Werkgroep

Gerrie de Haas
Private Bag / Privaatsak X9474
0700 Pietersburg
Tel.: 015-2972180 (w); 015-2954021 (h)
Fax / Faks: 015-2973947

Transvaal

Derik Minnaar
P.O. Box/Posbus 95597
0145 Waterkloof
(Pretoria)
Tel.: 012-8033061

Pollen- and seedbank officers / Stuifmeel- en saadbankbeamptes

Eastern Cape / Oos-Kaap

Don Giese
P.O. Box / Posbus 2
20 Edgewater Place
5256 Gonubie
(East London / Oos-Londen)
Tel. & Fax / & Faks: 0431-403851

Northern Province / Noordelike provinsie

Diekie de Klerk
Private Bag / Privaatsak X9474
0700 Pietersburg
Tel. 015-2973196
Fax / Faks: 015-2973947

Natal

Vacant / Vakant

Overseas correspondents / Buitelandse skakelbeamptes

Australia

Paul Kennedy
21 Sierra Road
Engadine
New South Wales 2233
Tel.: 02-520-7690

U.S.A. and Canada

Willie Tang
Fairchild Tropical Garden
11935 Old Cutler Road
Miami, Florida 33156
Tel.: 305-667-1651

CHANGE OF ADDRESS / ADRESVERANDERING

When changing address, please notify the Secretary-treasurer.

Wanneer u van adres verander, laat weet asseblief die Sekretaris-tesourier.

ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 63 SEPTEMBER 2000 ISSN 1012-9987

COVER / VOORBLAD : A painting of *Stangeria eriopus* by John Donaldson. Numbered prints of the painting are still available from the artist (see advert elsewhere in the journal).

CONTENTS / INHOUD

CONTENTS / INHOUD (continued / vervolg)

FROM THE PRESIDENT

In recent issues of ***ENCEPHALARTOS*** a fair amount was written about colour printing. The results of our members' survey on this matter are now available; and although too few of you wrote back, it is clear that those who did react are in favour of **a coloured front cover plus four pages of colour photographs**.

Op page 39 in this issue the increased membership fees for 2001 are announced. Members may feel that it is a drastic increase; but before you decide not to renew your membership, I would like to remind you that last year we didn't raise membership fees at all, in spite of considerable increases in our costs. This was made possible by the strict financial policy implemented by our secretary / treasurer, Guillaume Theron. **However, the most important reason for the current raise is the decision to use colour printing on a regular basis.** Up to now we have financed the colour printing from our savings account, but we can only afford that till the end of this year.

Council also decided that in future the March issue of ***ENCEPHALARTOS*** will not be sent to persons whose membership hasn't been renewed by the 31st December, and they will only receive a copy after renewal of their membership. Many recalcitrant members do renew eventually, but there are a considerable number of persons who never renew, and we cannot afford to give away free copies. We therefore implore you to renew your membership in time.

One of our members, Werner Diedericks, will henceforth act as our auditor. Council thought it wise to co-opt him as a Council member, so that he can take part in the decision-making process.

May your cycads push out numerous leaves this summer, and may our members in the Northern Hemisphere be spared any freezes!

Piet Vorster

VAN DIE PRESIDENT

In die jongste verlede is daar in ***ENCEPHALARTOS*** heelwat geskryf oor kleur-drukwerk. Die uitslag van ons meningspeiling is nou bekend; en hoewel te min van u reageer het, is dit duidelik dat meeste van die lede wat wel teruggeskryf het, ten gunste is van **'n gekleurde voorblad plus vier bladsye kleurfoto's**.

Op bladsy 39 in hierdie uitgawe word die verhoogde ledegeld vir 2001 aangekondig. Lede mag voel dat dit 'n drastiese verhoging is; maar voordat u besluit om nie u lidmaatskap te hernu nie, herinner ek u daaraan dat ons nie verlede jaar die ledegeld verhoog het nie, ten spyte van 'n aansienlike styging in ons kostes. Dit was moontlik gemaak deur die streng finansiële bestuur van ons sekretaris/tesourier, Guillaume Theron. **Die vernaamste rede vir die huidige verhoging is egter die besluit om kleurdrukwerk op 'n gereelde grondslag te gebruik.** Tot dusver het ons die kleurdrukwerk finansier uit ons spaarrekening maar ons kan dit net tot die einde van hierdie jaar bekostig.

Die Raad het ook besluit dat die Maart-uitgawe van ***ENCEPHALARTOS*** voortaan nie gestuur sal word aan persone wie se ledegeld teen 31 Desember nog nie betaal is nie, hulle sal slegs later 'n eksemplaar ontvang wanneer hul lidmaatskap hernu is. Baie trae betalers betaal wel mettertyd, maar daar is ook heelwat mense wat nooit hernu nie, en ons kan nie bekostig om gratis eksemplare weg te gee nie. Ons doen dus 'n beroep op u om betyds u lidmaatskap te hernu.

Een van ons lede, Werner Diedericks, sal voortaan optree as ons ouditeur. Die Raad het dit goedgedink om hom op die Raad te ko-opteer, sodat hy kan deelneem in die besluitnemings-proses.

Mag u broodbome hierdie somer baie blare stoot!

Piet Vorster

FOCUS ON ... FOKUS OP ...

In each edition of *ENCEPHALARTOS*, we focus on one cycad species, in the form of an in-depth article in layman's language. In this edition the spotlight falls on:

In elke uitgawe van *ENCEPHALARTOS* fokus ons op een broodboomsoort, in die vorm van 'n in-diepte-artikel in leketaal. In hierdie uitgawe val die kollig op:

ENCEPHALARTOS SENTICOSUS P. Vorster

[With special reference to variation in *Encephalartos lebomboensis* Verdoorn, as it was formerly generally interpreted (*sensu lato*)]

Compiled by **Isabella Claassen**
P.O. Box 25688, 0105 Monument Park, Pretoria, R.S.A.

Excerpts and illustrations from Piet Vorster's original articles reprinted with his permission as author and editor.

INTRODUCTION

In his paper on *Encephalartos altensteinii*, Maans Kemp (1988) pointed out that a number of South African cycads were collectively known under the name of that species. However, since 1926 several species were separated from *E. altensteinii* and described as new, such as *E. transvenosus* (1926), *E. lebomboensis* (1949), *E. natalensis* (1951), and *E. aemulans* (1990).

After fieldwork, in the area between Ingwavuma in northern KwaZulu-Natal and Siteki (formerly Stegi) in Swaziland, by a botanical party, which included herself, Dr. Inez Verdoorn described and officially published *Encephalartos lebomboensis* (*sensu lato*) in 1949. In her description of the species, Dr. Verdoorn was careful to note that the Ingwavuma plants "had stems more woolly at the crown and the cones with scale faces somewhat more prominent and pubescent" than those at Siteki (Osborne 1988).

Fieldwork by Piet Vorster of Stellenbosch revealed that two forms of *Encephalartos*, both under the name of *E. lebomboensis* Verdoorn with very different cone morphologies occur: (1) throughout the greater central part of the geographical range (along the summit of the Lebombo range, from south of the Jozini Dam, KwaZulu-Natal, northwards to a few kilometres beyond Siteki in Swaziland) a form with exposed faces of the female cone scales protuberant (Figure 1a,b), and (2) at either extremity of the range (Pongola valley in the south and the northernmost known locality at Mananga in Kangwane, Mpumalanga) a form with the exposed faces of the female cone scales flat (Figures 2a–c, 3a–c) (Vorster 1995). Vegetatively the two forms are fairly similar (Colour Figures 7–9 on p. 20), but plants from the middle and upper reaches of the Pongola River valley (the so-called "Piet Retiefii" form of collectors) have narrower leaflets than the others (Figure 4).

Encephalartos senticosus (Figure 1a–e, Colour Figures 1, 2, 8 on p. 19, 20), at that time known under the name of *E. lebomboensis sensu lato*, became a very well-known species due to thousands of specimens removed from the site of the Pongola Poort Dam (Jozini Dam) in the early 1960's and distributed throughout South Africa and even overseas. This ample material revealed multiple apricot-coloured cones of which the males are often stalked, and the exposed faces of the male cone scales are drawn out into downcurved beaks (Figure 1c–e, Colour Figure 1 on p. 19), and the exposed faces of the female cone scales are smooth and raised pyramidally to the terminal facet (Figure 1a–b, Colour Figure 2 on p. 19).

Plants from the middle and upper reaches of the Pongola River valley ("Piet Retiefii") (Figure 2a–f, Colour Figures 3, 4, 7 on p. 19, 20), however, seemed to warrant separate taxonomic status. Although the plants are vegetatively practically identical to those from the type locality, their cones, especially the female cones, are quite different. Habitually, but not invariably, single cones are produced, which are sessile (without a stalk) in both sexes. Unlike the plants from the Lebombo Mountains, the exposed faces of the female cone scales are not pyramidally raised towards the central facet, in fact, the facets including the central facet tend to be poorly defined so that the exposed

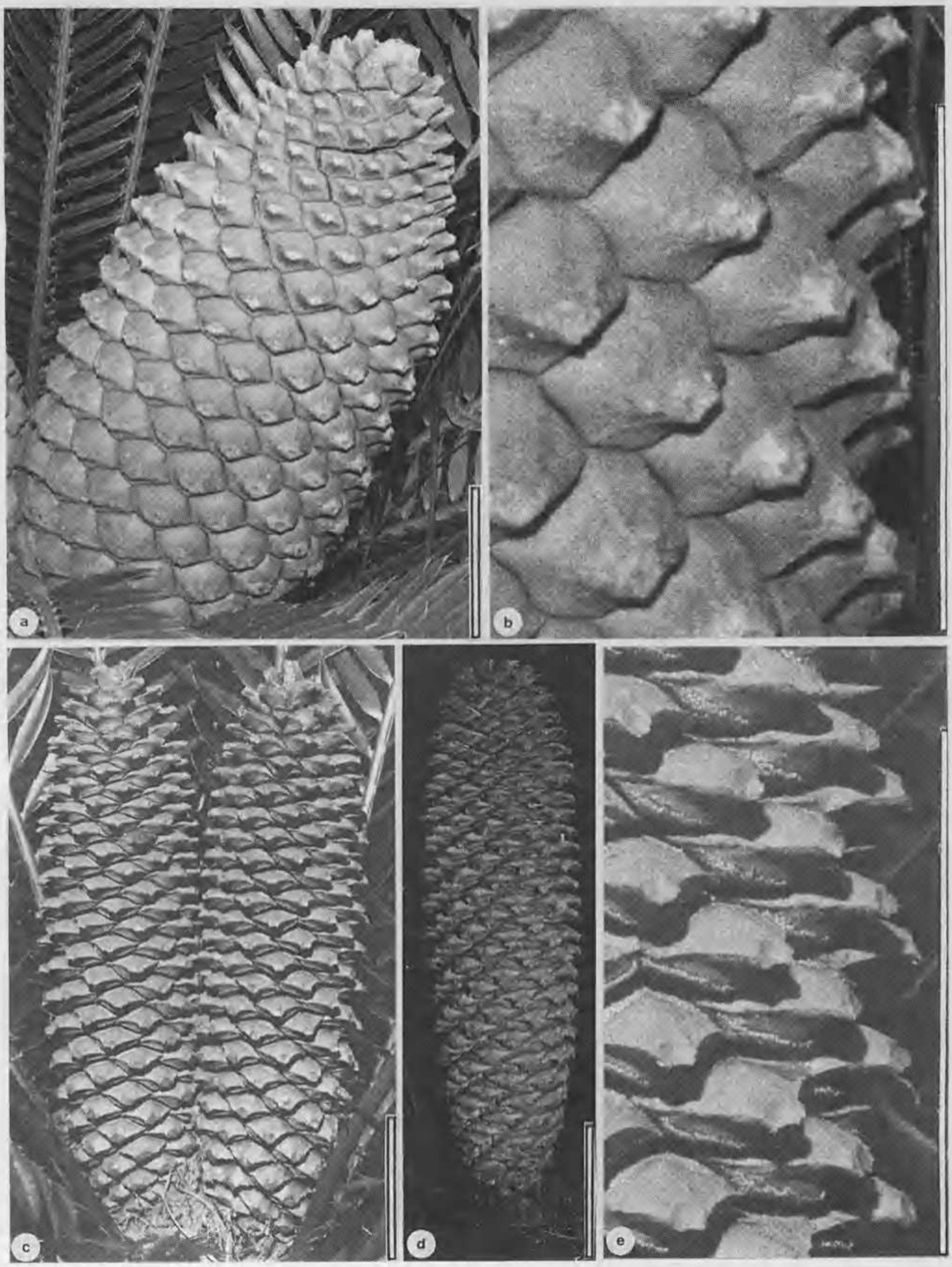


Figure 1 *Encephalartos senticosus* **from the Lebombo Mountains: (a) female cone, (b) detail of female cone showing pyramidally raised exposed faces of female cone scales, (c) male cones, (d) male cone, (e) detail of male cone in (c), showing exposed faces of male cone scales drawn out as drooping beaks. Scale bars = 100 mm. (a–c, e from plants near Goba in Mozambique, but on the Swaziland side of the border; d from Jozini). Photos: Piet Vorster.**

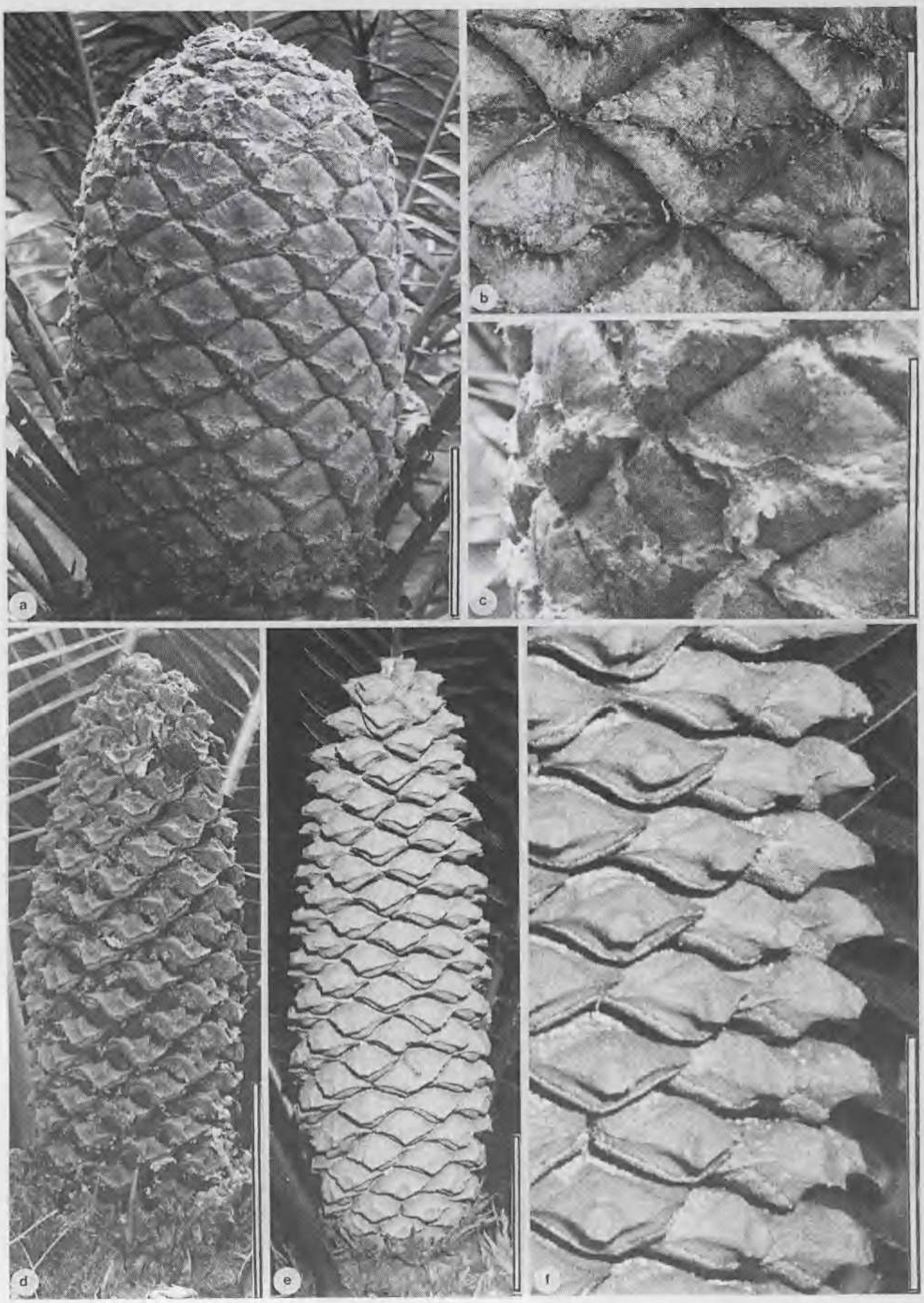


Figure 2 *Encephalartos lebomboensis* ("Piet Retiefii") from the Pongola valley: (a) female cone, showing barrel-shape, (b, c) detail of female cone, showing flat exposed faces of female cone scales, (d) semi-dried solitary, sessile male cone in habitat, (e) fresh male cone in cultivation, (f) detail of fresh mail cone showing protruding exposed faces of male cone scales. Scale bars: a, d, e = 100 mm; b, c, f = 50 mm. (a–d: from a plant in habitat, e–f: from a cultivated plant.) Photos: Piet Vorster.

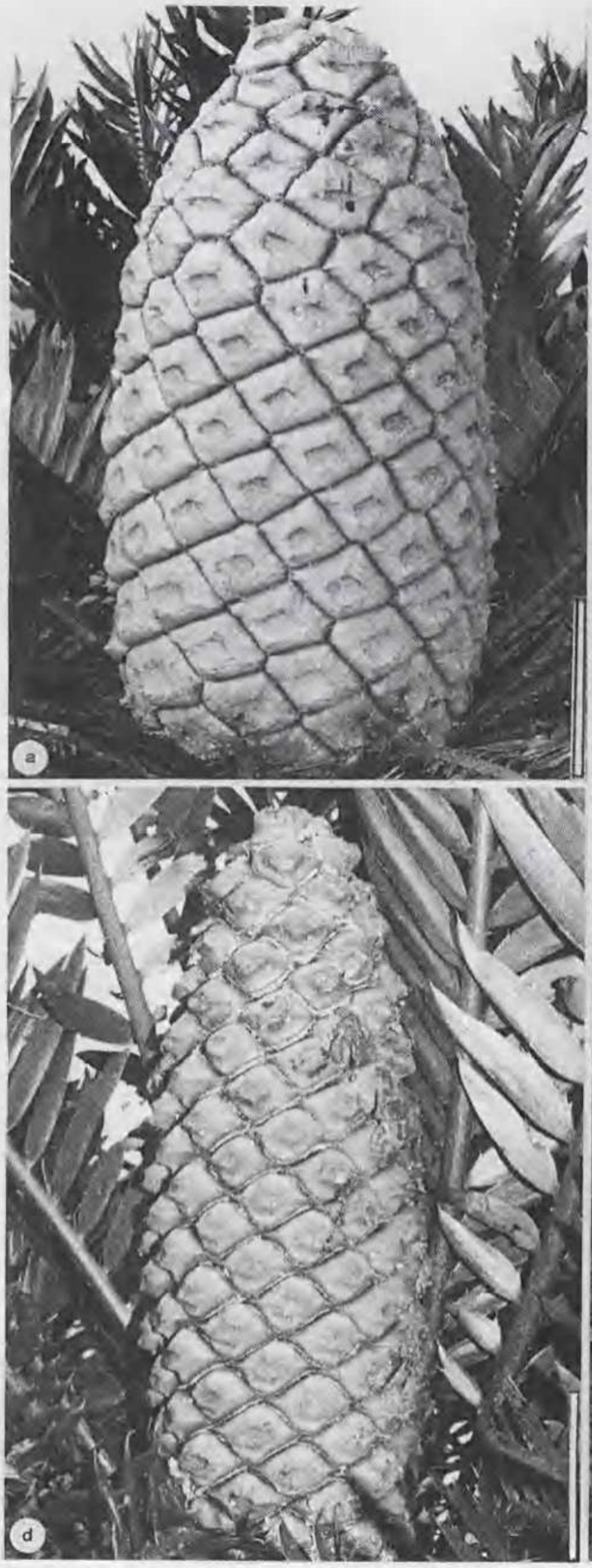


Figure 3 *Encephalartos lebomboensis*, Mananga form from Kangwane: (a) female cone, showing egg shape, (b, c) detail of female cone, showing flat exposed faces of female cone scales, (d) solitary, sessile male cone, (e) detail of male cone, showing relatively non-protruding exposed faces of male cone scales. Scale bars: a, d = 100mm, b, c, e = 50 mm. Photographed in habitat by Piet Vorster.

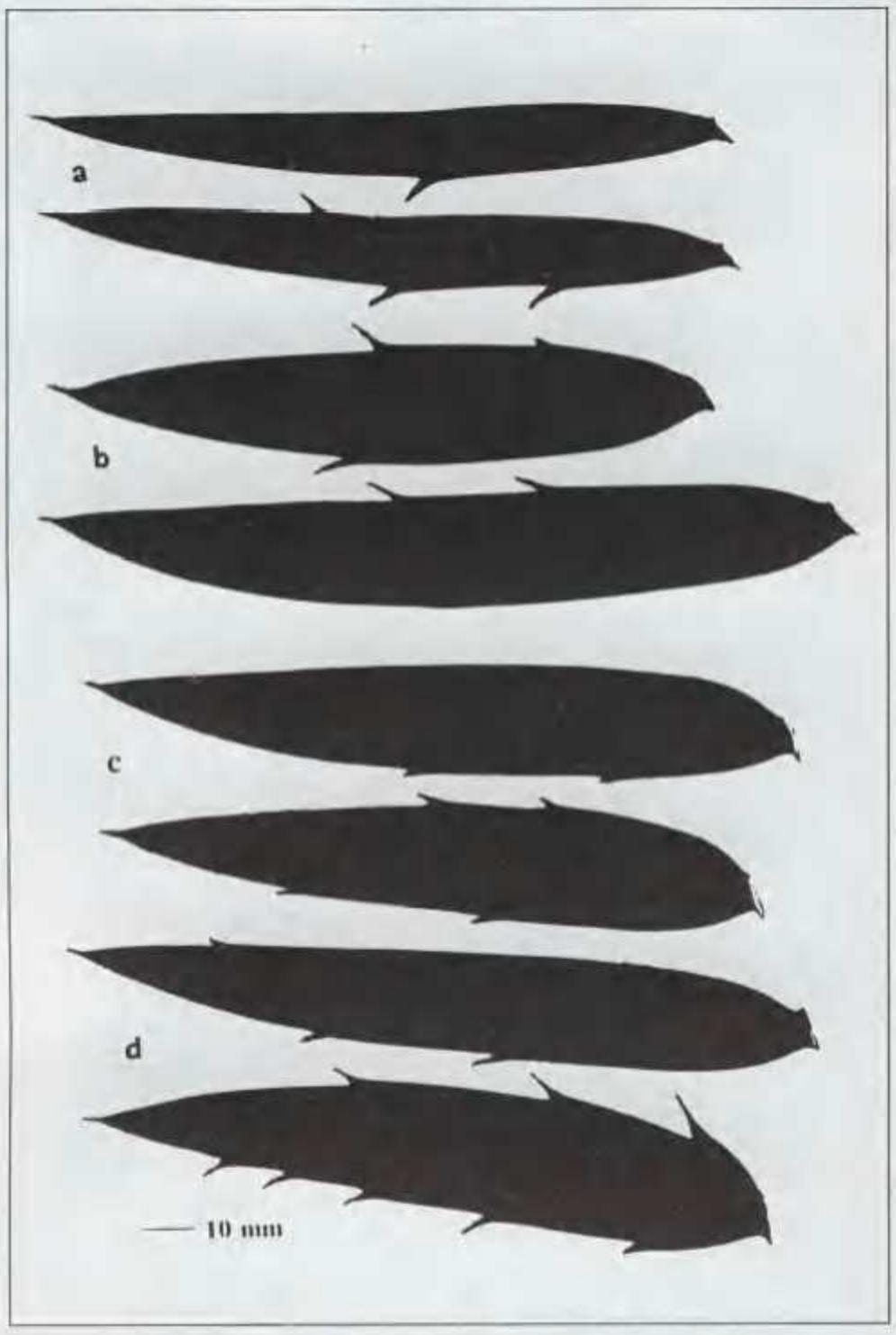


Figure 4 Photostat copy of median leaflets of (a) *Encephalartos lebomboensis* ("Piet Retiefii) (plant from habitat), (b) *E. lebomboensis* (Mananga form) (plant grown from seed at the former Transvaal Nature Conservation's Hartbeeshoek nursery), (c, d) *E. senticosus*, (c) from Swaziland (exact habitat unknown), (d) from Jozini. All leaflets from plants in Pretoria gardens. Two leaflets were chosen from each plant to show variation in the number of marginal spines.

faces appear flat and more or less smooth (Figure 2a–c, Colour Figure 4 on p. 19). The female cones tend to be barrel-shaped rather than egg-shaped (Figure 2a). The exposed faces of the male cone scales are raised, but not drawn out into quite such a conspicuously drooping beak (Figure 2f, Colour Figure 3 on p. 19), and often the median ridge of the exposed face is frilled as in *E. villosus* (Figure 2e).

The "International Code of Botanical Nomenclature" stipulates, *inter alia*, that the name of a plant species is determined by means of a nomenclatural type (type of the name of the species), which is a specimen (usually a dried specimen conserved permanently on one herbarium sheet) or illustration of the original material used by the author when describing the species.

The type material of *E. lebomboensis* Verdoorn came from a garden near Siteki (Swaziland) belonging to Col D.R. Keith but was stated to have originally been collected in the immediate vicinity of Siteki. However, this material does not conform with material known from elsewhere in the range or collected from Siteki by Vorster, but seems to be similar to the material from the Pongola valley. Vorster wrote: "Could it be that Keith's plants sampled for the type collection were obtained from someone in the Pongola valley, perhaps in exchange for plants from his area?"

During fieldwork Vorster paid special attention to the cones, in order to determine whether the different cone types occur sporadically throughout the range of *E. lebomboensis sensu lato* or whether they are geographically (*i.e.* reproductively) isolated from each other. However, no-where between Ubombo and Siteki were any cones seen which conformed to the type material, *i.e.* the Pongola valley type. [In his article on *Encephalartos lebomboensis* Roy Osborne (1988) provided copies of the original drawings by Cythna Letty as used in Dr Verdoorn's description of the species in 1949 (*Encephalartos* **15**: 7, 8)].

According to Vorster (1995) the picture changed dramatically when the northernmost known locality of *E. lebomboensis* (Mananga form) in Kangwane, Mpumalanga (Figure 3a–e, Colour Figures 5, 6, 9 on p. 19, 20), which is only about 50 km north of Siteki, was visited. Here all the plants had Pongola valley type cone characteristics, namely a *tendency* towards solitary rather than multiple cones, flat exposed faces to the female cone scales, and outright sessile rather than mostly stalked male cones (Figure 3c, Colour Figure 5 on p. 19). True, there are slight differences when compared with plants from the Pongola valley, such as the cones are apricot yellow instead of greenish yellow, the female cones are egg-shaped rather than barrel-shaped, the exposed faces of the male cone scales are only slightly raised instead of drawn out into a drooping beak, and the leaflets are wider (Figure 4b) than in the Pongola valley (Figure 4a), but these deviations can hardly be quantified and agree well with the range of variation known in species like *E. altensteinii* and *E. natalensis*. In fact, these plants very closely match the illustrations of the type material of *E. lebomboensis sensu lato*, in respect of shape and colour of the female cone, and the exposed faces of the male cone not being drawn out into a drooping beak. [In my opinion, if one compares leaflets (Figure 4b) and female cones (Figure 5) of some Mananga specimens with those of the original drawings used in Dr. Verdoorn's description of the species (Figure 6, and copies of the drawings in Osborne 1988, p. 7, 8), the plants in Col Keith's garden probably came from the Mananga area in Kangwane and not from the Pongola valley. - **Editor.**]

Vorster (1995) proposed to award the Lebombo Mountain plants on the one hand, and the Pongola valley and Kangwane plants together on the other hand, separate status at specific level.

The "International Code of Botanical Nomenclature"

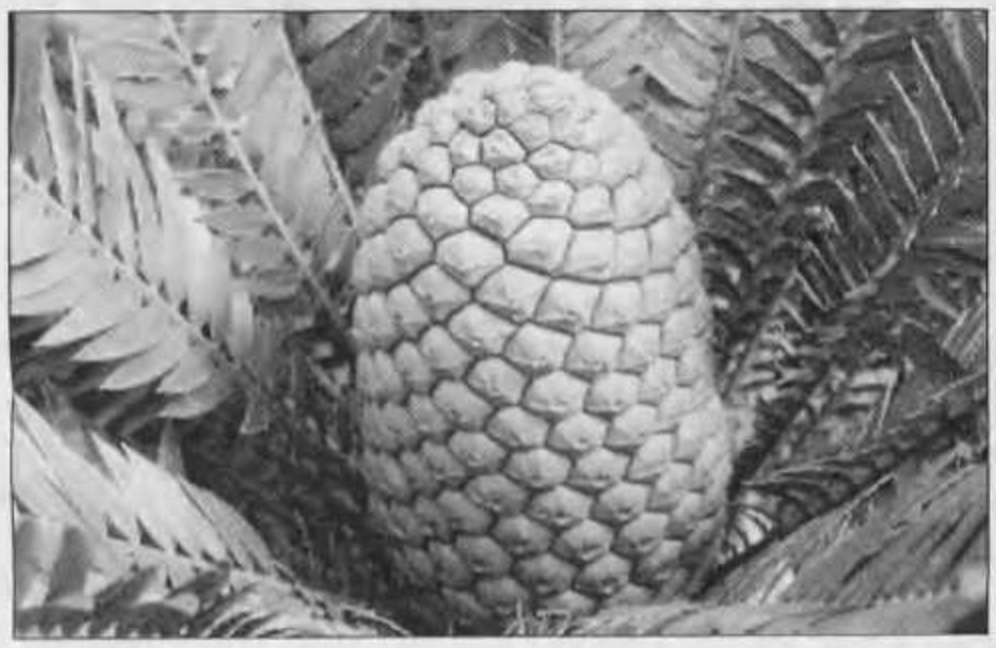


Figure 5 ***Encephalartos lebomboensis*** **(Mananga form); female plant in cone at the University of Pretoria. Photo: Isabella Claassen.**

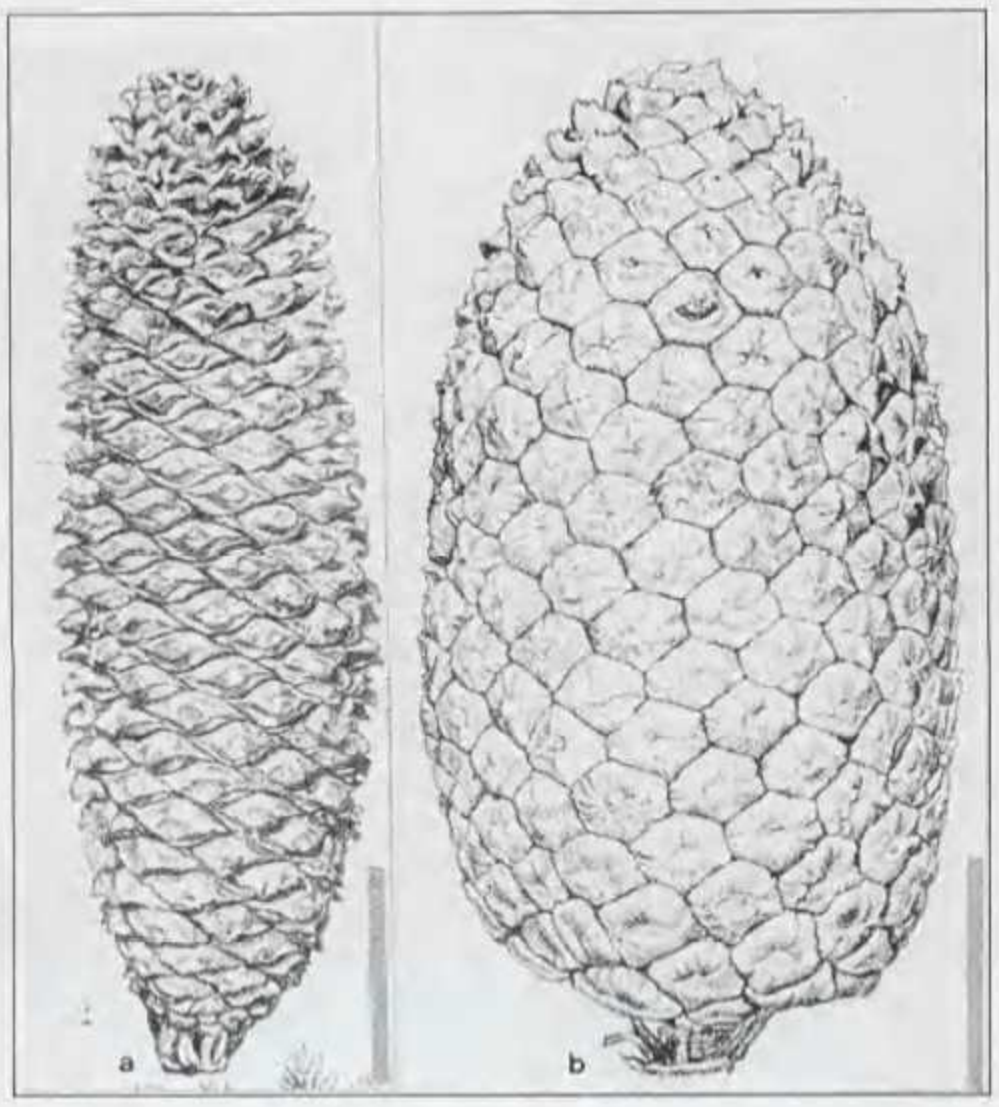


Figure 6 Copies of original drawings by Cythna Letty as used in Dr. Verdoorn's description of ***Encephalartos lebomboensis*** **in 1949: (a) male cone, (b) female cone. Scale bars = 100 mm.**

stipulates that when a species is divided into two or more species, the specific name, if correct, must be retained for one of them (namely the species that most closely complies with the original description and type material), and if a particular specimen was originally designated as the type, the specific name must be retained for the species including that element. This implies that the name *E. lebomboensis* should be applied to the plants in the Pongola valley and Kangwane, while the plants from the Lebombo Mountains should be described as a new species with a new name. The latter was thus described as new in the *South African Journal of Botany* 62(2): 76–79 (1996), under the name of *Encephalartos senticosus*.

The photographs on p. 9, 10 and 12 of Roy Osborne's 1988 "Focus on ... " article on *E. lebomboensis* most probably all represent specimens of *E. senticosus* and not *E. lebomboensis*.

DESCRIPTION

1. STEM

The *trunk* (Colour Figure 8 on p. 20) is well developed, often suckering from the base to form clumps. The trunk is erect but often leaning to some extent, up to 4 m tall and about 300 mm in diameter, covered by remains of leaf bases, and the crown is somewhat woolly.

2. LEAVES

The *leaves* (Colour Figure 8 on p. 20) are of medium length, 1100-1500(-1800) mm long, rigid and straight to somewhat arched, and dark glossy green. There is a short length of clear *petiole* (leaf stalk) which is thornless, hairless, usually 50-100 but up to 200 mm long and 15-18 mm in diameter (see drawings of leaves in Goode 1989, p. 122); the rachis (leaf axis) is yellowish. The *leaflets* are progressively reduced in size towards the base of the rachis, ending in a short series of prickles and sometimes one or two thorns (see drawings of leaves in Goode 1989, p. 122). The leaflets situated at about the middle of the leaf are pointed towards the apex of the leaf at an angle of about 30° with the rachis, opposing leaflets are placed with an angle of about 135° between them, they are spaced 20–35 mm apart, not overlapping or with the lower margin slightly overlapping the upper margin of the leaflet below it when viewing the upper surface. The leaflets are hard in texture, very narrowly ovate and usually with teeth on both margins (uncommonly without teeth), with the apices ending in sharp and hard spines (Figure 4c, d). The leaflets are (80–)120–180 mm long and 14–20(–27) mm wide.

3. CONES

The *male cones* (Figure 1c, Colour Figure 1 on p. 19) are on short stalks, usually 10–30 but up to 100 mm long; 2–4 cones per stem, very narrowly egg-shaped, covered with sparse and very short tawny felt-like hair, orange to orange-yellow, and 300–500 mm long and up to 100 mm in diameter. The exposed faces of the cone scales are rhombic, drawn out into prominant drooping beaks towards their central facet which is the only facet to be clearly defined (Figure 1c–e, Colour Figure 1 on p. 19).

The *female cones* (Figure 1a, Colour Figure 2 on p. 19) are egg-shaped, 2–3 per stem, covered with sparse and very short tawny felt-like hair, pale apricot-yellow, about 450 mm long and 220 mm in diameter. The exposed faces of

the cone scales are smooth and raised pyramidally towards the central facet which is the only facet to be clearly defined (Figure 1b).

The *seeds* have a bright red sarcotesta (fleshy outer layer).

CONING PATTERN

Cones are produced in February and early March (in Pretoria between 15 December and 23 January) and pollination takes place in late April and early May (in Pretoria between 2 April and 9 May). The seeds are released in October (in Pretoria at the end of August to the end November but most commonly in November). The seeds germinate one year after having been released.

AFFINITIES AND DIAGNOSTIC FEATURES

Encephalartos senticosus seems to be closely related to *E. lebomboensis* Verdoorn, as testified by the vegetative similarity, and the apricot-yellow cones of which the exposed faces of the female cone scales are smooth. It differs as discussed in the INTRODUCTION above.

GEOGRAPHICAL DISTRIBUTION AND HABITAT

Encephalartos senticosus is not uncommon along the summit of the Lebombo range, from south of the Jozini Dam northwards to a few kilometres beyond Siteki in Swaziland. It can sometimes be seen on very dry and sunny cliffs, but more commonly it occurs on gentle slopes along the summit amongst boulders and within bush clumps, more or less in direct sunlight, at altitudes of 400 to 800 m.

CONSERVATION STATUS

Vast numbers have been removed from the habitat for landscaping purposes over the past 50 years. It is by no means as abundant as formerly, and its continued existence in nature is cause for concern.

CULTIVATION

Encephalartos senticosus appears to produce highly viable seed which is easily germinated. The plants grow relatively quickly in suitable garden conditions, reaching appreciable size within 5–10 years. They are best sited in a well-drained area in full sun or partial shade but also make good container specimens. The species is only semi-hardy to frosts.

REFERENCES

GOODE, D. 1989. Cycads of Africa, p. 120–127. Struik Winchester, Cape Town.

KEMP, M. 1988. Focus on *Encephalartos altensteinii*. *Encephalartos* 13: 8–17.

OSBORNE, R. 1988. Focus on *Encephalartos lebomboensis*. *Encephalartos* 15: 6–15.

VORSTER, P. 1995. The identity of *Encephalartos lebomboensis*. In: Proceedings of the Third International Conference on Cycad Biology, ed. P. Vorster, p. 245–254. Cycad Society of South Africa, Stellenbosch.

VORSTER, P. 1996. *Encephalartos senticosus* (Zamiaceae): a new species from northern KwaZulu-Natal and Swaziland. *South African Journal of Botany* 62(2): 76–79.

ARTICLES / ARTIKELS

THE DIOONS OF MEXICO

Jeff Chemnick

114 Conejo Road, Santa Barbara, California 93103, U.S.A.

Received 1 June 2000

The most widely distributed of the three cycad genera that occur in Mexico is the genus *Dioon*. *Zamia* is predominantly found in lowland tropical and subtropical forests while *Ceratozamia* is typically found in middle elevation and montane tropical and subtropical forests. *Dioon*, however, is found in a variety of habitats including sand dunes along the Gulf of Mexico, oak-pine forest, karst outcroppings in tropical forest, and on steep cliffs along deep ravines in tropical deciduous and thorn forest. The purpose of this discussion is to briefly identify the various

Mexican *Dioon* species and types known, and describe the range and habitat in which each is found. I have been travelling throughout Mexico for some 25 years and only recently have managed to see the last of the described species in the wild. However, I would like to stress that many members of the genus occur in areas that are extremely difficult to access. Many populations remained unknown for years until such time as a road or trail provided access to permit their discovery. I am sure that many more populations of *Dioon* await discovery pending the access that new roads bring. And among those new populations are certain to be new types and perhaps new species as well. The logistics of surveying the numerous mountains and canyons containing likely habitat are rather daunting. As Mexico slowly bores new roads into its interior, descriptions of new and exciting populations of all three genera will no doubt be forthcoming.

This biogeographical tour of the Mexican Dioons begins in the northwest along the Pacific slope of the Sierra Madre Occidental. Less than 200 kilometres south of the US border occurs the northernmost of the Pacific slope cycads, *Dioon sonorense* (Colour Figure 10 on p. 20). Recently elevated to full specific status, *D. sonorense* is restricted to the state of Sonora. The cycads are found, like so many of the Mexican Dioons, within the transition zone between oak-pine forest and tropical deciduous thorn forest. Most populations of *D. sonorense* occur at an elevation of 1000 to 1200 metres. The plants are readily recognized by the presence of extremely long, narrow leaflets; sparsely armed with greatly reduced spines. The leaves are typically held "basket-like" in an upright fashion and often are twisted along the axis of the petiole and rachis. The new foliage is glaucous, which gives the plants a blue-grey appearance. After a number of months, the waxy cuticle that gives the leaves their blue aspect begins to wash away and the leaves appear dull green for the duration of their existence. In cultivation, *D. sonorense* is notorious for long intervals of time between new flushes of leaves. The length of the stem in this species does not normally exceed 1.5 metres.

Dioon tomasellii (Colour Figure 20 on p. 22) ranges along the Pacific slope from Sinaloa to Michoacan and is even reputed to occur as far south as Guerrero. The populations that I have visited occur in oak-pine and oak forest at an elevational range of 700 to 900 metres. *Dioon tomasellii* is quite distinctive with its falcate, deflexed leaflets and long, arching medium green leaves. The emerging new leaves are extremely tomentous. The tomentum persists on the petiole and rachis for many months after the leaves have fully expanded. The leaflets are normally armed with several to many small spines along the margin though the occasional individual with entire margins does occur. The stems of this species are typically under 1.5 metres although, as with many of the Mexican Dioons, exceptional individuals may persist within a population that are much longer, by up to several times, than the average.

Continuing southward, the next Pacific slope *Dioon* is *D. holmgrenii* (see *Encephalartos* **62**, p. 14, Figure 4; p. 18–20, Colour Figures 10, 11, 18), which is currently known only from a small population of plants growing in a remnant patch of disturbed oak forest at 550 metres elevation. The leaves are very long and slightly arched. The leaflets are variable; ranging from patterns of nearly imbricated angular insertion on the rachis to flat and abutting. The margins of the leaflets are typically armed with prominent spines. *Dioon holmgrenii* is difficult to identify in cultivation because the plants are highly variable; do not seem to grow well out of habitat; and so few specimens of *D. holmgrenii* are available in collections to study the range of variability within the taxon. Several new populations in the Pacific drainage of Oaxaca within 150 kilometres of the type locality are currently under investigation and may prove to be outlying populations of *D. holmgrenii*. Until such time when the disposition of these new cycad populations is determined, *D. holmgrenii* would have to be considered the most threatened Mexican species in the genus. The number of mature individual plants at the type locality has been greatly reduced by habitat destruction and collector poaching, to fewer than 200 individuals. The tallest plants are upward of 3 metres.

The most southeasterly of the Pacific slopes Dioons is *D. merolae* (Colour Figures 12, 13 on p. 20, 21). Though it was originally described as endemic to the state of Chîapas, several populations have since been located in eastern Oaxaca as well. Most of the populations of *D. merolae* occur in oak-pine forest or tropical deciduous forest at an elevational range of 700 to 1050 metres. The variety of habitats is considerable. *Dioon merolae* is found under pines, on steep sandstone cliffs, along thickly vegetated watercourses, among oaks, and in deciduous thorn forest. This species is readily identified by the presence of extremely imbricated leaflets which are strongly arched and deflexed above and below the rachis so that in cross-section, the leaf silhouette looks like a gull in flight with wings in the downstroke. The presence and degree of marginal spines is variable even within different cohorts of leaves on the same plant. Stems can grow to considerable length. Plants with stems of up to 6 metres are not uncommon and occasionally plants with numerous stems and even branches occur.

Starting in the northeast of Mexico and working southward down the eastern slope of the Sierra Madre Oriental the first *Dioon* one encounters, less than 150 kilometres south of the US border, is the species with the largest range of any Mexican *Dioon, D. edule* (see *Encephalartos* **61**, p. 37, 38, Colour Figures 10, 11, 13, 14, 19). It is currently split into two varieties; var. *angustifolium* and var. *edule*, but that treatment does not adequately treat all the various forms and types that are now known. Perhaps the only unifying character that defines *D. edule* is that the leaflets have entire margins. Otherwise, the populations vary considerably. *Dioon edule* can range in elevation from sea level to 1000 metres. The leaves are flat to keeled, short to very long, numerous to few. The leaflets can be greatly

reduced and linear to long and broad, glabrous to glaucous, flat to revolute. The cones are small to large with seeds of various colours. Habitats range from sand dunes, oak forest, thorn forest, cliffs, oak-pine to tropical deciduous transition forest, and limestone outcroppings. Stems of *D. edule* typically are less than 1 metre tall but some of the southern populations feature plants with stems up to 4 metres long. *Dioon edule* ranges from Tamaulipas and Nuevo Leon south to Tabasco. The populations that are perhaps most likely to be separated out in some taxonomic fashion (from the current concept of *D. edule* as two varieties), include the plants with strongly revolute leaflets and yellow rachis from Queretaro and Hidalgo; the plants with diminutive cones from San Luis Potosi; and the plants with keeled leaves and nearly imbricated leaflets from the vicinity of Palma Sola in Veracruz.

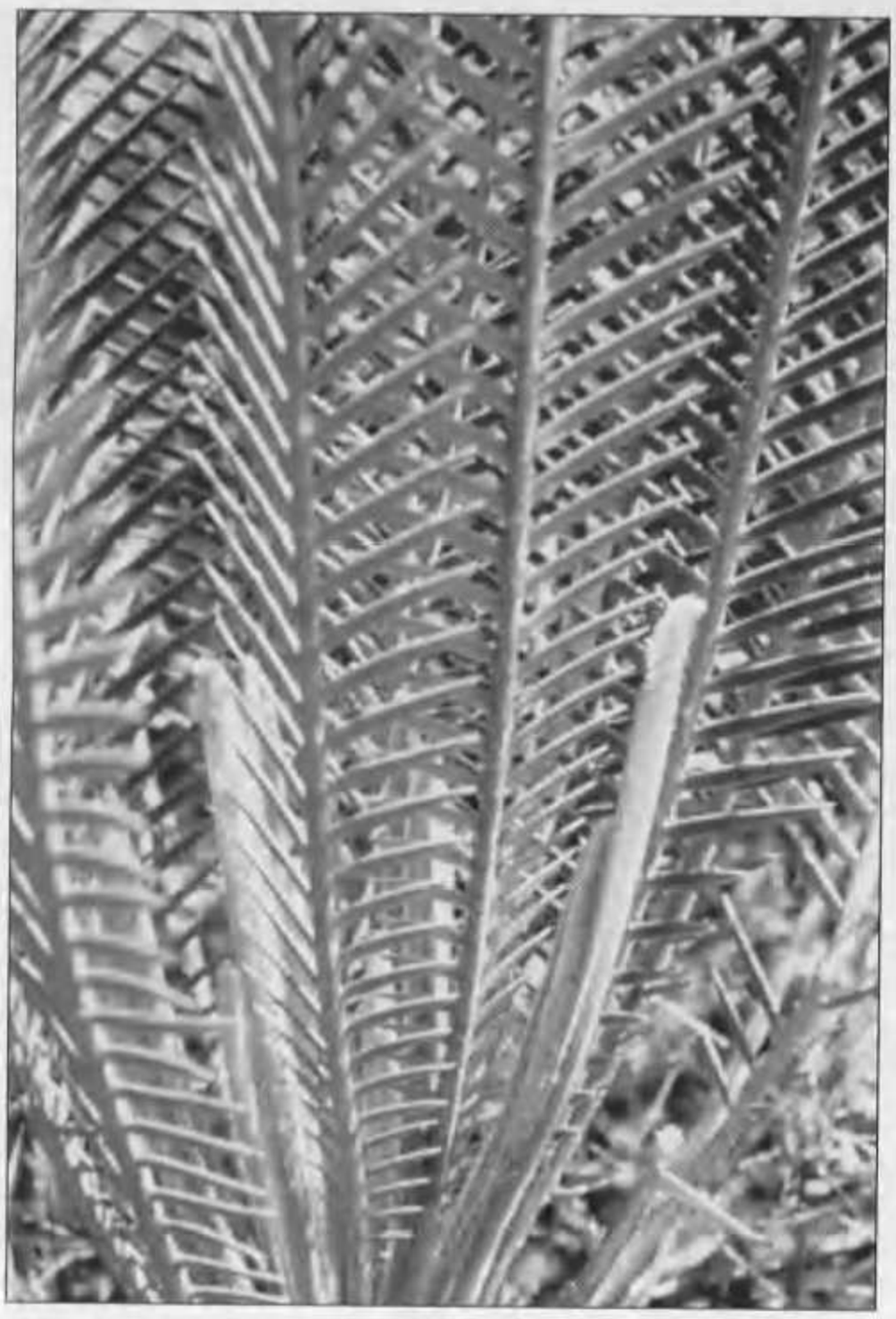


Figure 1 ***Dioon caputoi*** **in southeastern Puebla.**

Moving southward into Oaxaca, one enters the epicentre of *Dioon* diversity. At the northwestern corner of Oaxaca, just across the state line in extreme southeastern Puebla are *Dioon caputoi* (Figure 1) and *D. califanoi* (Figure 2, Colour Figure 11 on p. 20, and see *Encephalartos* **61**, p. 38, Colour Figures 20, 22). *Dioon caputoi* was long thought to be a member of the *D. purpusii* group, but the recent discovery of several populations of a new, giant *caputoi*-like *Dioon* (Colour Figure 19 on p. 23) (some 150 kilometres to the west in the Rio Balsas drainage of the Pacific slope) suggests that it is perhaps a derivative of that group instead. *Dioon caputoi* is currently known only from several small populations occurring above 2000 metres in thorn forest entirely within the state of Puebla. The leaves emerge glaucous; are small, flat, and held erect. The most diagnostic character of *D. caputoi* is the wide spacing of the leaflets with several small spines along the margin. Stems are typically less than 1 metre tall.

Figure 2 ***Dioon califanoi*** **in southeastern Puebla.**

Dioon califanoi (Figure 2, Colour Figure 11 on p. 20) is now known from several populations at an elevational range of 1500 to 2000 metres. The leaves are strongly keeled; more so than in *D. purpusii* (Colour Figure 11 on p. 20), and slightly recurved distally. The leaflets are generally smaller than those of *D. purpusii* and usually entire, but some reduced spines may be present along the margin. Stems may be up to 3 metres tall and offset freely. *Dioon califanoi* typically occurs in the transition zone between oak-pine forest and deciduous tropical thorn forest. Populations of this species consist of numerous individuals.

Perhaps the most misunderstood of all the *Dioon* species is *D. purpusii* (see *Encephalartos* **61**, p. 38, Colour Figures

21, 23, 24) because, though it was described many years ago, it is rather uncommon in cultivation. Consequently, many plants have incorrectly been identified as this species due to the presence of spines along the leaflet margins.

Figure 3 ***Dioon spinulosum*** **in habitat**

Dioon purpusii is quite similar to *D. califanoi* (Colour Figure 11 on p. 20) and indeed, perhaps *D. califanoi* is better treated as a subspecies of *D. purpusii*. In any event, *D. purpusii* (Colour Figure 11 on p. 20) is identified by its long, straight, slightly to moderately keeled leaves and acutely inserted, imbricated leaflets with conspicuous spines along the margin (though occasionally individuals occur with entire leaflets). The new leaves emerge with conspicuous tomentum, which is soon lost. Stems of this species are large, often over 2 metres in length and occasionally up to 5 metres tall. *Dioon purpusii* is now known from at least seven different localities. No doubt more populations will be discovered as access is created into the remote canyons it favours. It occurs in the transition zone between oak-pine forest and tropical deciduous thorn forest generally within an elevational range of 1200 to 1700 metres.

Two other central Oaxacan *Dioon* types are currently under investigation with respect to taxonomic status. One is clearly a member of the "*purpusii* group" and the other is a member of the "*merolae* group". The former has large, flat leaves with dense, persistent tomentum, which gives the plants a silvery-white aspect when seen from a distance (Colour Figure 16 on p. 21). The latter (known in cultivation as "El Camaron") (Colour Figures 12, 14, 15 on p. 20, 21) has flat to slightly keeled leaves that differ from *D. merolae* by the presence of straight, glaucous leaflets. Each of these types is known from several populations. Both occur above 1200 metres and are found in the oak-pine to tropical deciduous thorn forest transition zone. The stems of these plants are up to 4 metres tall.

The last two taxa are *Dioon spinulosum* (Figure 3, and see *Encephalartos* **62**: 15, Figures 6, 7, and p. 19, Colour Figures 12, 13) and *D. rzedowskii* (Figure 4, and see *Encephalartos* **62**, p. 20, Colour Figures 15–17 and Front Cover). These two species occur within 30 kilometres of each other and are quite similar in appearance. Indeed, they are also perhaps best treated as two subspecies rather than separate species.

Dioon spinulosum is very well known in cultivation throughout the world. Plants in the wild occur exclusively on "mogotes", which are limestone hills that arise abruptly from the gulf plain and are covered with seasonally moist lowland tropical forest. The elevation of *D. spinulosum* is normally less than 200 metres. The range was once quite extensive throughout northern Oaxaca and southern Veracruz but has been reduced by farming, ranching, and the creation of a large reservoir. Stems of the largest plants may be in excess of 10 metres! The female cones are huge and pendant at maturity. The mature crowns can contain several hundred leaves of dark green, spiny-margined, slightly deflexed leaflets. *Dioon spinulosum* grows in considerable shade as a sub-canopy plant and occasionally emerges as a canopy tree. The roots seek out pockets of soil among the limestone outcroppings and large plants sometimes appear to grow out of solid rock.

Figure 4 ***Dioon rzedowskii*****; leaf detail.**

Dioon rzedowskii occurs at an elevation of 400 to 600 metres on extremely steep, limestone cliffs. The

seedlings differ from those of *D. spinulosum* by having larger, more coriaceous leaflets that are more heavily armed and somewhat duller in colour. The mature plants have much larger, more leatherly leaflets with broader points of insertion and margins that are typically entire. The cones are nearly identical to those of *D. spinulosum*. Mature plants do not quite reach the size of *D. spinulosum* but procumbent stems of up to 7 metres are not uncommon. Surveying the surrounding cliff faces at the type locality reveals large numbers of this species and because it favours such an extreme exposure, it appears to be safe from both collectors and farmers for some time to come.

All Dioons germinate readily from fresh seed and, if kept warm, will grow rapidly. As a CITES Appendix 2 plant, *Dioon* seed is legal to import in conjunction with a Mexican plant-collecting permit. Hopefully the cycad nurseries that have been trafficking in illegal, mature wild collected plants will cease and desist, and the supply of seedlings now in cultivation will satisfy the demands of collectors worldwide. *Dioon* is certainly one of the most beautiful and prolific of all the cycad genera and, as such, should be grown by cycad enthusiasts everywhere. However, to fully appreciate the genus *Dioon*, there is no better way than to behold these impressive cycads in the wild, in Mexico.

TRAVELS IN SEARCH OF MEXICAN CYCADS
(A REVIEW OF MEXICO CYCAD ECOTOUR MARCH 2000)

Jeff Chemnick
114 Conejo Road, Santa Barbara, California 93103, U.S.A.

Received 22 June 2000

Ten days! It was just enough time to see the more than 16 cycad species and types that the March, 2000 cycad ecotour visited. A group of six intrepid cycadophiles issued forth from Veracruz on the eve of Carnival in the comforts of an air-conditioned van to travel over 2000 kilometres through the southern Mexico states of Oaxaca, Puebla, Chiapas, Tabasco, and Veracruz. The group consisted of enthusiasts and botanists from Great Britain, Germany, Holland, South Africa, and even the United States of America.

We began by visiting the spectacular sand dune population of *Dioon edule* that grows, incredibly, in searing temperatures within several hundred metres of the Gulf of Mexico. The plants are quite similar to the *D. edule* types known as "Palma Sola" (see *Encephalartos* **61**, p. 37, Colour Figure 11) which occur inland and just so happened to be our second stop of the day. Keeled leaves and slightly imbricated leaflets are the characteristic aspect of these populations. Our next stop was to visit the roadside population of *Ceratozamia* known as "Palma Sola" (see *Encephalartos* **61**, p. 38, Colour Figure 18) which are somewhat similar to *C. robusta* but definitely in need of clarification and possibly separation as a new species. Our final visit of the day was to the remarkable cloud forest habitat of *Ceratozamia morettii* (see *Encephalartos* **61**, p. 37, Colour Figures 12, 15). Fortunately, the road was recently graded and we were able to drive right to the population. The night was spent in the charming colonial town of Naolinco which has more boot shops per capita than anywhere else in the world!

The next morning we stopped by the type locality of *Ceratozamia mexicana* (see *Encephalartos* **61**, p. 37, Colour Figure 16) en route to Xalapa. The population consists of thousands of plants and is an unforgettable setting of montane tropical forest. Next stop was the botanic garden at the Institute of Ecology in Xalapa and a meeting/garden tour with Andrew Vovides (see *Encephalartos* **61**, p. 42, Figure 9) and the cycad staff that maintains the collection and conducts the field work. We left Xalapa heading south through the Rio Pescado drainage into drier, steeper country that is typical habitat for Dioons. At a certain point just past the river, we emptied out of the van to admire the immense, pendant clumps of *Dioon edule* (see *Encephalartos* **61**, p. 38, Colour Figure 19) that have ornamented the surrounding cliffs for eons. Then it was on to El Mirador, a well known *Ceratozamia* locality for many years. We were treated to a fascinating tour at the restored hacienda of a family with ties to Maxmillian. The night was spent in the famed garden city of Fortin de las Flores.

The following day we enthusiastically explored one of the trip highlights, the high desert of Oaxaca and Puebla which is only recently accessible along much of the new toll road that links Oaxaca City with Tehuacan, Puebla. Unbelievably huge barrel cactus, immense Beaucarnias, thousands of Dasyleurions, a group of the exceedingly rare *Fouquieria purpusii*, and all manner of beautiful, rare, and endemic xerophytes (especially cactus) are the feature vegetation of this area. The night was spent in the colourful town of Teotitlan.

We headed up the mountain the next morning to acquaint ourselves with the type locality of *Dioon califanoi* (see Figure 2 on p. 12, and *Encephalartos* **61**, p. 38, Colour Figures 20, 22). A perennial favourite because of the large

number of mature individuals, the *Dioon califanoi* locality never fails to deliver at least several plants with female cones. From Teotitlan, we entered one of the most remarkable, most ambitious bio-conservation projects in Mexico, La Canada de Cuicatlan which is internationally known for its large numbers and sizes of endemic cactus. The feature cycad of this biosphere is *Dioon purpusii* (see *Encephalartos* **61**, p. 38, Colour Figures 21, 23, 24 and Front Cover) which we visited at two distinctly different localities. We stopped en route back at the top of the canyon to admire a small stand of endemic Beaucarnias (to take advantage of one participants's plant expertise in that particular group). The night was spent in downtown Oaxaca where we were able to indulge all fantasies of showering, dining, sampling Mezcal, and touring the famous Spanish colonial city centre.

Figure 1 ***Dioon juchatengo*, a new Pacific slope species.**

From Oaxaca City, we journeyed southeast into the Isthmus of Tehuantepec stopping briefly to admire the nearly mythical "El Tule" tree which stands sentry in front of an ancient church. El Tule is a venerable *Taxodium* that is claimed to have the largest girth of any tree in the world. The Isthmus of Tehuantepec is a land of marked contrasts. Dry, tropical deciduous thorn forest, cloud forest, mangrove, oak pine woodland, and tropical rain forest are all well-represented. The Isthmus was once even a strong candidate for construction of a trans-continental canal prior to the selection of Panama. Our next cycad stop was in the centre of the Isthmus to climb a large, flat-top hill that is revered locally for its spiritual powers. A new *Dioon* species, *D. juchatengo* (Figure 1), grows along the very top, ornamenting the dramatic cliffs below which are intense hues of white, black, and orange. Heading further east, into the state of Chiapas, we visited my favourite individual cycad in the world, the giant *Dioon merolae* (Colour Figure 13 on p. 21) of El Rancho which grows in oak pine woodland. The plant is female and consists of numerous branches and offsets, some greater than 4 metres in length. This monster *D. merolae* is growing with several similar but slightly smaller cycad clusters. It is definitely a mandatory "let's all pose by this one" kind of plant. Along the way out, we stopped to explore an abandoned centuries-old hacienda which still contains some of the original but now antique furniture. We travelled deeper into Chiapas, to the Lago Malpaso with the intention of visiting *Ceratozamia miqueliana, C. robusta*, and *Zamia splendens*, but the remaining daylight only permitted a trip to the *C. miqueliana* locality. That night we were treated to the spectacle of a local fiesta and some brightly costumed, mask-adorned parade revellers whose fragrant consumption of tequila was detectable from several metres away.

The following day we passed through the capital city of Tuxtla Gutierrez, which enabled us to take care of some errands, business matters, and phone calls. Then, we headed up into the remarkable canyon of El Sumidero which features Grand Canyon-like splendour complete with thick tropical forest, unbelievably high cliff faces (again with hues of orange, black, and white), and the largest river in Mexico way down below. From Tuxtla, we crossed the Isthmus north through high cloud forest and rural indigenous villages before descending into the verdant Atlantic rain forest. Our accommodation that evening was at the "Agua azul" waterfall which not only has a beautiful falls, but a number of turquoise-coloured pools for which it is named.

The next day's destination was Palenque; famous not only as (arguably) the best ruins in all on Mexico but home as well to *Zamia lacondona* which is (arguably) the finest of all the Mexican Zamias! The plants grow in spectacular lowland forest which is contained, along with the ruins, in a national park. The group enjoyed the pyramid and temple, I think, almost as much as the cycads. We stopped en route back to inspect a stand of *Zamia loddigesii* growing right alongside the highway. Our evening was spent, like most, consuming delicious Mexican fare and washing it down with fresh orange juice and beer.

Dioon spinulosum (see Figure 3 on p. 13, and *Encephalartos* **62**, p. 15, Figures 6, 8; p. 19, Colour Figures 12, 14) was the next stop and did not disappoint! The largest of all New World Cycads is an incredible sight to behold. Other strange plants that occur in the locality are huge, turtle-like *Dioscorea* and giant Anthuriums. Then it was onward to the *D. rzedowskii* (see Figure 4 on p. 13, and *Encephalartos* **62**, p. 20, Colour Figures 15–17 and Front Cover) locality which also features a stand of *Ceratozamia robusta* and *Zamia loddigesii*. Fortunately, the locals have carved an excellent path down the rather steep, almost cliff-like exposure. The *D. rzedowskii* are everywhere, dripping off the rock faces as far as the binoculars can see.

The following morning we turned our attentions to the drainage above Valle Nacional and the type locality of *Ceratozamia whitelockiana* (see *Encephalartos* **62**, p. 19, Colour Figure 13). Much of the area has been destroyed by conversion to coffee and I can only hope that our occasional visits to the community will influence the locals to try and protect some of the remaining habitat and the

cycads growing within. Finally, after a delicious seafood banquet in the charming white-washed town of Tlacotalpan, we visited a roadside locality of *Zamia furfuracea*. Dining on fresh fish and world-famous shrimp cocktails while the gulf waters lap lazily against the patio walls of the restaurant is just the nourishment that one requires preparatory to returning from a 10 day long cycad ecotour in Mexico.

So, we said goodbye in Veracruz with pleasant memories of numerous plant localities, remote villages, and delicious meals in our minds, and in our bags - many rolls of exposed film left to develop.

EX SITU CONSERVATION OF *STANGERIA ERIOPUS* (STANGERIACEAE) AT THE DURBAN BOTANIC GARDENS, SOUTH AFRICA

[1]Crouch, N.R., [2]Donaldson, J., [3]Smith, G.F., [4]Symmonds, R., [4]Dalzell, C.G.M. and [5]Scott-Shaw, C.R.

[1]Ethnobotany Unit, National Botanical Institute, P.O. Box 52099, 4007 Berea Road, South Africa

[2]Conservation Biology, National Botanical Institute, Private Bag X7, 7735 Claremont, South Africa

[3]Office of the Research Director, National Botanical Institute, Private Bag X101, 0001 Pretoria, South Africa

[4]Durban botanic Gardens, Parks Department, P.O. Box 3740, 4000 Durban, South Africa

[5]Biodiversity Research Division, KwaZulu-Natal Nature Conservation Service, P.O. Box 13053, 3202 Cascades, South Africa

Received 15 June 2000

Stangeria T. Moore is a monotypic genus that is endemic to Africa. Once a usual sight in the coastal and scarp forests, and the Ngongoni and coastal grasslands ranging from Kosi Bay in northern KwaZulu-Natal (KZN) to Bathurst in the Eastern Cape Province of South Africa, this fern-like cycad is today far less common. A recent survey of southern and eastern African medicinal plants risking extinction (Marshall 1998) shortlisted 102 species that were of concern and rated *S. eriopus* (Kunze) Baill. (see Front Cover) as one of the top three most threatened taxa together with *Aloe polyphylla* Schönland and *Warburgia stuhlmannii* Engl. Although international *muthi* (ethnomedicinal plant) trade in *Stangeria* has apparently not yet been reported (Marshall 1998), movement of plants between KZN and Mozambique can be expected given its sale in Mpumalanga (Mander 1997) and on South Africa's Witwatersrand (Williams 1996). The present listing of *Stangeria* in Appendix 1 of CITES (World Conservation Monitoring Centre, 1998) means that international trade in wild-collected plants is illegal but there are currently few mechanisms in place to limit or even monitor the *muthi* trade. Threats to wild populations of *Stangeria* have long been documented. Whilst reminiscing on the early botanical collectors, the late Prof. Adolf Bayer, previously a professor of botany at the University of Natal, offered this post-first world war anecdote on H. Rudatis, an early 20th century field botanist then active along the Natal south coast (Anonymous 1971).

> *Rudatis showed my uncle a letter from the Field Museum of Natural History, Chicago, offering to purchase as many living* Stangeria *plants as Rudatis could send at 1 pound a plant. "Well Rudatis, there's your chance" said my uncle as he returned the letter, "You can collect a whole hillside of plants". Rudatis crumpled the letter and threw it into the fire. "Fancy" he said, "destroying a lovely hillside for filthy lucre". Thirty years after this incident I made a point of visiting this hillside. It had become a part of a "labour farm"; the area had been overgrazed and trampled and not a plant of* Stangeria *remained.*

This early demand for live plants of *Stangeria* could account for a request documented by Wood in 1905. who as head of the National Botanic Gardens and Colonial Herbarium was solicited for "*information as to the different species of* Encephalartos *and* Stangeria *in the Colony, with the native names of the genera*". Even today it is not unknown for collectors to make use of traditional medicine contacts to obtain their plants. The threats mentioned in Bayer's anecdote persist, but intensive harvesting by users of traditional medicines must now be added to the threats imposed by collectors and the ongoing transformation of its grassland (Dyer 1965) and forest habitats in KZN and the Eastern Cape. To the Zulu *Stangeria* is generally known as *imfingo* (Osborne *et al.* 1995), and as *infingwane* (Tyiso & Bhat 1998), *umfingwani*, or *umncuma* (Dold & Cocks 1999) to the Xhosa. Wood (1896) was likely the first to record the ethnobotany of this plant. Since then the medicinal and ritual uses have been well documented (Hutchings *et al.* 1996; Osborne & Grove 1992; Osborne *et al.* 1994; Osborne *et al.* 1995; Watt & Breyer-Brandwijk 1962), and for such information the reader is referred to these texts.

One usage that perhaps is less well known is the application of tuber preparations to the damaged teats of stock

(Cunninham & Zondi 1991). Recent research has partly validated the use of *Stangeria* in the treatment of headaches (Jager *et al.* 1996).

Osborne *et al.* (1994) estimated that 3410 lignotubers (totalling 2380 kg) were traded at Durban's Victoria and Isipingo medicinal plant markets during July of 1992 alone. Cunningham (1990) had earlier described the movement of large volumes of material, 54 traders moving a total of 233 bags (50 kg) of the tubers in a single year. Recent visits to these markets have revealed that both sites still trade extensively in *imfingo* (Figure 1); a recent assessment (Mander 1998) ranked the popularity of *Stangeria* amongst the top 15% of all 400-odd species in trade. Although the two Durban markets are amongst the largest in the sub-region, one could reasonably expect a fair volume to additionally pass through the country's many herbalist shops, as well as the Bushbuckridge (Mander 1997), Johannesburg and Cape Town *muthi* markets. Although not providing figures on volumes traded, Williams (1996) recorded *S. eriopus* as one of the most popular and difficult to obtain species in trade on the Witwatersrand. Based on the unpublished findings of Mander *et al.* (1997), Marshall (1998) too revealed an increased scarcity of *S. eriopus*. This notion was founded on the perceptions of market traders. Marshall suggested a propagation approach to the sourcing of *Stangeria*, rather than sustainable harvesting of remnant wild stocks.

Figure 1 Chopped lignotubers of *Stangeria eriopus*, traded as *imfingo* in the Ezimbuzini *muthi* market, Durban. Freshly cut surfaces reveal a prominent yellow vascular ring, before drying to a characteristic powdery white. Photo: N. Croach.

A conservation project on *Stangeria* has been initiated at the Durban Botanic Gardens (DBG), situated near the centre of distribution of this cycad. Plants are typically found within 30 km of the sea, out of range of salt spray, and are still known to occur as close as 25 km to the Gardens themselves. The project aims to pro-actively pre-empt the sort of crises experienced by other cycad species along the southeastern seaboard of Africa (Scott-Shaw 1995) that have resulted in at least one extinction in the wild, *Encephalartos woodii*. It is perhaps fitting that DBG should play a leading role in saving *Stangeria* since some of the last *E. woodii* specimens were removed from the wild and planted in the DBG in the early 1900's. These plants have produced several hundred offshoots that have been removed and distributed to gardens as far afield as Kirstenbosch (RSA), Kew (UK), Longwood (USA), and the Foster Botanic Gardens in Honolulu (USA). Presently, the DBG conserves 106 of the known 294 cycad taxa of the world, from 10 different genera. The genus *Encephalartos* Lehm. makes up the bulk of the collection, and includes 48 of the 64 recognised species. As early as 1855 the curator Mark McKen listed cycad holdings, including *Encephalartos cycadifolius* (Jacq.) Lehm. (syn. *Zamia cycadifolia*), *E. horridus* (Jacq.) Lehm. (Syn. *Zamia horrida*) and *Stangeria eriopus* (syn. *S. paradoxa*). Subsequent curators have all expanded the collection, to incorporate material from Central Africa, Australia, Asia and Meso-America.

With funds provided by the Bressler Foundation of the USA, the Durban Botanic Gardens will survey the remaining populations of *Stangeria* and set up genebanks to represent and preserve this diversity. The possibility of an extension of *Stangeria*'s range into Swaziland and southern Mozambique has not been thoroughly evaluated, nor has an attempt been made to substantiate an archival report of its occurrence in Mpumalanga (Steyn *et al.* 1999). Notably though, an intensive grassland survey of the area within a 10 km radius of Zitundo just north of the RSA-Mozambique border did not yield *Stangeria*. Using GIS technology, the suitable habitats of *S. eriopus* and other Red Data Listed taxa are currently being modelled by the KwaZulu-Natal Nature Conservation Service (KZNNCS). Following extensive fieldwork guided by such predictive models and evaluations of known sites of occurrence, an accurate reassessment of the Red Data List status of *Stangeria* should be possible. Scott-Shaw (1999), noted its ongoing decline and therefore rated it Lower Risk (LR), conservation dependent (cd). This category is defined as one including "*taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for ... (a higher Red Data Listing status) ... within a period of five years*".

Although authorities such as the KZNNCS undertake to manage a large network of reserves, it is beyond their present resources to run taxon-specific programmes for each of the ca. 680 rare and threatened plants identified for KZN and neighbouring regions (Scott-Shaw 1999). Such is the nature of cycad collecting in southern Africa that even *Stangeria* populations within the borders of designated nature reserves are not altogether safe. The Dlinza Forest, Entumeni, Krantzkloof, Ongoye, Vernon Crookes (Osborne *et al.* 1985) and Umtamvuna Nature Reserves are all known to at least historically have held this species. Regular visitors to Ongoye report drastic reductions in population numbers of both *Stangeria* and *Encephalartos ngoyanus* Verdoorn. A recent half-day survey in Hlatikulu forest north of Jozini (KZN) failed to turn up any specimens.

With this context Giddy (1995) pointed out that the aspirations of first world plant conservationists and third world communities conflict somewhat. As has been evidenced with *Encephalartos* species, both social and economic factors may ultimately decide the fate of *Stangeria* in the wild. A commitment by DBG to the long-term maintenance of this *Stangeria* genebank will not only complement the *in situ* efforts of the regional conservation authorities, but also provide the research community with material for taxonomic, biosystematic and other studies. The ensuing findings would further support conservation efforts, as we come to better understand the reproductive biology, diversity and ecology of this species. Research areas that would benefit from the DBG collections would include:

Taxonomy and diversity studies: The Stangeriaceae is presently treated as a small cycad family of two genera and three species, with our monotypic genus *Stangeria* endemic to southern Africa. *Bowenia* with its two species *B. spectabilis* Hook. ex Hook.f. and *B. serrulata* (W. Bull) Chamb. is confined to Queensland in Australia (Stevenson 1992, Steyn *et al.* 1999). The issue of whether the spectacular degree of variation exhibited by *S. eriopus* indicates that there is more than one species has long been debated. A proper understanding of the taxonomic units involved is essential if the remaining genetic diversity is to be effectively and efficiently conserved. In this case, grassland and forest forms appear particularly different to the casual observer but Dyer (1966) and Vorster & Vorster (1985) concluded that there was no basis for splitting *Stangeria* into more than one species (Steyn *et al.* 1999). Curiously enough, Hermann Staude (pers. comm.) observed that the geometrid moth *Callioratis millari*, which appears to depend on *Stangeria eriopus* as a host plant, utilises only the cycads that grow in the open grasslands. No eggs, larvae or feeding damage has been found on the nearby forest plants, despite their proximity and abundance. Whether this preference is due to actual differences in the plants, as opposed to differences in habitat, remains to be tested. As taxonomic methodologies and techniques improve, they will enhance our ability to recognise natural variation, and the collection of *Stangeria* genotypes in the DBG will become increasingly important. The genebank, drawing together the full range of remaining genotypes and cultivating them under similar conditions, will allow for meaningful comparisons to be made at morphological as well as other levels.

Plant-insect interactions: In addition to *Callioratis millari*, *Stangeria* is also a hostplant for several other insects. The larvae of other geometrid moths (*Zerenopsis leopardina, Diptychus geometrina* and *Durbana setinata*) utilise *Stangeria* (Kroon 1999), although differential forest-grassland feeding patterns have not been reported (Staude 1994, 1999; Duke & Duke 1998). These interactions are of particular interest to entomologists because of the way insects overcome the range of cycad-specific toxins that occur in *Stangeria*. Moreover, there is increasing evidence that cycads are insect pollinated. Insect pollination in *Stangeria* remains an enigma. Chamberlain (1919) noted that the male cone of *Stangeria* has a relatively small number of microsporangia and Pearson (1906) argued that *Stangeria* habitat was suited to insect pollination. However, Rattray (1913) found no insects associated with *Stangeria* cones and surveys by one of us (JD) have yielded very few insects in contrast to other cycads that are insect pollinated. Some of these important and interesting aspects of cycad biology can be resolved if researchers have access to good *ex situ* collections.

Horticulture: Propagation of *Stangeria* will be thoroughly investigated at the Gardens. Although horticultural aspects of cultivation and sexual reproduction are fairly well understood (Vorster & Vorster 1984), much is still to be learnt about optimising the fertilisation and coning processes. Experiments with clonal multiplication through lignotuber division (Pant 1973, Vorster & Vorster 1984) and (*Encephalartos*) leaf cutting techniques (Grobbelaar 1995, Osborne & Dalzell 1996) will be advanced. Additionally, the Micropropagation Unit of the Durban Parks Department will attempt to develop the partial *in vitro* success reported by Osborne and Van Staden (1987) through to a full micro-propagation procedure. The development of such a technique will allow for the mass production of forms selected on the basis of both market and horticultural appeal, be this related to growth rate, cone size, pinnae division, or a tendency to produce multiple subterranean heads and/or leaves.

The Durban Botanic Gardens has a history of involvement with Zulu medicinal plants dating to the 1880's under the curation of John Medley Wood. This association continues. Initiatives are underway to obtain approximately 1 ha of land adjoining the Gardens but a lack of funds is currently delaying this acquisition. This site has been earmarked for medicinal plant conservation. Its procurement will afford the Gardens with an opportunity to simultaneously pursue one of its mission statements namely "*to demonstrate the role plants can play in social upliftment by teaching organic gardening techniques*". The main focus of the programme would be the demonstration of small-scale organic cultivation systems applicable to Durban's urban environment. *Stangeria* will feature prominently as a cultivation subject. Situated on the Garden's southern boundary, the proposed development site is a five minute walk from three important nodes in the informal quarter: the province's largest medicinal plant market, an enormous taxi rank, and Durban's largest collection of vegetable sellers. In transferring propagation and cultivation techniques to the very sector of the population that most use medicinal plants, we will be promoting another of our related themes, "*conservation-through-education*". The *ex situ* conservation project on *Stangeria* will play a key role in the Garden's response to the joint challenges of stemming unsustainable plant use, and improving the lives of Durban's inhabitants.

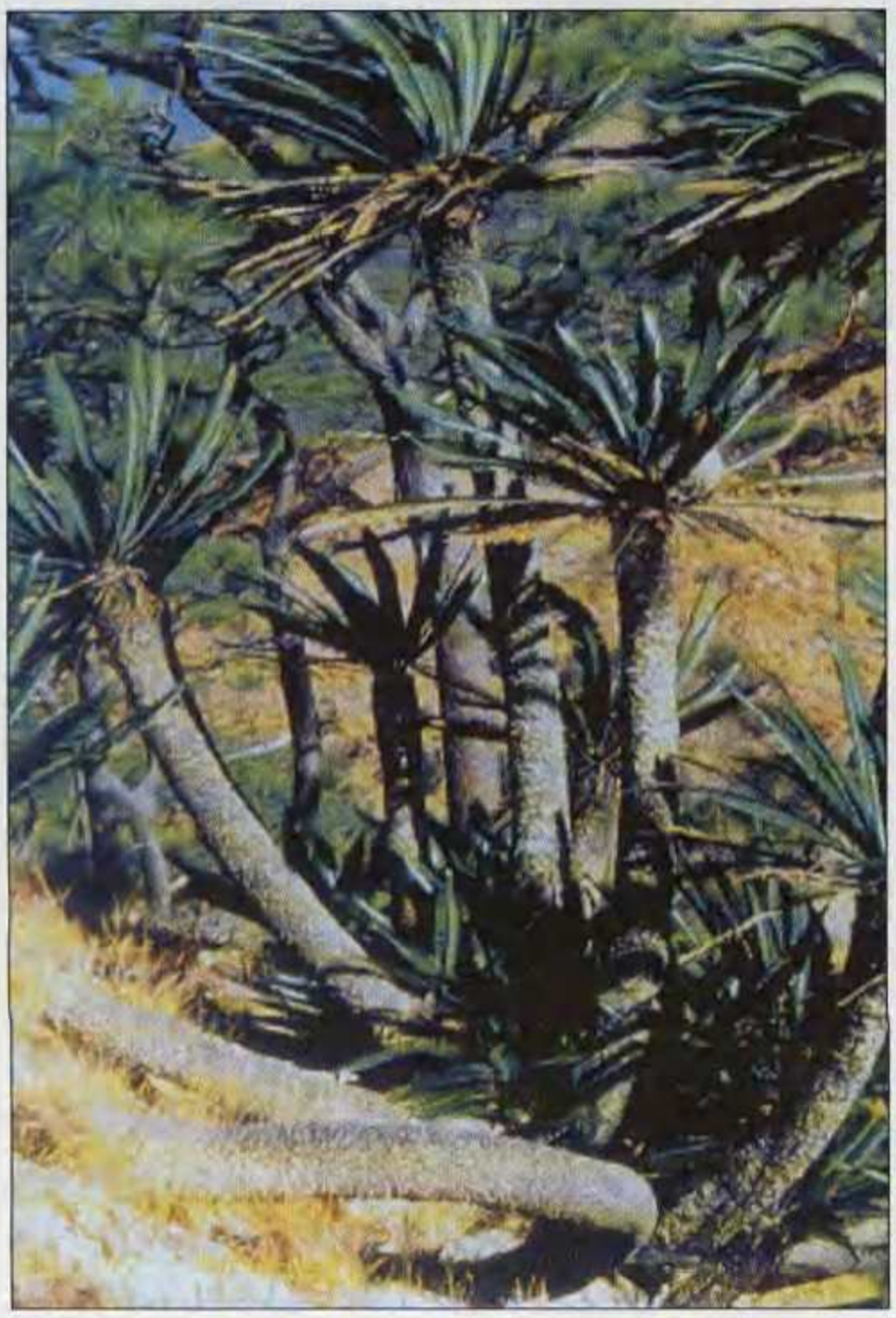
Colour Figure 1 *Encephalartos senticosus*; male cones. Photo: Piet Vorster.

Colour Figure 2 *Encephalartos senticosus*; female cone. Photo: Piet Vorster.

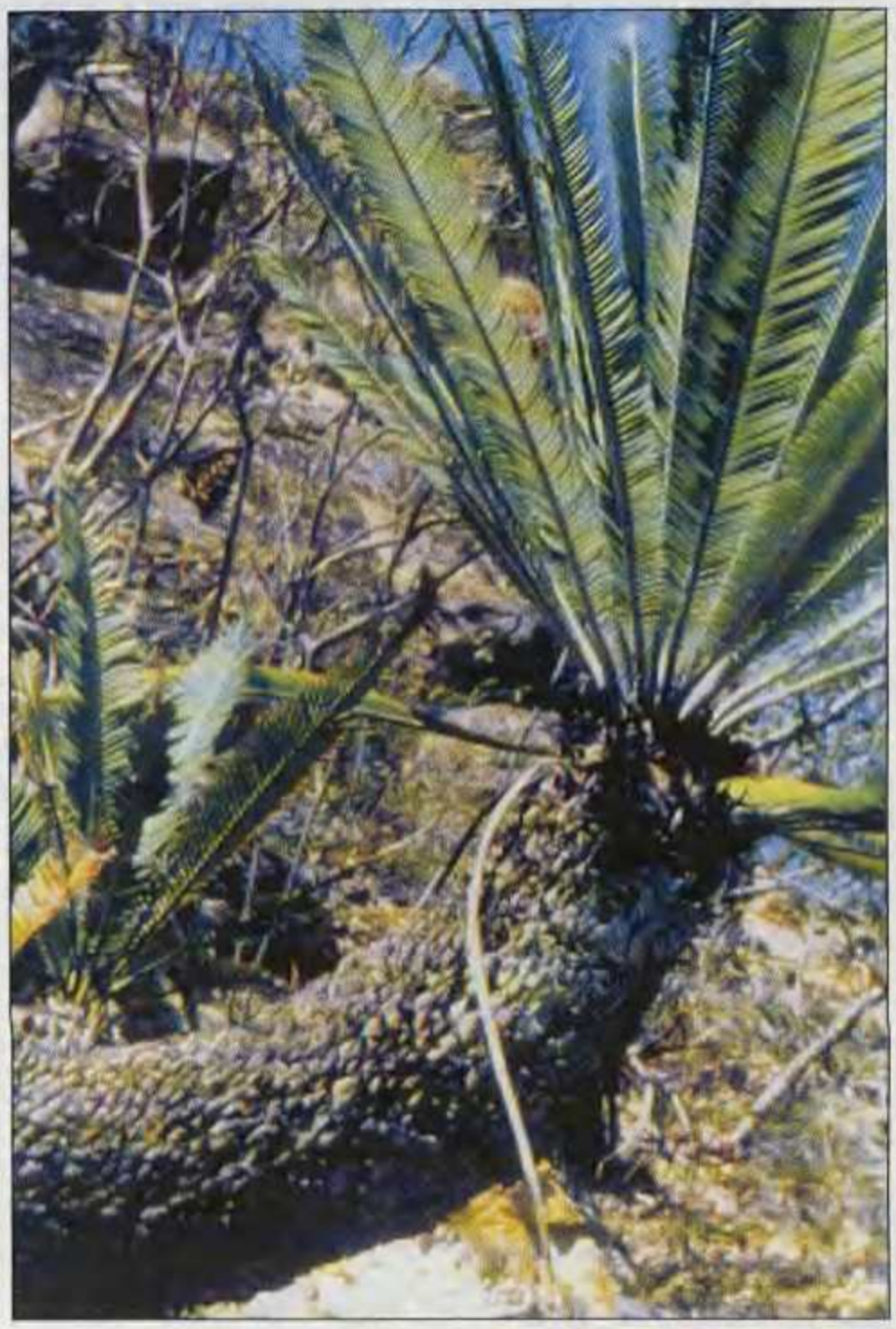
Colour Figure 3 *Encephalartos lebomboensis* ("Piet Retiefii"); male cones. Photo: Piet Vorster.

Colour Figure 4 *Encephalartos lebomboensis* ("Piet Retiefii"); female cone. Photo: Piet Vorster.

Colour Figure 5 *Encephalartos lebomboensis* (Mananga); male cone. Photo: Piet Vorster.



Colour Figure 13 The giant *Dioon merolae* of El Rancho, Mexico. Photo: Jeff Chemnick.



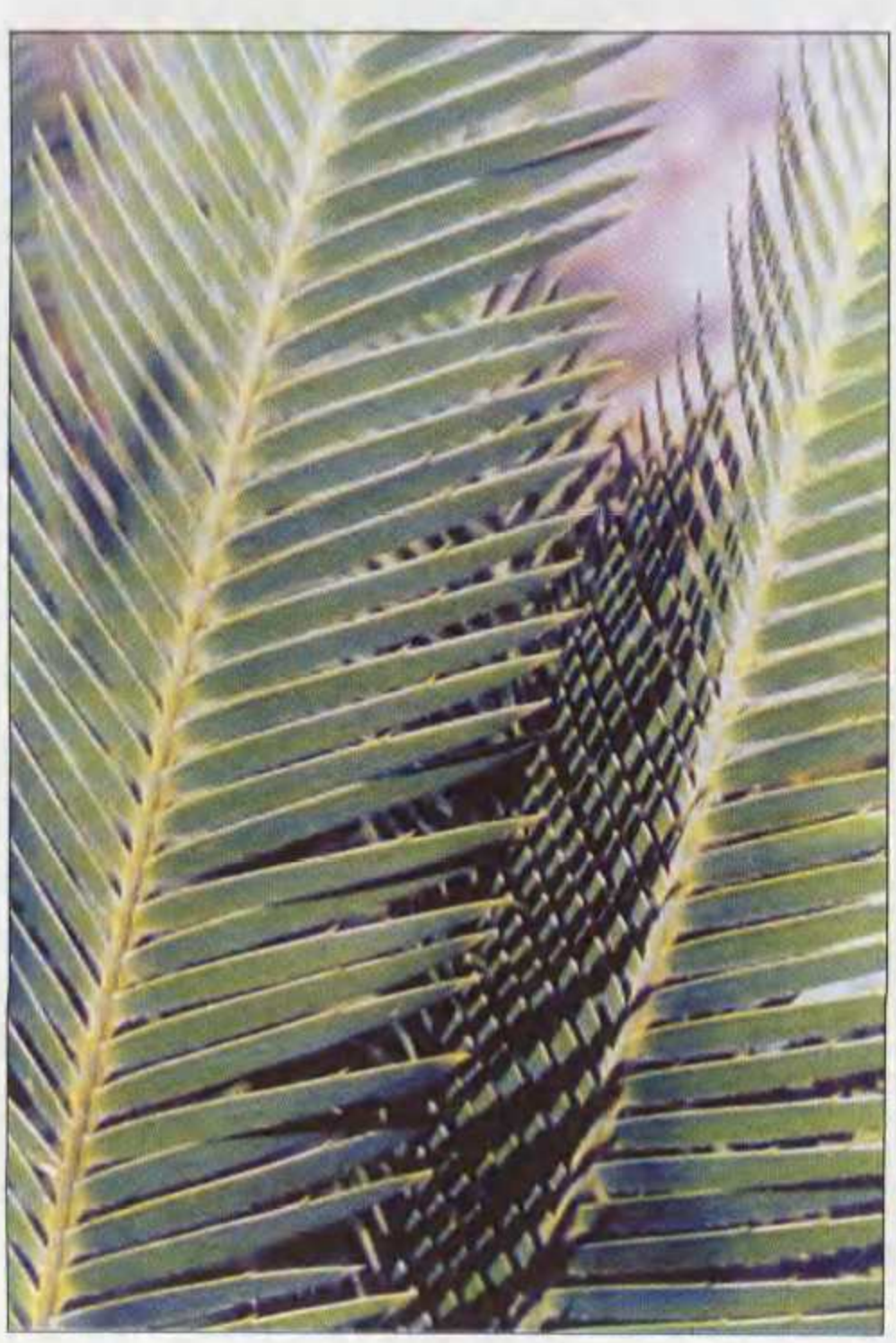
Colour Figure 14 *Dioon* "El Camaron", a new species (a member of the "*merolae* group") from central Oaxaca, Mexico. Photo: Jeff Chemnick.

Colour Figure 15 *Dioon* "El Camaron"; close-up of the leaves. Photo: Jeff Chemnick.

Colour Figure 16 A new *Dioon* species from central Oaxaca: leaf detail, note the dense silver-white tomentum covering the leaflets. Photo: Jeff Chemnick.

Colour Figure 17 *Encephalartos lehmannii*; female cone, hand-pollinated after removal of one of the cone scales, note the pollen on the cone. Photo: O. Stainer.

Colour Figure 18 *Dioon edule*(?) **in the Hambury garden "La Martora", Italy. Photo: Ottorino Stainer.**



Colour Figure 19 Leaves of *Dioon* **"balsas", a new giant "***caputoi***"-like** *Dioon* **in the Rio Balsas drainage of the Pacific slope, Mexico. Photo: Jeff Chemnick.**

Colour Figure 20 *Dioon tomasellii*, **Mexico. Photo: Jeff Chemnick.**

Colour Figure 21 *Cycas revoluta*; **strange looking leaves. Photo: Richard Rudy.**

Kleurfiguur 22 *Encephalartos eugene-maraisii* **in die Entabeni Natuurreservaat naby Naboomspruit, Noordelike Provinsie.**
Colour Figure 22 *Encephalartos eugene-maraisii* **in the Entabeni Nature Reserve, near Naboomspruit in the Northern Province, South Africa. Foto/Photo: Derik Minnaar.**

ACKNOWLEDGEMENTS

Our appreciation to Richard and Judith Bressler of the Bressler Foundation for generously donating the project funds. The DEAT has supported the development of MEDBASE, the National Medicinal Plants Database for South Africa.

REFERENCES AND SELECT ANNOTATED BIBLIOGRAPHY - ISSUES RELATING TO THE CONSERVATION OF *STANGERIA ERIOPUS*

ANONYMOUS. 1971. Even Dingaan couldn't deter lady plant collector. *Natal wildlife* 12(3): 9–12, 27. [collecting land transformation]

CHAMBERLAIN, C.J. 1919. The living cycads. Facsimile edition (1965). Hafner, New York. [reproductive biology]

CUNNINGHAM, A.B. 1990. People and medicines: the exploitation and conservation of traditional Zulu medicinal plants. *Mitteilungen as dem Institut für Allgemeine Botanik Hamburg* 23b: S979–990. [trade volumes]

CUNNINGHAM, A.B. & ZONDI, A.S. 1991. Cattle owners and traditional medicines used for livestock. Institute of Natural Resources Report 69. UNP, Pietermaritzburg. 26 pp. [ethnoveterinary medicine]

DOLD, A.P. & COCKS, M.L. 1999. Preliminary list of Xhosa plant names from Eastern Cape, South Africa. *Bothalia* 29: 267–292. [Xhosa names]

DUKE, N.J. & DUKE, A.J. 1998. An annotated list of larval host-plants utilized by southern African Geometridae (Lepidoptera). *Metamorphosis* 9(1): 5–19. [insect interactions]

DYER, R.A. 1965. The cycads of southern Africa. *Bothalia* 8: 405–432. [natural variation, historical distribution, habitat loss]

DYER, R.A. 1966. Stangeriaceae. *Flora of Southern Africa* 1: 1–13. [natural variation, historical distribution]

GIDDY, C. 1995. Cycad conservation - a third world perspective. In: Proceedings of the Third International Conference on Cycad Biology, Pretoria 5–9 July. pp. 19–25. [CITES listing]

GOODE, D. 1989. Cycads of Africa. Struik, Cape Town. 256 pp. [distribution map, natural variation, ecology - seed dispersal]

GROBBELAAR, N. 1995. Vegetative propagation of *Encephalartos* species using excised leaves. In: Proceedings of the Third International Conference on Cycad Biology, Pretoria 5–9 July. pp. 85–89.

HUTCHINGS, A., SCOTT, A.H., LEWIS, G. & CUNNINGHAM, A.B. 1996. Zulu medicinal plants. An inventory. University of Natal Press, Pietermaritzburg. 450 pp. [ethnobotany, common names]

JAGER, A.K., HUTCHINGS, A. & VAN STADEN, J. 1996. Screening of Zulu medicinal plants for prostaglandin-synthesis inhibitors. *Journal of Ethnopharmacology* 52: 95–100. [pharmacology]

JONES, D.L. 1995. Cycads of the world. Ancient plants in today's landscape. Smithsonian Institution Press, Washington. 312 pp. [cultivation, propagation from seed, propagation by lignotuber division, distribution]

KROON, D.M. 1999. Lepidoptera of southern Africa. Host-plant & other associations. A catalogue. Lepidopterist's Society of Africa, Johannesburg. 159 pp. [insect interactions]

MANDER, M. 1997. Medicinal plant marketing and strategies for sustaining the plant supply in the Bushbuckridge area and Mpumalanga Province. DANCED/DWAF, Nelspruit. 44 pp. [marketing, trade, relative popularity]

MANDER, M. 1998. Marketing of indigenous medicinal plants in South Africa. A case study in KwaZulu-Natal. FAO of the UN, Rome. 151 pp. [marketing, trade, relative popularity]

MANDER, J. & QUINN, N. in association with MANDER, M., ELLIS, T. & HORSWELL, M. 1997. Trade in wildlife medicinals in South Africa. Report prepared for TRAFFIC East/Southern Africa. Unpublished. [trade, scarcity]

MARSHALL, N. 1998. Searching for a cure: conservation of medicinal wildlife resources in East and southern Africa. TRAFFIC International, Cambridge. [interprovincial trade, conservation status]

OSBORNE, R. & GROVE, A. 1992. The magical and medicinal usage of *Stangeria eriopus* in Natal. *Encephalartos* 32: 8–11. [trade, legal protection, conservation status, ethnobotany, chemistry]

OSBORNE, R., GROVE, A., OH, P., MABRY, T.J., NG, J.C. & SEAWRIGHT, A.A. 1994. The magical and medicinal usage of *Stangeria eriopus* in South Africa. *Journal of Ethnopharmacology* 43: 67–72. [trade, conservation status, ethnobotany, chemistry, pharmacology]

OSBORNE, R., GROVE, A., OH, P., MABRY, T.J., NG, J.C. & SEAWRIGHT, A.A. 1995. The ritual and medicinal usage of *Stangeria eriopus* in South Africa. In: Proceedings of the Third International Conference on Cycad Biology, Pretoria 5–9 July. p. 121–128. [trade, conservation status, ethnobotany, chemistry, pharmacology]

OSBORNE, R. & DALZELL, C. 1996. Potential propagation of *Encephalartos woodii* from excised leaves. *Encephalartos* 45: 16–17.

OSBORNE, R. & VAN STADEN, J. 1987. *In vitro* regeneration of *Stangeria eriopus*. *HortScience* 22(6): 1326. [propagation - tissue culture, incomplete micropropagation]

PANT, D.D. 1973. Cycads and the Cycadales. 2nd edition. Central Book Depot, Allahabad, India. [propagation by lignotuber division]

PEARSON, H.H.W. 1906. Notes on South African cycads. *Transactions of the Philosophical Society of South Africa* 16: 341–353. [insect interactions, pollination]

RATTRAY, G. 1913. Notes on the pollination of some South African cycads. *Transactions of the Royal Society of South Africa* 3: 259–270. [insect interactions]

SCOTT-SHAW, R. 1995. Cycad conservation in Natal. In: Proceedings of the Third International Conference on Cycad Biology, Pretoria 5–9 July. pp. 47–50.

SCOTT-SHAW, R. 1999. Rare and threatened plants of KwaZulu-Natal and neighbouring regions. A plant red data book. KwaZulu-Natal Nature Conservation Service, Pietermaritzburg. 182 pp. [habitat, distribution, conservation status, ethnobotany]

STAUDE, H.S. 1994. Notes on the life history of the inflamed tigerlet, *Venilodes inflammata* Warren, 1894 (Lepidoptera: Geometridae). *Metamorphosis* 5(3): 122–125. [herbivores, insect interactions]

STAUDE, H.S. 1999. New host-plant records of Loopers (Lepidoptera: Geometridae) from South Africa. *Meta-*

morphosis 10(1): 42–45. [herbivores, insect interactions]
STEVENSON, D.W. 1992. A formal classification of the extant cycads. *Brittonia* 44: 220–223. [classification]
STEYN, E.M.A., SMITH, G.F. & HILL, K.D. 1999. Stangeriaceae. *Species Plantarum: Flora of the World* 2: 1–9. [distribution, taxonomy, natural variation]
TYISO, S. & BHAT, R.B. 1998. Medicinal plants used for child welfare in the Transkei region of the Eastern Cape (South Africa). *Angewandte Botanik* 72: 92–98. [ethnomedicine]
VORSTER, P. & VORSTER, E. 1985. Focus on *Stangeria eriopus*. *Encephalartos* 2: 8–17. [habitat, natural variation, distribution map, ecology - symbionts, ethnobotany, transplanting, pollination, cultivation, growth rate, propagation - seed, propagation - lignotuber division]
WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. The medicinal and poisonous plants of southern and eastern Africa. E & S Livingstone Ltd., London. [ethnobotany]
WILLIAMS, V. 1996. The Witwatersrand muti trade. *Veld & Flora* 82: 12–14. [trade, marketing]
WOOD, J.M. 1896. Native herbs. *The Natal Almanac Directory and Yearly Register*: 260–265. [ethnomedicine]
WOOD, J.M. 1905. Report on the Natal Botanic Gardens and Colonial Herbarium for the year 1904–1905. Bennett & Davis, Durban.
WORLD CONSERVATION MONITORING CENTRE. 1998. Checklist of CITES species. A reference to the appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora. CITES Secretariat and World Conservation Monitoring Centre, Châtelaine-Genève and Cambridge. 312 pp. [international trade]

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Dear Editor

PLANTS OF THE FUTURE OR MUTATIONS?

Figure 1 *Cycas revoluta*; **strange looking leaves.**

Figure 2 *Cycas revoluta*; **some of the strange looking leaves are abnormally contorted.**

I am enclosing photographs (Figures 1, 2, Colour Figure 21 on p.) of my strange looking *Cycas revoluta* plants. They never had normal leaves before, and after they aborted numerous abnormal leaves they had to decide whether to live or die. Now they have produced these strange looking leaves.

I don't know if it is an imbalance of growth hormones that is making my plants what they are, or if they are mutations. Sometimes when looking at these plants, I feel that they are showing me the evolutionary tract of *C. revoluta* of the past. Then seeing that the abnormal leaves seem to be stronger than the ones closer to normal, I wonder whether they are plants of the future or simply mutations.

Richard M. Rudy, *2055 82 Ave # 435, Vero Beach, FL 32966-7526, U.S.A.*

Received 4 July 2000

Dear Editor

COLOUR CONTENT IN *ENCEPHALARTOS*

Without exception, all of the Australian members of the Society to whom I have spoken commented very favourably about the recently introduced colour content in "*Encephalartos*", though they were well aware of the high cost of printing involved.

May I suggest two possible methods of obtaining funds to offset the cost of colour printing:

first - that members be urged to enter a competition to display their best plant photos in the magazine. For the right to enter the competition members would be required to pay an appropriate non-refundable fee. A committee would then be required to select the best photos for publication, and/ or

second - that members could pay a nominated fee to have "approved" photos displayed in the magazine, on a per-photo or per-page basis.

***Paul Kennedy**, 21 Sierra Road, Engadine, N.S.W., 2233, Australia*

Received 4 July 2000

. . . . . .

Geagte Redaktrise

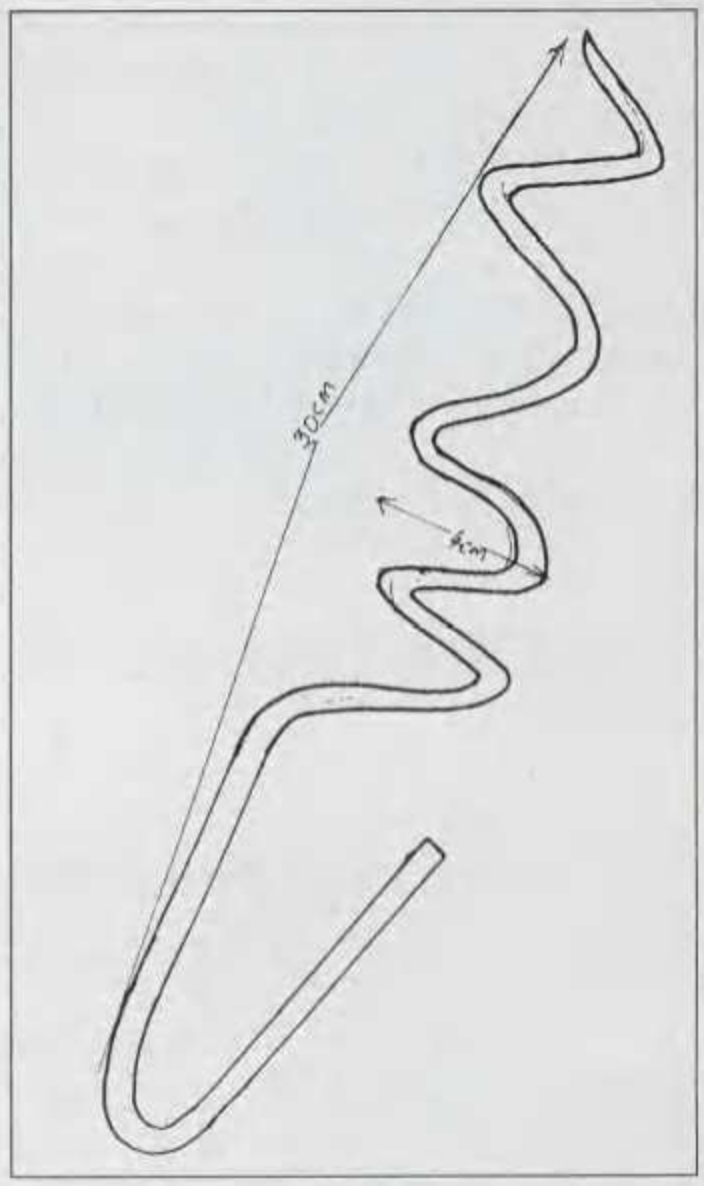
GEREEDSKAP OM UI-AGTIGE BOLPLANTE TE VERWYDER

Daar is miskien lede wat ook met 'n soortgelyke probleem sit. Dit is ui-agtige plante (met bolle) wat bv. digby broodbome groei en wat moeilik verwyder kan word sonder om 'n hoeveelheid wortels te beskadig. Een van ons lede, Blackie Swart, het die volgende gereedskap gemaak van 5,5 mm vleklose ronde staaldraad. Dit lyk soos 'n kurktrekker (kyk skets). Om die uieplant te verwyder, draai mens die "kurktrekker" oor die uieplant in en trek dan die plant uit, met die minste skade aan die broodboomwortels. Die draad kan helies gebuig word oor bv. 'n stuk pyp wat vasgeklem is in 'n skroef.

***Leon van Rooy**, Posbus 1019, 1240 Witrivier, R.S.A.*

Ontvang 6 Julie 2000

[Die betrokke ui-agtige plant is waarskynlik "basterknoffel" (*Nothoscordum inodorum*) (kyk "Bekamping van 'n lastige onkruid" deur Nat Grobbelaar in *Encephalartos* **53**: 6–7, Maart 1998).]



TOOL FOR REMOVAL OF ONION-LIKE BULBOUS PLANTS

There are probably some members with a similar problem, that is a type of onion plant with numerous bulbs that grow at the base of cycad plants and are difficult to remove without damaging some of their roots. One of our members, Blackie Swart, made a tool from 5.5 mm stainless steel rod, which resembles a corkscrew (see sketch). To remove the onionous weed, insert the tip of the corkscrew tool over the plant and turn it around a few times. The weed can then be removed with the least damage to the cycad roots. The wire can be bent helically around a pipe which is clamped in a vice.

[The onion-like plant in question is probably "fragrant false garlic" (*Nothoscordum inodorum*) (see "Fighting a troublesome weed" by Nat Grobbelaar in *Encephalartos* **53**: 7–8, March 1998).]

. . . . . .

Dear Editor

ALBINO CYCAD SEEDLINGS

We read with interest Nat Grobbelaar's report on albinism in *Encephalartos* seedlings (*Encephalartos* **62**: 9, June 2000). Here too we have experienced a similar phenomenon. In summer 1999 we found 3 of 30

germinating seeds of *Encephalartos cerinus* came up as albinos. As an experiment, we grafted the upper half of one of the albinos onto the side of a 2-year old *E. natalensis* seedling. In this manner, the albino was kept alive for many months although it did not grow in size.

We have also recently found a high percentage of *Zamia* seedlings germinating without chlorophyll. In this case, the seedlings are not albinos, but are a vivid bright yellow, presumably because of the presence of carotene pigments. Some of these eventually became green and survived; others remained stunted and eventually succumbed.

Stan Walkley and Roy Osborne, *Cycad Connections, P.O. Box 244, Burpengary, Queensland 4505, Australia.*

Received 19 July 2000

SHORT COMMUNICATIONS / KORT MEDEDELINGS

POLLEN: PRODUCTION, PREPARATION AND PRESERVATION

Jack van der Merwe
P.O. Box 39, 0835 Duiwelskloof, R.S.A.

Received 20 May 2000

We have all read in the various cycad publications what a male cycad cone looks like. You cut it off when shedding pollen fairly freely and then what? My own procedure is as follows:

Cut off the cone/cones and place in a well ventilated room without draughts (pollen is largely distributed by wind, so why waste it). My opinion is that pollen having such a short viable life must be removed from the action of outside influence as soon as possible. So once the cone is in your quiet room and the stalk has been wrapped to prevent the exuding mucilage dripping on the floor or on your workspace, lay it gently on the table top which has been covered with a layer of paper, hold it tightly by the stalk, tap it gently and watch the pollen settle on the paper.

A word of warning: People suffering from allergies such as hay fever, etc., may find it advisable to wear protective gloves and masks at these stages. Now with a flat bladed instrument, ruler or edge of knife blade, scrape the pollen into a pile. You now require a teacup, a fine sieve (tea or coffee strainer) and a teaspoon. Sift the pollen into the teacup by tapping the side of the sieve with the teaspoon. This may seem boring and unnecessary. When you are eventually trying to pollinate a female cone and the syringe, puffer or sterile sand will not flow because of the junk left in the pollen, you will regret having neglected this step.

Prior to all this you will have been to your local pharmacist and obtained a number of the plastic pillboxes used in dispensing his wares and an equal number of little packets of desiccant used to keep pills dry. These are not usually for sale, a bit of diplomacy may be called for.

Back at the scene of operations, put a half teaspoon of pollen in each container, and a packet of pre-dried dessicant, and to guild the lilly a touch of office glue around the lid to insure that no air or moisture can enter.

Most authorities state that the male cone should be picked when pollen is being release freely and left for another three up to eight days before collecting the pollen. I feel that pollen is a living medium and detoriates very rapidly when exposed to air, I thus do my shaking of the cones and further processing every second day to make certain that the pollen is frozen as soon as possible. You now have your precious pollen, how to store it?

You have three choices:

Firstly stick it into the cold section of the fridge without freezing. This is the method used at the Lowveld Botanical Gardens in Nelspruit. The logic behind this procedure is that they have enough plants of their own and stored pollen is only required under unusual circumstances.

Pollen stored at the normal temperature attained by a household refrigerator is considered to retain satisfactory viability for a year.

The second and most practical method is to put it into the freezer compartment of the fridge. This can give a viability of three to five years (see *Encephalartos* **28**, Osborne, Robbertse & Claassen). It should be noted that pollen that has been frozen and then defrosted for use should not be re-frozen as this is considered to reduce viability to a very large extent.

The third method is storage in liquid nitrogen to preserve the pollen for use up to the next millenium. This is obviously beyond the reach of the common or garden cycad enthusiast. If you have pollen that you feel is entirely irreplaceable you may be able to come to terms with an animal breeding station or artificial insemination officer to store your pollen in their semen tank.

Please remember that each pollen grain is a living entity that was created by the same creator that created all living things. Treat it with respect.

Extract from

THE DENEYS REITZ TRILOGY

ADRIFT ON THE OPEN VELD

The Anglo-Boer War and its Aftermath 1899-1943

Published by Stormberg Publishers, P.O. Box 3191, Cape Town 8000, South Africa

Compiled by **Ian Strang**, P.O. Box 69212, 2021 Bryanston, R.S.A.

Received 25 May 2000

Reprinted with permission from the editor of Stormberg Publishers

This extract is from Chapter 22 of "Commando", the first book in the trilogy.

A Boer commando under the command of General Smuts had crossed from the Free State into the Cape and was moving in the direction of Port Elizabeth closely pursued by a strong British force. In order to evade this force the commando had moved into the Suurberge.

"Up to now we had found little or so little difficulty in commandeering supplies from the farms we passed, that no one ever thought about the next day, with the result that when we unexpectedly found ourselves in a wild region without habitations, the men had little or no food with them, and were already beginning to feel hungry. Scattered about stood a strange growth known as 'Hottentots bread' (*Encephalartos altensteinii**), a wild fruit not unlike a large pine-apple. It is edible only at certain seasons of the year but coming from the north, we did not know this, and as one of the men sampled it and found it to his liking, many unfortunately followed suit.

I had not eaten any, and returning to the firing-line, after going to tie up some horses that had broken loose, I was astonished to find more than half our men groaning and retching on the ground in agony some apparently at their last gasp. General Smuts was worse than the rest, so, with half our number out of action we were also leaderless, for he was lying comatose."

It was getting toward sunset and the fit members of the commando managed to repulse an attack; the British force withdrew and both sides settled down for the night.

" ..... The sick men were worse than ever. General Smuts was very bad indeed ..... From the groans and cries on all sides it was clear that the sufferers could not travel ..... It was urgently necessary to get away before daylight would enable the English to surround us. ..... We knew that if the men did not recover in time to avoid the pursuing column, our expedition into the Cape would come to a speedy end next morning ..... However, as the darkness slowly passed, one man after another recovered sufficiently to stagger to his feet, and toward dawn there were no more than twenty unable to stand. General Smuts was still prostate, but able to take in the position, and he gave orders that the men who were not able to help themselves were to be tied to their sadles ..... He himself had to be held on his horse, ... "

The commando withdrew under fire from the British force. Deneys Reitz was at the rear of the commando.

"I was one of the last to gain the top ..... But when I got above and looked back I was surprised to see General Smuts was still lying below, with three of our men attending him, while down the path above them came a number of English scouts trailing the spoor the commando had made. At the rate at which the scouts were descending they would soon come on General Smuts and his men ..... I ..... rushed and slid to the bottom unharmed by the bullets of the scouts. When the men with General Smuts heard the firing overhead they lifted him to his horse, and were already starting, a couple on either side to hold him on, by the time I got down.

We did not follow the commando, as we should have

presented too easy a mark, but kept away to the right where there was a gully up which we could make our way unseen. When we reached the top I fetched my two animals, and we followed on to find the commando waiting for us in a glade."

*The *Encephalartos altensteinii* mentioned in the book should actually be *Encephalartos longifolius*, of which specimens occur here and there in large numbers in the Suurberge, whereas *E. altensteinii* does not occur in that area.

THE HANBURY GARDEN "LA MORTOLA"

Ottorino Stainer
Via Lisbona 25, 30010 Treporti, Venezia, Italy

Received 4 July 2000

I would like to introduce you to the garden (Figure 1) that I consider to be the most beautiful Botanical Garden in Italy.

Figure 1 A beautiful corner in the Hanbury garden.

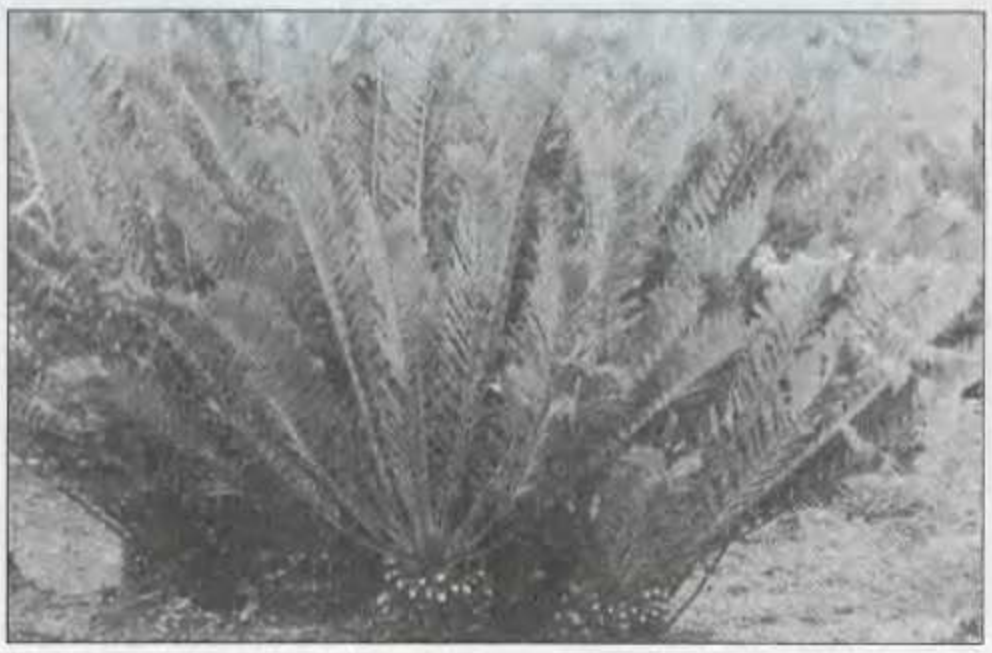


Figure 2 A clump of *Encephalartos arenarius* plants.

Its cycad collection is not exceptional if you compare it with other collections around the world. However, it is pretty amazing if you consider that those plants have been kept outdoors at 43°59'N.Lat. for over a century.

Figure 3 A beautiful *Encephalartos longifolius* specimen with part of an *E. arenarius* in the foreground.

I do not know the exact date when the cycads were introduced to the garden. Mr. Thomas Hanbury established his garden between 1867 and 1875. With the assistance of many experts of different nationalities the

garden attained a level of international fame in a very short time. In 1912 a count of 5 800 cultivated plants was catalogued for this garden, which covers an area of 180 000 square metres. Unfortunately, during the second world war the garden was abandoned and covered with mines because of its location near the French border, and this caused a decrease in the number of plants in the garden.

Figure 4 ***Encephalartos horridus.***

Figure 5 ***Macrozamia moorei.***

However, after the Italian Republic bought the garden in 1960 its beauty has been restored.

The collection of cycads of interest to us consists mainly of several massive clumps of male *Encephalartos arenarius* (Figure 2), one mature female *E. lehmannii* (Colour Figure 17 on p. 21) a few male *E. altensteinii*, one *E. horridus* (Figure 4), a few *E. longifolius* (Figure 3), one female *Dioon edule* (Colour Figure 18 on p. 22), and one *Macrozamia moorei* (Figure 5). All are displayed in harmony with a number of Cycas revoluta alongside a road called "Cycas Avenue". The number of species is limited but certainly deserve to be seen.

The garden is situated on top of a hill, from where you have a wide view of the "Cote de Azur" which is well-known to be one of the most amazing sceneries of the world. Historical names of different origin have been used to adorn the garden, above all "La Via Aurelia", an antique road of Roman origin, going through it.

Figure 6 ***Encephalartos trispinosus*?**

"La Mortola" lies a few kilometers west of Ventimiglia.

[Unfortunately Mr. Stainer did not provide legends to the photographs. The cycad in Figure 6 appears to be an *Encephalartos trispinosus* although this species is not mentioned by Stainer as occurring in the garden. The *Dioon* specimen in Colour Figure 18 on p. 22 does not appear to be *D. edule* although I am not very familiar with all the forms of this species. Finally, I presume that the person in Figure 1 is Mr. Stainer. - **Editor.**]

THE FIRST SEXUAL REPRODUCTION OF *ENCEPHALARTOS* IN EUROPE?

Ottorino Stainer
Via Lisbona, 30010 Treporti, Venezia, Italy

Received 4 July 2000

For many years I have been spending my holidays at the Ligury coast in the north-west of Italy.

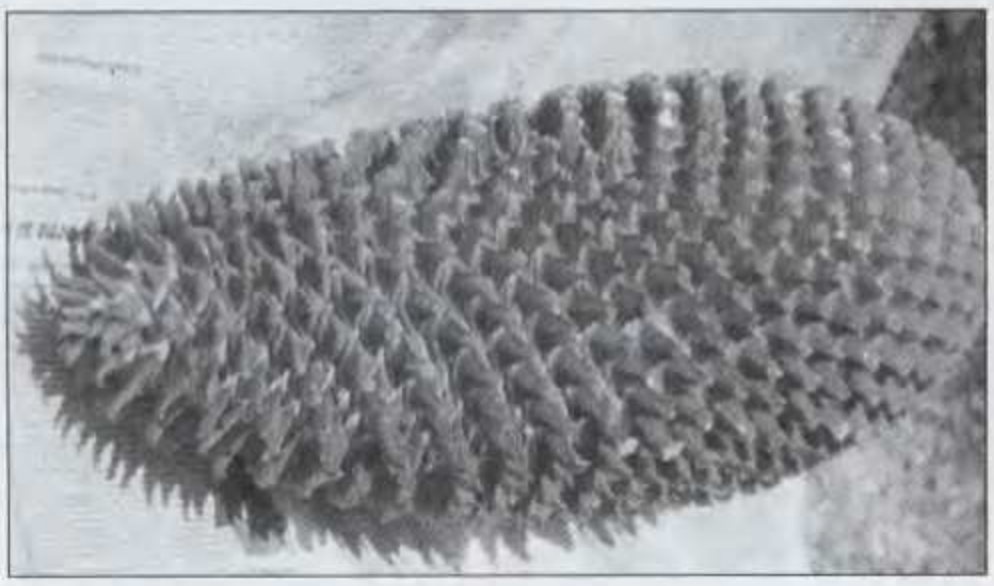


Figure 1 ***Encephalartos longifolius*** **male cone.**

During my holidays I usually visit the garden of Villa Hanbury which is located near the French border. On a visit in April 1997 I was surprised to notice a fully developed female cone on an *Encephalartos lehmannii* plant (Colour Figure 17 on p. 21). In trying to find out if the Director of the garden was going to pollinate the cone, I learned that they did not know how to handle the matter. Therefore, knowing how difficult it is to obtain seeds from overseas, I decided to do something about it. But, as I was 650 km from home, my only choice was to use pollen from an *Encephalartos longifolius* male cone (Figure 1) that was shedding pollen at the time. As the female *E. lehmannii* cone was not yet open, I had to remove one of the apical cone scales and blow pollen into the cone using a plastic tube.

After that I only had to hope for the best. When I went back the next season I was grateful to receive about 20 seeds. Four of the seeds germinated and I have reason to believe that those seedlings are the first *Encephalartos lehmannii* x *E. longifolius* hybrids (Figure 2) ever generated in Europe.

I do realize that it may not sound that interesting to anybody that lives in Africa, but for us here in Europe it does.

Besides, most of the European gardens are connected and their plants are derived from the same clone, and that makes sexual reproduction practically impossible.

Figure 2 Seedlings of ***Encephalartos lehmannii*** **x** ***E. longifolius*****.**

I am hoping that my successful attempt will stimulate those concerned to try hand-pollination more often. In that particular situation I did not have many choices and a hybrid was created. However, these hybrids are only meant to be displayed to the public and will not be reintroduced into the wild, therefore their purity is not essential.

BACK COPIES OF OUR MAGAZINE STILL AVAILABLE
VORIGE UITGAWES VAN ONS TYDSKRIF WAT NOG BESKIKBAAR IS
2000-06-08

Guillaume Theron
P.O. Box / Posbus 1790, 0027 Groenkloof (Pretoria), R.S.A.

Received / Ontvang 12 July/Julie 2000

Number/Nommer	Copies/Eksemplare
11	24
12	47
20	2
22	24
23	6
24	9
26	38
27	76
30	100
32	39
34	125
36	116
38	53
39	44
40	198
43	148
44	139
46	275
47	198
48	97
49	30
50	168
51	229
52	131
54	226
55	42
56	126
57	±196
58*	±197
59*	±137
60*	127
61*	111

*= Numbers with colour printing / Nommers met kleur drukwerk.

PRICES/PRYSE:

Local members/Plaaslike lede: R24.00 (with colour/met kleur), R15.00 (black and white/swart en wit). **Local non-members/Plaaslike nie-lede:** R30.00 (with colour/met kleur), R20.00 (black and white/swart en wit). **Overseas members/Oorseese lede** (Airmail/Lugpos): R60.00, US$9.00, A$16.00 (with colour/met kleur), R50.00, US$7.00, A$13.00 (black and white/swart en wit); (Surface mail/Seepos): R48.00, US$7.00, A$13.00 (with colour/met kleur), R39.00, US$6.00, A$10.00 (black and white/swart en wit). **Overseas non-members/Oorseese nie-lede** (Airmail/Lugpos): R75.00, US$11.00, A$20.00 (with colour/met kleur), R55.00, US$8.00, A$14.00 (black and white/swart en wit); Surface mail/Seepos: R54.00, US$8.00, A$14.00 (with colour/met kleur), R50.00, US$7.00, A$13.00 (black and white/swart en wit).

Photocopies of the other numbers are available at the same price as black and white copies. / Fotokopieë van die ander nommers is teen dieselfde prys as swart en wit eksemplare beskikbaar.

Numbers with colour can only be copied in black and white. / Nommers met kleur kan net in swart en wit gekopieer word.

NUUS OOR DIE TRANSVAALSE STREEKTAK VAN DIE VERENIGING

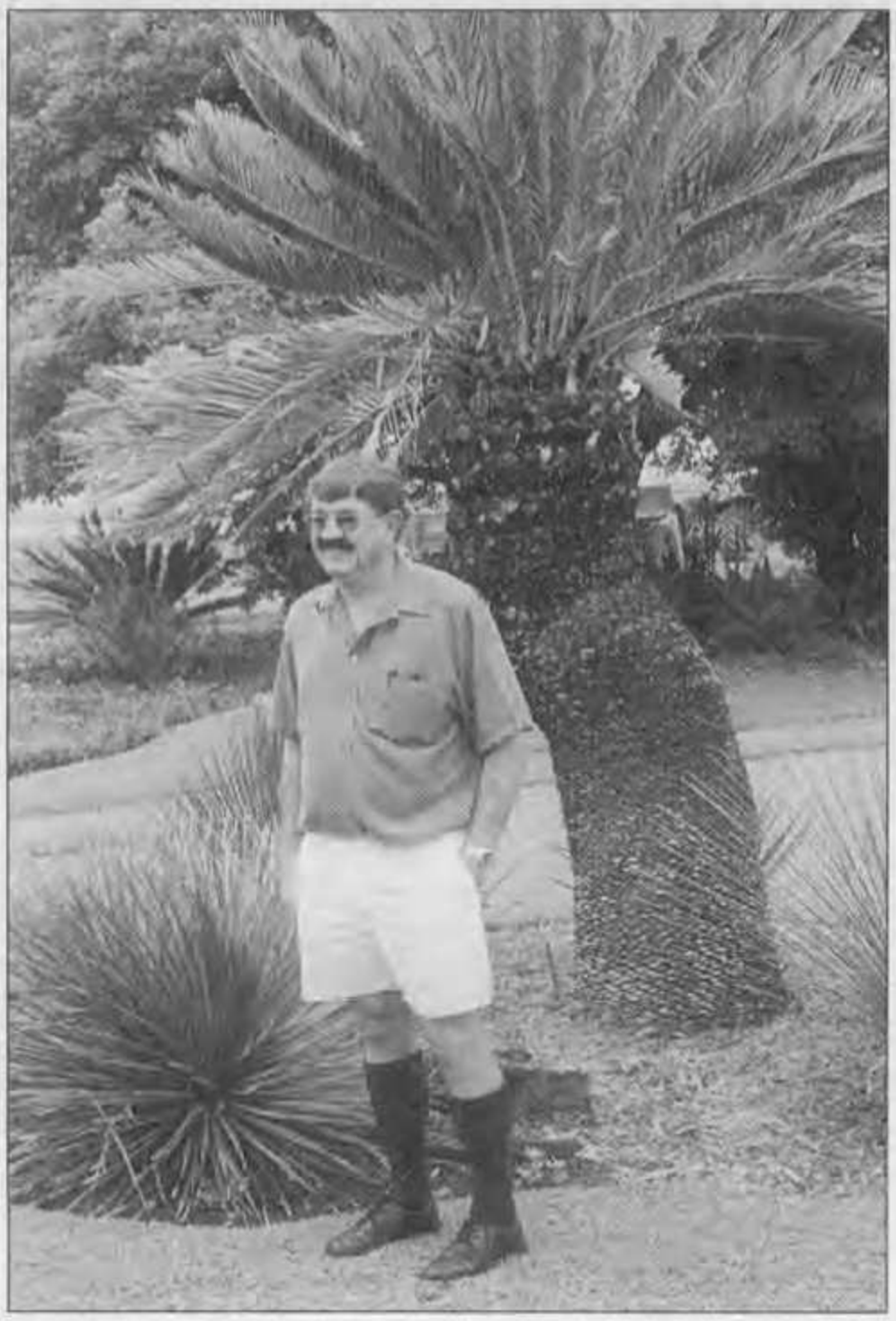
Derik Minnaar
Posbus 95597, 0145 Waterkloof, R.S.A.

Ontvang 11 Julie 2000

Verslae oor onlangse aktiwiteite:

Op die koel oggend van 15 April 2000 het 'n groep van 18 belangstellendes vroeg op Groblersdal bymekaargekom vir die uitstappie na John en Maryna Kloppers se tuin. Op kort kennisgewing het John ook 'n verrassingsbesoek aan Wolfs Rock se broodboomtuin gereël Na 'n kort besoek het die konvooi vertrek na John en Maryna se spogtuin. John

(Figuur 1) het die groep deur die tuin geneem en 'n baie groot verskeidenheid broodboomsoorte getoon. Dit was duidelik dat die tuin baie aandag geniet en in 'n uitstekende toestand gehou word. Die dag is afgesluit met 'n bring en braai waarna die groep verdaag het.



Figuur 1 John Kloppers by 'n pragtige *Encephalartos middelburgensis* in sy tuin.
Figure 1 John Kloppers standing near a beautiful *Encephalartos middelburgensis* in his garden, near Middelburg in the Northern Province, South Africa.

Die besoek op 10 Junie 2000 aan die Entabeni Natuurreservaat, naby Naboomspruit in die Noordelike Provinsie, het ongelukkig met 'n misverstand begin. Die aanwysings na die verkeerde toegangshek het die verrigtinge met ongeveer twee uur vertraag. 'n Ontvangs met 'n ontbytkelkie het gevolg waartydens Derik die toergroep van 22 persone verwelkom het. Derik het die groep se geheue kortliks verfris deur *Encephalartos eugene-maraisii* en verwante soortgelyke broodboomspesies te beskryf. Daarna het die groep in twee veldvoertuie vertrek na die "Cycad Valley" waar die grootste natuurlike kolonie van *E. eugene-maraisii* voorkom. As gevolg van die oggend se vertraging was daar nie genoeg tyd om tot bo teen die hang te klim waar die meeste broodbome voorkom nie. Twee groot plante is egter in die vallei gesien (Figuur 2, 3, Kleurfiguur 22 op p. 22). Die lang stamme van bykans twee meter is deur veldvuur afgebrand en het plat op die grond of teen rotse gelê waar hulle verder gegroei het. Die toergroep moes weer terughaas na die ontvangs-area van die reservaat waar 'n heerlike middagete in die restaurant voorgesit is. Daar is 'n wyle gesellig verkeer voordat die groep verdaag het.

Figuur 2 Een van die twee groot *Encephalartos eugene-maraisii* plante wat tydens die besoek aan die Entabeni Natuurreservaat, naby Naboomspruit in die Noordelike Provinsie, gesien is.
Figure 2 One of the two large *Encephalartos eugene-maraisii* plants seen on the visit to the Entabeni Nature Reserve, near Naboomspruit in the Northern Province, South Africa.

<u>Toekomstige aktiwiteite</u>:

Derik Minnaar het vroeg in Junie 'n brief van die Orgidee Vereniging van Noord-Transvaal (ONT) ontvang. Hulle is besig om 'n Nasionale orgideeskou namens die Suid-Afrikaanse Orgidee Vereniging (SAOC) te reël, wat van **6 tot 10 September 2000** by die sportkompleks van die Universiteit van Pretoria sal plaasvind. Baie van die lede van die 24 orgidee verenigings geaffilieer by SAOC sal die uitstalling bywoon, asook veral Amerikaanse lede. Die skou sal ook vir die publiek oop wees en daarom wyd en intensief geadverteer word.

Die reëlingskomitee het besluit om ook ander spesialis

plantverenigings te nooi om by die skou uit te stal. Die doel is om die publiek te betrek en meer lede te werf. Derik het die aanbod namens die Broodboom Vereniging aanvaar en 'n 3 m x 4 m stalletjie in die hoofsaal vir 'n broodboom-uitstalling gekry.

Asseblief, kom besoek die skou en bied veral ook hulp aan om die stalletjie gedurende die duur van die uitstalling te beman. Ons beoog om 'n rooster op te stel en persone te skeduleer om een uur sessies diens te doen by die stalletjie.

Figuur 3 Die ander groot *Encephalartos eugene-maraisii* plant wat in die Entabeni Natuurreservaat waargeneem is.
Figure 3 The other large *Encephalartos eugene-maraisii* specimen seen in the Entabeni Nature Reserve.

Die Transvaalse tak van die Broodboom Vereniging sal hul eerste jaareindfunksie van hierdie eeu op **4 November 2000** by die Botaniese Tuin in Pretoria hou. Die vergadering, waartydens die verkiesing van 'n bestuur vir 2001 en 2002 gehou sal word, sal afgesluit word deur 'n bring en braai. Die byeenkoms is oudergewoonte by Velcichhuis in die tuin van die Nasionale Botaniese Instituut, Pretoria, aan die noordelike kant van die rant. Die bestuur van die Streektak sal pap en vleis gratis voorsien maar verder moet elke persoon sy/haar eie eet en drinkgoed sowel as eet-gereedskap saambring. Lede wie se vanne met **A tot M** begin moet asseblief vrugteslaai bring terwyl diegene wie se vanne met **N tot Z** begin mengelslaai moet bring. **RSVP aan Derik Minnaar voor 25 Oktober 2000 [(012) 8033061 (na-ure)].**

Kontak gerus vir Derik by (012) 8033061 (na-ure) met enige voorstelle rakende sprekers en uitstappies, of vir verdere inligting met betrekking tot toekomstige aktiwiteite.

DOES THIS MAKE YOU CROSS?

Jeff Chemnick
114 Conejo Road, Santa Barbara,
California 93103, U.S.A.

Received 22 June 2000

Reprinted from *Cycad Newsletter* Vol. 21, # 4: 8–9, December 1998, with permission from the editor.

One sure way to start a lively debate among cycadophiles is to bring up the subject of hybrids. To hybridize or not to hybridize, that is the question! One school holds that cycad species are inviolable works of nature and should not be tampered with genetically. Among the concerns is the potential threat of generic contamination in a native population from the reintroduction of hybridized plants. Another objection is the proliferation and "trickle-down" of bastard plants through cultivation into private collections and public gardens. Enough confusion exists already without addition of man-made types and forms. Cycads are frequently sold, traded, or otherwise reconveyed from one owner to the next. Labels and tags are easily lost or accidentally switched and thus are how a hybrid cycad can infiltrate the world at large ultimately to deceive the unaware observer.

The other school says, "So what?" Exotic cycads hybridized in cultivation in the US cannot go back whence they came. Cycad pollinators from Mexico, Australia, Asia, or South Africa will not be paying visits to male cones here in the US only to fly back to a native cycad population with tainted pollen. Furthermore, the one truly reliable, scientifically valid, "accession-quality" cycads are plants or seeds from habitat with all pertinent data and proper field notations; meticulously and scrupulously maintained in a properly curated setting (like a botanical garden). All others are suspect. Why? Because labels are lost; vendors might have a conflict of interest, plants are mis-identified; localities are forgotten; and even garden produced seed of a particular species offers no assurance that both the parent plants are from the same population.

Allopatric populations of the same species are unlikely to be swimming in the same gene pool since many cycad populations are sufficiently disjunct to be beyond the pollinator's range. This is evidenced by the variation within a taxon from one population to the next. The assignment of a specific epithet to variant populations from a number of localities has the umbrella effect of implying that they are all the same thing. So the creation of garden seed of the same "species" is often a hybrid of sorts if the parent plants come from different wild populations because the seed will produce something slightly different genotypically and phenotypically from either parent population. Thus a hybrid is made within the same taxon since the result is something that does not exist in nature. In many ways, this intraspecific hybrid is more insidious than interspecific hybrids because it is not regarded as a cross but simply as a "good" species. Consider the historical record of cycad systematics in many species. A plant is described as species "a". Subsequently it might be revised or split into two or more species. But while it enjoyed the single species status, garden seeds were produced that were labelled as species "a" because at the time that was the current taxonomic disposition, even though they came from populations that were later split into species "b" and "c". Well, the plants produced from those seed are now floating around the cycad universe labelled as species "a" though to make the same cross today would be regarded as hybridizing the two species "b" and "c". And since the parental plants were similar enough to have been originally regarded as synonymous, the hybridized progeny would be nearly impossible to detect. Until such time when DNA fingerprinting in cycads is commonplace enough to easily determine genetic relationships, plant pedigree determination is an imperfect science.

However, plants from disparate parental species are much more readily identified as hybrids. I made a cross several years ago between *Encephalartos horridus* and *E. woodii*. The result is much different than either parent plant. Traditionally crosses were made between similar species such as *E. natalensis* x *E. woodii* (remember: the species contributing the female cone is listed first) and *E. arenarius* x *E. latifrons*. But why? Among cycad fascists, close doesn't count. So I suggest that it is much more interesting to create something as different as possible from known parental types. Two other crosses I have made are *E. lebomboensis* x *E. trispinosus* and *E. lehmannii* x *E. altensteinii*. They are fast-growing, beautiful and sure to be unique. Nature offers us just 300 or so distict types (species and varieties) of cycads. Hybridization opens the door for many more. In addition, it's a wonderful way not to waste the potential of perfectly good female cones when pollen is not available. There are many applications of attractive cycads in the garden and landscape that don't require the use of valid species. Growers of orchids, bromeliads, and countless other plant families realized this years ago. And I do not think there should be a stigma of compromise attached to hybrids nor their advocates. It is possible to invest one's attentions in the fascinating problems of cycad speciation and systematics in wild plants and still enjoy the creation of interesting and beautiful new hybrids for the garden. After all, it's the beauty of cycads that hooks most people's interest in the first place.

The real consideration is the purpose of the collection. If the intent is to serve as an *ex situ* repository for living vouchers of properly accessioned and curated plant materials with comprehensive field data; whether in a public botanical garden, institutional collection, or private collection, then man-made hybrids should not be included. Such a collection should serve as a living reference library for taxonomic work and as a genetic storehouse for rare and endangered plants. There should be no conflict between nature's creations and fanciful dalliances with fabricated form. Whereas if the purpose of a collection of cycads is to enhance the landscape, serve as an investment, or provide a diversion, then hybrids deserve consideration for inclusion on all three counts. The development and possession of hybrids for gratification purposes is not an impeachable offense! I welcome your comments.

jchemnick@prodigy.net

NEW CYCAD PUBLICATIONS

BOWE, L.M., COAT, G. & DEPAMPHILIS, C.W. 2000. **Phylogeny of seed plants based on all three genomic compartments: Extant gymnosperms are monophyletic and Gnetales' closest relatives are conifers.** *Proceedings of the National Academy of Sciences of the United States of America* 97(8): 4092–4097.

[Efforts to resolve Darwin's "abominable mystery" - the origin of angiosperms - have lead to the conclusion that Gnetales and various fossil groups are sister to angiosperms, forming the "anthophytes". Morphological homologies, however, are difficult to interpret, and molecular data have not provided clear resolution of relationships among major groups of seed plants. We introduce two sequence data sets from slowly evolving mitochondrial genes, coxl and atpA, which unambiguously reject the anthophyte hypothesis, favouring instead a close relationship between Gnetales and conifers. Parsimony- and likelihood-based analyses of plastid rbcL and nuclear 18s rDNA alone with coxl and atpA also strongly support

a gnetophyte-conifer grouping. Surprisingly, three of four genes (all but nuclear rDNA) and combined three-genome analyses also suggest or strongly support Gnetales as derived conifers, sister to Pinaceae. Analyses with outgroups screened to avoid long branches consistently identify all gymnosperms as a monophyletic sister group to angiosperms. Combined three- and four-gene rooted analyses resolve the branching order for the remaining major groups - cycads separate from other gymnosperms first, followed by *Ginkgo* and then (Gnetales + Pinaceae) sister to a monophyletic group with all other conifer families. The molecular phylogeny strongly conflicts with current interpretations of seed plant morphology, and implies that many similarities between gnetophytes and angiosperms, such as "flower-like" reproductive structures and double fertilization, were independently derived, whereas other characters could emerge as synapomorphies for an expanded conifer group including Gnetales. An initial angiosperm-gymnosperm split implies a long stem lineage preceding the explosive Mesozoic radiation of flowering plants and suggests that angiosperm origins and homologies should be sought among extinct seed plant groups.]

First author's address: Department of Biology, Institute of Molecular Evolutionary Genetics, and Life Sciences Consortium, Pennsylvania State University, University Park, PA, 16802 U.S.A.

CHAW, S-M., PARKINSON, C.L., CHENG, Y., VINCENT, T.M. & PALMER, J.D. 2000. **Seed plant phylogeny inferred from all three plant genomes: Monophylly of extant Gymnosperms and origin of Gnetales from conifers.** *Proceedings of the National Academy of Sciences of the United States of America* 97(8): 4086–4091.

[Phylogenetic relationships among the five groups of extant seed plants are presently quite unclear. For example, morphological studies consistently identify the Gnetales as the extant sister group to angiosperms (the so-called "anthophyte" hypothesis), whereas a number of molecular studies recover gymnosperm monophyly, and few agree with the morphology-based placement of Gnetales. To better resolve these and other unsettled issues, we have generated a new molecular data set of mitochondrial small subunit rRNA sequences, and have analysed these data together with comparable data sets for the nuclear small subunit rRNA gene and the chloroplast rbcL gene. All nuclear analyses strongly ally Gnetales with a monophyletic conifer, whereas all mitochondrial analyses and those chloroplast analyses that take into account saturation of third-codon position transitions actually place Gnetales within conifers, as the sister group to the Pinaceae. Combined analyses of all three genes strongly support this latter relationship, which to our knowledge has never been suggested before. The combined analyses also strongly support monophyly of extant gymnosperms, with cycads identified as the basal-most group of gymnosperms, *Ginkgo* as the next basal, and all conifers except for Pinaceae as sister to the Gnetales + Pinaceae clade. According to these findings, the Gnetales may be viewed as extremely divergent conifers, and the many morphological similarities between angiosperms and Gnetales (e.g., double fertilization and flower-like reproductive structures) arose independently.]

First author's address: Department of Biology, Institute of Molecular Evolutionary Genetics, and Life Sciences Consortium, Pennsylvania State University, University Park, PA, 16802 U.S.A.

KOKUBUGATA, G., KONDO, K., WILSON, G.W., RANDALL, L.M., VAN DER SCHANS, A. & MORRIS, D.K. 2000. **Comparison of karyotype and r-DNA-distribution in somatic chromosomes of *Bowenia* species (Stangeriaceae, Cycadales).** *Australian Systematic Botany* 13(1): 15–20.

[Somatic chromosomes at mitotic metaphase of *Bowenia serrulata*, *B. spectabilis* and *B.* sp. "Tinaroo" were investigated by the standard aceto-orcein staining method and the fluorescent *in situ* hybridisation method (FISH) with ribosomal DNA (rDNA) probe. *Bowenia serrulata*, *B. spectabilis* and *B.* sp. "Tinaroo" each have a chromosome number of 2n=18. The karyotype of *B. serrulata* exhibits 10 median-centromeric chromosomes, while *B. spectabilis* and *B.* sp. "Tinaroo" exhibit eight median-centromeric chromosomes. By using FISH, *B. serrulata*, *B. spectabilis* and *B.* sp. "Tinaroo" show a hybridisation signal on the satellite of the short arm of two submedian-centromeric chromosomes. However, the other hybridisation signal pattern is different among *B. serrulata*, *B. spectabilis* and *B.* sp. "Tinaroo".]

First author's address: Tsukuba Botanical Garden, National Science Museum, Tokyo, Amakubo, Tsukuba City, 305-0005 Japan.

SCHUTZMAN, B., VOVIDES, A.P. & ADAMS, R.S. 1998. **A new *Zamia* (Zamiaceae, Cycadales) from central Panama.** *Phytologia* 85(3): 137–145.

[*Zamia elegantissima* Schutzman, Vovides & Adams is described from central Panama, and differentiated from closely related taxa *Z. fairchildiana* L.D. Gomez and *Z. tuerckheimii* J. Donn. Sm. The new species was previously considered part of *Z. fairchildiana*, but is morphologically and geographically distinct.]

First author's address: Department of Environmental Horticulture, University of Florida, 1525 Fifield Hall, Gainesville, FL, 32611-0670 U.S.A.

Compiled by **Nat Grobbelaar**, *P.O. Box 15357, 0039 Lynn East, South Africa.*

THE CYCAD SOCIETY OF SOUTH AFRICA

INCOME STATEMENT

- for the year ended 31 December 1999

	1999	1998	1997
Income	**103 225**	97 255	69 539
Subscriptions	**79 692**	73 718	54 797
Donations	**6 599**	6 597	5 469
Sales - back issues	**3 968**	3 685	870
Interest received	**12 108**	12 672	7 540
Sundry income	**858**	583	863
Less: Expenditure	**97 193**	64 673	56 002
Bank charges	**1 118**	709	1 972
Branch transfers	**2 276**	2 304	-
Depreciation	**1 929**	2 018	2 018
Grants & subsidies	**7 000**	-	-
'Encephalartos' publication & printing costs	**55 847**	31 836	28 246
Postage & photo copies	**27 791**	26 427	21 498
Sundry expenditure	**1 232**	1 379	2 268
Net surplus for the year	**6 032**	32 582	13 537
Accumulated reserves			
- at beginning of year	**101 360**	68 778	55 241
- at end of year	**107 392**	101 360	68 778

THE CYCAD SOCIETY OF SOUTH AFRICA

BALANCE SHEET

- at 31 December 1999

	1999	1998	1997
Capital Employed			
Accumulated reserves	**107 392**	101 360	68 778
Employment of capital			
Fixed assets	**2 302**	1 851	3 869
Net current assets	**105 090**	99 509	64 909
Current assets	**123 956**	124 366	83 131
Cash at bank	**81 580**	83 247	44 526
Fixed deposits	**32 605**	32 605	32 605
Stock - back issues	**9 771**	8 514	6 000
Less: Current liabilities	**18 866**	24 857	18 222
Prepaid subscriptions	**18 350**	24 857	17 825
Sundry creditors	**516**	-	397
Net assets	**107 392**	101 360	68 778

I hereby declare that I am a member of the Cycad Society of South Africa, but that I have no interest in its financial affairs. The financial statements have been compiled from information and explanations received from the President and Officials of the Society.

I therefore certify that the Balance sheet and income statement for the year ended 31 December 1999 are in accordance with the accounting records.

WJ Diedericks

Pretoria, 2 June 2000

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR
(continued vervolg)

Dear Editor

Re MAANS KEMP

I was profoundly sorry to hear of Maans Kemp's death as announced in the June 2000 issue of *Encephalartos*.

As mentioned on p. 7, Maans was almost wholly responsible for producing the first 16 issues of our magazine and the well-structured format which he initiated is still used at present. But much more than that, through the Society I developed a very sincere friendship with Maans and his family. There are few that I know who have as rigorous a set of academic, community and family values and who remain humble and down-to-earth. Maans, we'll miss you.

Roy Osborne, *Cycad Connections, P.O. Box 244, Burpengary, Queensland 4505, Australia.*

Received 21 July 2000

FROM COUNCIL / VAN DIE RAAD

IMPORTANT NOTICE / BELANGRIKE KENNISGEWING

ENCLOSED IN THIS ISSUE OF "ENCEPHALARTOS" (NO. 63, SEPTEMBER 2000) EACH MEMBER WILL FIND A PERSONAL ACCOUNT IN HIS/HER COPY (LOOSE LEAF) TO RENEW HIS/HER MEMBERSHIP FOR 2001. PLEASE RENEW YOUR MEMBERSHIP BEFORE THE END OF DECEMBER 2000. IF YOU FAIL TO RENEW BEFORE THIS DATE YOUR NAME WILL BE TEMPORARILY REMOVED FROM THE MEMBERSHIP LIST AND YOU WILL NOT RECEIVE THE MARCH 2001 ISSUE OF "ENCEPHALARTOS" UNTIL YOU HAVE RENEWED YOUR MEMBERSHIP.

****

INGESLUIT IN HIERDIE UITGAWE VAN "ENCEPHALARTOS" (NR 63, SEPTEMBER 2000) SAL ELKE LID IN SY/HAAR EKSEMPLAAR 'N PERSOONLIKE REKENING VIND (LOS BLAD) OM SY/HAAR LIDMAATSKAP VIR 2001 TE HERNU. HERNU ASSEBLIEF U LIDMAATSKAP VOOR DIE EINDE VAN DESEMBER 2000. INDIEN U NALAAT OM VOOR HIERDIE DATUM TE HERNU, SAL U NAAM VOORLOPIG VAN DIE LEDELYS VERWYDER WORD EN SAL U NIE DIE MAART 2001 UITGAWE VAN "ENCEPHALARTOS" ONTVANG ALVORENS U NIE U LIDMAATSKAP HERNU HET NIE.

SHAMEFUL CONDUCT IN POSTAL SERVICES: POSTAL ARTICLES DISAPPEAR!, BUT WHERE?
SKANDELIKE GEDRAG IN POSDIENSTE!, POSSTUKKE RAAK WEG!, MAAR WAAR?

Editor / Redaktrise

Re the *Lepidozamia hopei* article by Roy Osborne (Australia): In *Encephalartos* **62**: 4, I reported that the original set of photographs that Roy posted to us by airmail on 27 January 2000 got lost in the post. Unfortunately the second set op photographs that he posted to us, also by airmail, on 5 April 2000 also got lost in the post. Those photographs are of no commercial value to other people but, including postage, they must have cost Roy quite a bit of money and, even worse, he had to borrow photographs from other Australian members of our Society. One can only speculate as to where the photographs disappeared, and on the mentality of some employees in the postal system, who unfortunately will probably never set eyes on this report.

Insake die *Lepidozamia hopei* artikel deur Roy Osborne (Australië): In *Encephalartos* **62**: 4, het ek berig dat die oorspronklike stel foto's wat Roy op 27 Januarie 2000 per lugpos aan ons gepos het in die pos verlore geraak het. Ongelukkig het die tweede stel foto's wat Roy op 5 April 2000, ook per lugpos, aan ons gepos het ook in die pos verlore geraak. Daardie foto's het geen kommersiële waarde vir ander mense nie maar, saam met die posgeld, moes dit Roy seker heelwat geld gekos het en, nog erger, hy moes ook foto's by ander Australiese lede van ons Vereniging leen. Mens kan maar net spekuleer oor waar die foto's verdwyn het en oor die mentaliteit van sommige werknemers in die poswese, wie ongelukkig waarskynlik nooit hierdie skrywe onder oë sal kry nie.

MEMBERSHIP FEES FOR 2001 / LEDEGELD VIR 2001

Membership fees had to be increased due to an increase in postal rates and printing costs. Henceforth all issues of *ENCEPHALARTOS* will be published with the front cover and four pages with photographs in colour. / Ledegeld moes verhoog word weens verhoogde postariewe en drukkostes. Alle uitgawes van *ENCEPHALARTOS* sal voortaan met die voorblad en vier bladsye met foto's in kleur gedruk word.

Local / Plaaslik: R106.00

Africa / Afrika: Airmail / Lugpos: R195.00
Surface mail / Landpos: R123.00

Overseas / Oorsee: Airmail / Lugpos: R290.00; US$44.00; A$72.00
Surface mail / Seepos: R175.00; US$26.00; A$44.00

OTHER CYCAD WEBSITES / ANDER BROODBOOM WEBBLAD-ADRESSE

Visit the website of the National Botanical Institute, Private Bag X7, Claremont 7735, South Africa at
http://www.nbi.ac.za

One of our American members, Doug Eckel, has a website which is well worth visiting if you are interested in cycads:
http://home.earthlink.net/~decho

Die persoonlike webblad-adres van een van ons lede in Swaziland, Morné Ferreira, is:
http://www.swazi.com/people/cycad/cycadhome.html

NEWSPAPER CLIPPING / KOERANTUITKNIPSEL

Cycad dealer fined R10 000 *(June 21, 2000)*

Sharon Hammond of African Eye News Service reports that a Johannesburg-based cycad dealer, Rolf Bauwer, was fined R10 000 in the Barberton Regional Court for stealing nine cycads in March this year.

According to the report, the court also ordered Bauwer to forfeit his four-wheel drive bakkie to the Mpumalanga Parks Board. He was given an additional 12 months in jail suspended for three years. Bauwer pleaded guilty to a charge of illegally picking especially protected plants. He was arrested with three villagers on March 22 when he was caught with nine E.paucidentatus cycads on the back of his bakkie. The cycads were taken from the Songimvelo Game
Reserve.

A spokesperson for the Mpumalanga Parks Board, Gary Sutter, said it is hoped that the sentence will act as deterrent to other cycad thieves.

Useful link 1: African Eye News Service
Useful link 2: Mpumalanga Parks Board

[Fortunately Rolf Bauer is not a member of the Cycad Society of South Africa. Readers, please let us know whether we should continue to publish such negative news reports or not.]