ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 49 MARCH / MAART 1997 ISSN 1012-9987

CYCAD SOCIETY OF SOUTH AFRICA

BROODBOOM VERENIGING VAN SUID-AFRIKA

Council members / Raadslede

CHANGE OF ADDRESS / ADRESVERANDERING

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COVER / VOORBLAD : *Macrozamia communis*

Emerging male cone photographed at Bateman's Bay, New South Wales, Australia. About 250 mm long, excluding peduncle.

Photo: Piet Vorster

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The "List of Members" will be included in the June issue of our journal.

Die "Ledelys" sal in die Junie-uitgawe van ons tydskrif ingesluit word.

FROM THE PRESIDENT

According to the Constitution of the Cycad Society of South Africa, "Council members shall serve a two year term, but are eligible for re-election". The present Council is serving its second year now, and towards the end of the year we must elect a new Council for 1998 and 1999. Details about the election and functioning of Council can be found on pages 2-4 of the Constitution, but for your convenience I will highlight a few points. The present Council consists of the following members:

President: Hannes Robbertse
Secretary-treasurer: Giel Fourie was replaced by Guillaume Theron
Editor of "*Encephalartos*": Isabella Claassen
Printing and dispatch officer: Piet Vorster
Back copies officer: André Jordaan

Branch representatives:

Transvaal branch: Hanneke Grobbelaar
Natal branch: Danie Nel
Eastern Cape branch: Frank Marx

I want to give early notice that I am not available for re-election and we will have to find a new president for the next term. I would also like to invite members to nominate candidates for each of the above offices and also supply a short *curriculum vitae* of the nominee, so that we can circulate the names in the July issue of "*Encephalartos*" and enclose the ballot papers in the September issue. Names of the newly elected Council will then be published in the December issue.

Please also study point 6 of the Constitution dealing with Regional Branches. Maybe some of you would like to form a new branch and you are most welcome to do so. I think we have far too few active branches to get members involved in our activities.

Giel Fourie's resignation came just after I had submitted my previous letter "From the President". I do not think that we all realise how much time is spent to keep the finances and member records up to date. Giel really did a wonderful job in this regard and on behalf of all the members I wish to thank him for all the hard work he has done for the Society and the spirit in which it was done. Giel, we wish you and your family all the best and good luck for the future.

I also wish to thank Guillaume Theron for accepting the gigantic task of Secretary-treasurer at very short notice.

Hannes Robbertse

VAN DIE PRESIDENT

Die grondwet van die Broodboom Vereniging van Suid-Afrika bepaal: "Lede van die Raad word vir 'n termyn van twee jaar aangestel, maar is herkiesbaar". Lede van die huidige Raad dien tans reeds vir hul tweede jaar en teen die einde van die jaar moet daar 'n nuwe Raad vir 1998 en 1999 verkies word. Besonderhede in verband met die verkiesing en funksionering van die Raad verskyn op bladsye 2-4 van die Grondwet, maar vir u gerief lig ek hier 'n paar punte uit. Die huidige Raad bestaan tans uit die volgende lede:

President: Hannes Robbertse
Sekretaris-tesourier: Giel Fourie is pas vervang deur Guillaume Theron
Redakteur van "*Encephalartos*": Isabella Claassen
Druk- en verspreidingsbeampte: Piet Vorster
Beampte vir vorige uitgawes: André Jordaan

Verteenwoordigers van Takke:

Transvaal: Hanneke Grobbelaar
Natal: Danie Nel
Oos-Kaap: Frank Marx

Ek wil vroegtydig kennis gee dat ek nie vir 'n volgende termyn herkiesbaar sal wees nie en dat ons 'n nuwe president vir die volgende termyn sal moet vind. Ek wil ook graag lede uitnooi om nominasies vir elk van die verskillende ampte in te dien en ook 'n kort *curriculum vitae* van die genomineerde saam te stuur. Die name en besonderhede sal dan in die Junie-uitgawe van "*Encephalartos*" vir kommentaar voorsien word sodat ons in die September-uitgawe die stembriewe kan insluit. Die name van die nuwe Raad sal dan in die Desember-uitgawe gepubliseer word.

Bestudeer ook asseblief die besonderhede van punt 6 van die Grondwet wat oor Streektakke handel. Moontlik stel van die lede daarin belang om met hul eie streektak te begin. Ek sal so-iets verwelkom aangesien ek dink dat ons by verre te min streektakke het om lede aktief by aktiwiteite te betrek.

Giel Fourie se bedanking het plaasgevind nadat ek my vorige brief "Van die President" vir publikasie aangebied het, sodat ons nie vir hom tot siens kon sê nie. Ek dink nie al die lede besef werklik hoeveel tyd daaraan bestee word om die finansies en gegewens van lede op datum te hou nie. In hierdie verband het Giel hom uitstekend van sy taak gekwyt en namens al die lede wil ek hom van harte bedank vir sy harde werk vir die Vereniging en die gees waarin hy dit gedoen het. Giel, ons wil vir jou en jou familie alles van die beste en baie geluk vir die toekoms toewens.

Verder wil ek ook vir Guillaume Theron bedank omdat hy na baie kort kennisgewing die reusetaak van Sekretaris-tesourier aanvaar het.

Hannes Robbertse

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:**

MACROZAMIA MOOREI F. Muell.

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

INTRODUCTION

Of all the *Macrozamia* species, it must be Australia's *Macrozamia moorei* which takes the prize for the biggest and the best. To me, seeing the fantastic stands of this imposing palm-like plant at Carnarvon Gorge (Figures 1, 2) was akin to seeing *Encephalartos transvenosus* at Modjadji for the first time. There's a similar ambience, not quite definable, which involves past people and cultures, things spiritual and the uneasy wonder of the wild. Others have been similarly affected: Len Butt writes as follows: "To see *Macrozamia moorei* in its natural state is to answer the question: 'Why grow or bother about Zamiaceae?' In the Carnarvon Gorge the *Macrozamia* dominates the scene from the entrance gates to the National Park, right through the established camping areas along the sides of the winding creek, and up both sides of the sloping gorge right up to the sheer cliffs. Even the other dominant plant in this area, an unnamed *Livistona* fan palm, takes second place to the big showy grandeur that is this cycad." Charles Chamberlain, during his visit to Australia in the early years of this century, wrote that - after travelling for a great distance through drought-ridden country - he came across the cycads at Carnarvon Gorge "..... the cycads looked fresh and vigorous, with dark green leaves and a wonderful display of cones." No-one can fail to be impressed by this plant, superficially more like a *Phoenix canariensis* palm than a cycad. Thus it is appropriate that the first of the Focus on ..... series to feature a *Macrozamia*, deals with this particular species.

Figure 1 A pair of tall *Macrozamia moorei* specimens stradles a trail in the Carnarvon National Park.

DISCOVERY

Undoubtedly *Macrozamia moorei* was well-known to the aboriginal tribes of central Queensland who must have regarded the plant as a useful food source. But it was Baron Ferdinand von Mueller (1825-1896) of the Melbourne Botanic gardens, writing in the *Chemist and*

Druggist of March 1881, who first drew the attention of the western world to the palm-like cycad. He based his description on material collected by J.G. Macdonald and P.A. O'Shanesy in hills near the Nogoa River in the Queensland's Springsure District. In naming the species, Mueller chose to honour Charles H. Moore, Superintendent of the Sydney Botanic Gardens for 48 years (1848-1896) and himself an avid cycad enthusiast. Mueller was a prolific correspondent, publishing numerous notes between 1858 and 1889 but (perhaps since he was not a person for spending much time in the field) couldn't seem to make up his mind if *Macrozamia* was a genus in its own right or perhaps a subgenus of *Encephalartos*. Thus we have citations: *Macrozamia moorei* F. Mueller from March 1881 and *Encephalartos moorei* (F. Mueller) F. Mueller of August in the same year, with the process being reversed in the name *Macrozamia moorei* F. Mueller ex F.M. Bailey in the *Queensland Flora* of 1883. These taxonomic niceties and the validity of the various citations are fully detailed by L.A.S. Johnson (1959, 1961) and need not concern us further.

Figure 2 The author, with a leaning specimen of *Macrozamia moorei* at Carnarvon Gorge. Photo: Angela Osborne.

One point that is of interest is that the original species description was taken to include a population of cycads in the Clarence River district of northern New South

Figure 3 Typical habitat for *Macrozamia moorei* - sloping terrain, sparsely wooded with *Eucalyptus* species - on a farm in the Injune District, Queensland.

Figure 4 A magnificent specimen of *Macrozamia moorei* in the Injune District, dwarfing Alan Buckley (left) and Ken Newton (right).

Wales. Only in 1992 was this matter resolved when the latter population was named as *Macrozamia johnsonii* by David Jones and Ken Hill. A consequence here is that many of the larger plants in major international botanical gardens, labelled as *Macrozamia moorei*, are in fact *M. johnsonii*. Any specimen with locality data "New

Figure 5 Mature *Macrozamia moorei* plants near Dawson River on the Injune - Rolleston Road.

South Wales" would certainly be one of these.

DISTRIBUTION AND ECOLOGY

Macrozamia moorei is endemic in central Queensland, extending from the Emerald area, on the Tropic of Capricorn, southwards through the Springsure and Rolleston districts towards Injune (Figures 3-5) and bounded in the west by mountains which are part of the Great Diving Range. It occurs in great stands so that it is described as "locally common". The associated vegetation varies from dry sclerophyll eucalypt woodland to quite well-developed eucalypt forest. Summer night/day temperatures extend from 21-35°C, while in winter the range is 6-23°C. Severe frosts can occur during the winters. The rainfall is about 500 mm p.a., falling mainly during the summer.

In the drier areas, comprising a dry sclerophyll woodland, the cycad populations are exposed to a regular burning cycle. In the wetter forested areas, particularly along river valleys, plants are not regularly exposed to fire. Interestingly, the cycad populations seem to survive equally well in both environments.

In the south-eastern part of its distribution, I have seen *Macrozamia moorei* occurring together with *M. fearnsidei*, a much smaller plant in the section *Parazamia*. In this situation, there are occasional intermediate plants which appear to be hybrids between the two species.

Little is known of the plant-insect relationships for this cycad. Until recently, all *Macrozamia* species were thought to be wind-pollinated, but recent research by C.E. Chadwick of the Australian Museum in Sydney has shown that there is an intimate relationship between *Macrozamia communis* and a curculionid beetle, *Tranes lyterioides*, which is active only at night time and which appears to have a role as a pollen vector. It is reasonable to believe that a similar situation may exist in other *Macrozamia* species. Little too is known of the seed dispersal animals for this plant. The attractively-coloured seeds must serve as a signal to predator-dispersers and it is probable that rodents, marsupials (possums, wallabies and kangaroos) and large birds (emus, parrots and cockatoos) function as seed transporters.

The toxic properties of *Macrozamia moorei* have been a subject of much discussion, most of it ill-informed. It is

Figure 6 ***Macrozamia moorei*** **leaf detail : note the rigid leaflets with sharp apices and swollen bases, these in a flattish plane and set at an angle of about 40° towards the rachis.**

true that cattle consuming the fresh cycad leaf growth, e.g. after a fire, may be subject to the nervous attack known as the bovine staggers. Earlier in this century, the Australian government embarked on a programme supplying large quantities of arsenic so that stock farmers could poison the offending cycads. In the early stages, many old mature plants, several meters in height, were poisoned, although cattle clearly would not be able to reach the foliage. Nowadays, many farmers still regard *Macrozamia* plants as a threat and actively engage in their eradication, but concentrate on removal of the smaller specimens. Some enlightened farmers (from our point of view) have gone to the trouble of isolating the cycad stands by fencing them off. Despite all this, the toxic principle which leads to the hindquarter paralysis condition remains unknown (Seawright *et al.* 1996).

A second and probably quite separate issue in terms of toxicity is the presence, mainly in the seed megagametophyte, of significant quantities of substances which are candidate liver poisons. Much has been published on the hepatotoxicity of MAM (methylazoxymethanol) and its glycosides (cycasin, macrozamin and related compounds). Yet another candidate neurotoxin in seeds is the substance B-methylamino-L-alanine (BMAA). It is curious that the Australian aboriginals and the African hottentots arrived at similar methods for treating the seeds (crushing, washing and roasting) so as to remove the toxins and obtain a raw material for bread-making. One wonders at what cost to human life these discoveries were made.

DESCRIPTION

1. STEM

The largest, or more correctly, "bulkiest" of the species in the genus, *Macrozamia moorei* can reach 8 m in height although plants are more commonly at 2-3 m tall. Trunk diameters are in the range 600-800 mms. Much of this diameter results from the persistent leaf bases which are gradually compressed and eroded with age to *give a* coarse "bark" to the trunk.

2. LEAVES AND LEAFLETS

The numerous pinnate leaves are 1.5-3.0 m long, dark bluish-green in colour and gracefully curved to give an overall rounded appearance to the foliage (Figures 1-5). This pattern is completed by the "skirt" of dead leaves in the lower section - unless these are burnt off in a fire. The long-lasting quality of the foliage has resulted in some interest from the floral trade.

The leaflets, which have stomata on both surfaces, are evenly spaced along an untwisted yellowish rachis (Figure 6). Median leaflets are 200-400 mm long by 5-11 mm wide and end apically in a sharp point while terminating basally in a white callous swelling. They are reduced progressively in size towards the leaf base and end up as a series of very tough spines. The rachis is concave on the upper surface but quite distinctly keeled below; terminating at the base in a swollen 50-100 mm long petiole set amongst cataphylls in a woolly crown. Opposing leaflets are set at an angle of less than 90° to each other, so as to give a "V" appearance to the leaf when viewed in section. Leaflets are also set at an acute angle (40-60°) to the rachis, so that they project forward when viewed from above.

3. REPRODUCTIVE STRUCTURES

Macrozamia moorei bears large numbers of male cones; up to 20 per plant for any one season would be typical. (Numbers of 100 male cones per plant are quoted in some writings but this is either an exaggeration or refers to a total of cones and cone remnants over several seasons.) The cones measure 250-450 mm in length by 80-100 mm in diameter and are supported on a 100-150 mm peduncle. They are cylindrical, green to brownish in colour, straight at first but becoming curved with age and length. The wedge-shaped male sporophylls are 20-

30 mm by 15-20 mm and have a centrally-placed erect spine 2-20 mm long.

The barrel-shaped female cones (Figure 7) for this species, together with those of *Macrozamia macdonnellii*, are the largest for the genus. Female plants typically bear up to 8 cones, sea-green in colour, each measuring 400-900 mm by 120-200 mm and supported on a 150-250 mm peduncle. Female sporophylls are wedge-shaped, 50-100 mm by 40-80 mm with a vicious spine about 20-70 mm long (Figure 7). Seeds are borne in pairs on each sporophyll (Figure 8); they are red to scarlet in colour, 40-60 mm long by 25-35 mm wide.

Figure 7 The mature female cone of *Macrozamia moorei*. As the seeds enlarge, they force the cone scales apart and produce an interesting and colourful structure.

AFFINITIES

Macrozamia moorei is closely related to *M. johnsonii* from which it was separated in 1992. Mature *M. moorei* plants are larger in all dimensions and have a bluer hue to the foliage. Seedlings of *M. moorei* have erect, straigt, dark blue-green leaflets. Seedling leaves have a petiole which is flat on the upper surface and a rachis which is recurved at the tip. By contrast, mature *M. johnsonii* plants are smaller, with much greener foliage.

Figure 8 *Macrozamia moorei* - details of seed-bearing sporophylls, seeds and seeds with the sarcotestae removed.

Seedlings of *M. johnsonii* have a rounder petiole and a more-or-less straight rachis with widely spreading falcate, thin-textured shiny green leaflets. These have stomata on the lower surface only and show a prominent white callous protuberance at an early age.

It is also reasonable to believe that *Macrozamia moorei* is related to other species in the Section *Macrozamia*, e.g. *M. communis, M. dyeri, M. fraseri, M. macdonnellii* and *M. riedlei*. However, the phylogeny for the genus has not been investigated in detail and we should guard against too many assumptions in this respect.

CULTIVATION AND CONSERVATION

With the swing away from the exotic and towards the indigenous, *Macrozamia moorei* is beginning to find its long-overdue niche in the Australian horticultural industry. It has all the advantages. Grown in a sunny position with good drainage, it responds well albeit slowly. Younger plants can look good in containers from 5-years onwards although a specimen plant needs several decades to reach maturity. Growth can be optimized by providing humus-rich slightly acidic soil, watering when dry and giving regular light applications of fertilizer. *Macrozamia moorei* is tough and adaptable, being suitable for container work, as a special landscape feature plant, or forming an imposing palm-like avenue. It is not troubled by any particular pest or disease and is one of the few cycads which can tolerate quite heavy frosts.

Macrozamia moorei is readily propagated from seed (Figure 9). Fresh seed has a ripening period of 6-12 months after the cone fragments, during which the embryo continues to develop. Planted seed will germinate intermittently for a year and a half thereafter. Since the species doesn't usually branch or produce suckers, propagation by any vegetative method is limited.

Figure 9 The appearance of *Macrozamia moorei* seedlings is characteristic for the species.

All cycads in Queensland are protected plants under the Queensland Nature Conservation Act of 1994. Each has been classified and *Macrozamia moorei* is listed as "common" (Paul Forster gave an update of the legislation in *Encephalartos* 46). The large stands of *Macrozamia moorei* occurring in the Carnarvon and Expedition National Parks are afforded additional protection by the Department of Environment & Heritage. However, there is little effective protection for the stands elsewhere and many hundreds of large plants have been removed for garden specimens with or without the knowledge of the landowners. Presently, some local nurseries in Queensland are offering 5-10 year-old seed-grown *Macrozamia* plants at quite reasonable prices; it is hoped that this supply will at least partially reduce the pressure on wild populations.

ACKNOWLEDGEMENTS

I am indebted to Ken Hill and David Jones for critical reading of the first draft of this manuscript. I have relied almost exclusively on the data in David Jones' "Cycads of the World", for the measurements given in the leaf and cone descriptions. Photographs are by the author unless mentioned otherwise.

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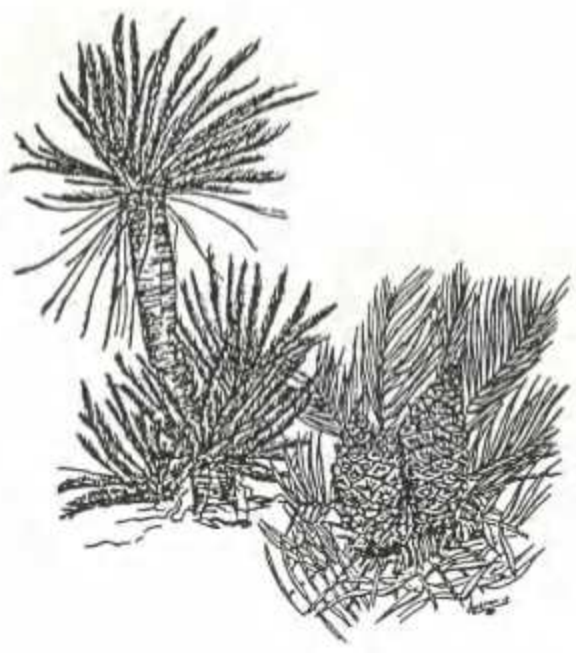

CERATOZAMIA WHITELOCKIANA

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

Received 3 October 1996

This article is based on a text that was previously published in *PHYTOLOGIA* 79(1): 51-57 (1995) as "Chemnick, J. & T.J. Gregory, A new species of *Ceratozamia* (Zamiaceae) from Oaxaca, México with comments on distribution, habitat and relationships". *PHYTOLOGIA* has granted permission for its use here.

MORPHOLOGY

1. STEM

Stem solitary, semi-subterranean (Figures 1, 2, 3c), moderately short (20-30 cm), cylindrical (12-18 cm) in diameter, covered by rough, irregular persistent leaf and cataphyll bases, brownish-red; cataphylls wrinkled, stipulate, triangular, densely white hairy at crown, irregularly arranged on lower portions of stem, 5 cm wide and 5 cm long.

Figure 1 *Ceratozamia whitelockiana*; *in situ* (1980).

2. LEAVES AND LEAFLETS

Leaves 2.0-2.5 m long, usually in whorls of 2-4, recently-emerged and juvenile leaves (Figures 4, 5) glaucous on both surfaces, light pea-green, older leaves glabrous, uniformly medium-green on both surfaces, adult plants with up to 2 previous whorls of leaves; petiole 1.00-1.25 m long, terete (circular in transverse section) with an expanded base, 15 mm in diameter at base and tapering gradually to 8 mm at the first leaflet, sparsely armed with simple spines (1-3 mm), spines more densely distributed proximally and becoming sparse distally; rachis nearly straight, subterete, very sparsely armed on proximal 25%, ending in conical-linear apex 10-25 mm long and unarmed; adaxial (upper) surface is flattened and shallowly bisulcate (2-grooved) with leaflets inserted in the paired grooves up to 5 mm apart, the paired grooves arising distally to the first pair of leaflets; leaflets (Figures 1, 2, 3c, 4, 5) linear lanceolate to falcate, papyraceous (papery), the median leaflets 30-50 cm long, gradually attenuate, 30-38 mm wide, with 22-27 veins slightly raised on abaxial (lower) surface, 30-40 leaflet "pairs" inserted on 25-50 mm centres, opposite to sub-opposite, 9-12 mm wide at point of attachment on rachis, margins are slightly revolute and turned upward, basal 25-30% of leaf keeled becoming flattened distally, leaflets gradually reduced in length towards apex.

Figure 2 *Ceratozamia whitelockiana*; *in situ*, **plant with old leaves.**

3. REPRODUCTIVE STRUCTURES

Male cone (microsporangiate strobilus) (Figures 3b, 6) elongate-conical, solitary, 26-28 cm in length, 28 mm in diameter at base, 15 mm in diameter distally, mucronate (terminating in a sharp point), peduncle 20-30 mm long and 11-15 mm in diameter, tomentose to woolly;

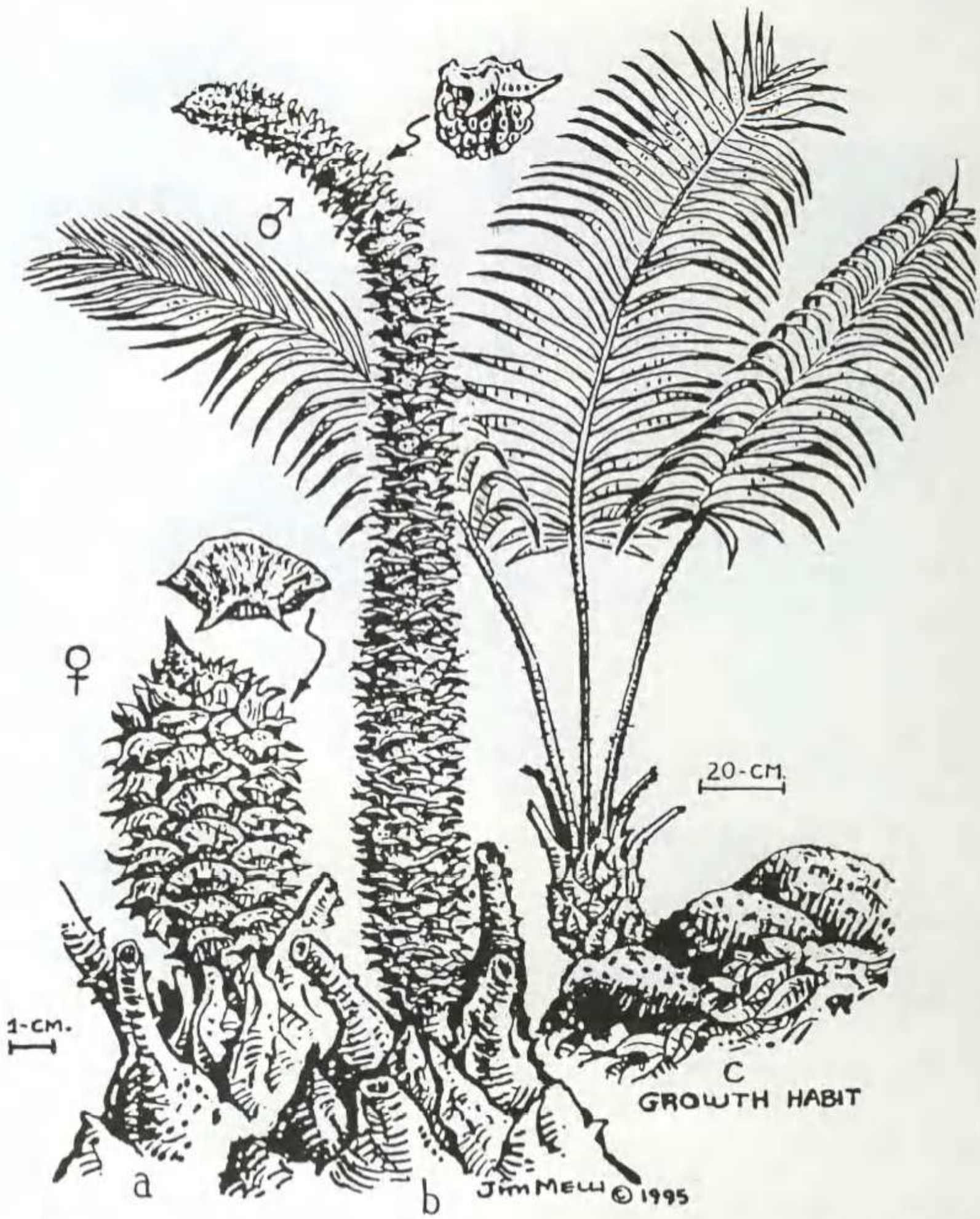

Figure 3 *Ceratozamia whitelockiana*: **a) female cone at pollination; b) male cone after shedding pollen; c) growth habit. Delineator: Jim Melli.**

microsporophylls (male cone scales) 8 mm wide and 3 mm long, sporangia in a single patch, olive green.

Female cone (megasporangiate strobilus) (Figures 3a, 7) cylindrical to ovoid with a large apiculum (sharp point at the apex/apiculate cap), solitary, overall length 14-18 cm and diameter 7.5-10.0 cm at maturity, apiculate cap 1.5-3.0 cm long and 3-5 cm wide, female cone borne on a short peduncle 30-38 mm long and 18-20 mm wide; female cone scale (megasporophyll) length 2.5-3.0 cm, sporophyll face 3.5-5.0 cm wide and 17-23 mm long, inner face somewhat glabrous except for the moderately rolled margins which are grey tomentose; sporophyll horns divergent to either side of the sporophyll, up to 10 mm long, only slightly raised from the sporophyll face, outer edges grey and tomentose, horns joined by a wrinkled raised edge; female cone with short purple hairs sparsely scattered on sporophyll face and sarcotesta (fleshy outer seed-coat) where exposed between megasporophylls which are widely separated at maturity by the fully developed seeds.

Sarcotesta of seed white, soon turning brown as it ripens; 31-33 mm long, 25-27 mm wide; sclerotesta (hard inner seed-coat) irregular, ovoid, tan, 24-26 mm long, 18-20 mm wide, smooth with 8-9 indistinct longitudinal ridges.

Ceratozamia whitelockiana is named to honour Mr.

Loran Whitelock of Los Angeles, California, U.S.A. for his remarkable dedication and contribution to cycad biology and awareness throughout the world.

Figure 4 *Ceratozamia whitelockiana*; **emergent leaves.**

Figure 5 *Ceratozamia whitelockiana*; **detail of emergent leaves.**

DISTRIBUTION AND HABITAT

Ceratozamia whitelockii was up to March 1996 known only from the drainage of the Rio Valle Nacional in montane tropical forest within the altitudinal range of 335-973 m above sea level, but occurs more commonly at lower elevations (335-600 m). Habitat consists of very steep slopes with small pockets of remnant primary forest now covered mostly by coffee and banana groves and secondary growth. The patchy canopy consists of emergent trees to specimens 40 m tall covered with epiphytes. *Ceratozamia whitelockiana* occurs on heavily shaded east- and west-facing slopes in primary forest with *Chamaedorea* sp., *Geonoma* sp., *Melastoma* spp., *Acanthus* sp., *Ficus* sp., and *Selaginella* sp. Soil is light-coloured crumbly, rocky clay with outcroppings of sedimentary rock. *Ceratozamia whitelockiana* growing in exposed, deforested areas have extremely bleached, yellow leaves. The entire locality is rapidly being cleared and burned and thus this cycad must be considered endangered. In our survey of the locality in May, 1995 we found approximately 250 plants during three days of field work. The same areas were visited several times in 1979, 1980, and 1981 and the population of *Ceratozamia whitelockiana* was considerably larger then, perhaps by twice as many individuals. Since this cycad is seldom seen in collections, it appears that habitat destruction is the greatest threat to its existence. The more inaccessible reaches of the Rio Valle Nacional drainage are likely to contain many pocket populations of *Ceratozamia whitelockiana* but the rapid rate of deforestation will soon reach areas that are currently inaccessible. In May 1995, the smoke from clearing fires was intense and recently cleared fields, as evidenced by still fresh, charred remains, were spread throughout the drainage like a patchwork quilt. This cycad does not seem to persist in open situations or in second growth forest for very long. The only plants we found in cleared areas were artificially maintained by local farmers and appeared bleached and chlorotic.

RELATIONSHIP TO OTHER SPECIES OF *CERATOZAMIA*

Ceratozamia whitelockiana is distinguished from the other large-leaved *Ceratozamia* as follows: *C. mexicana* has smooth, dark brown, globose stems up to 1 m tall

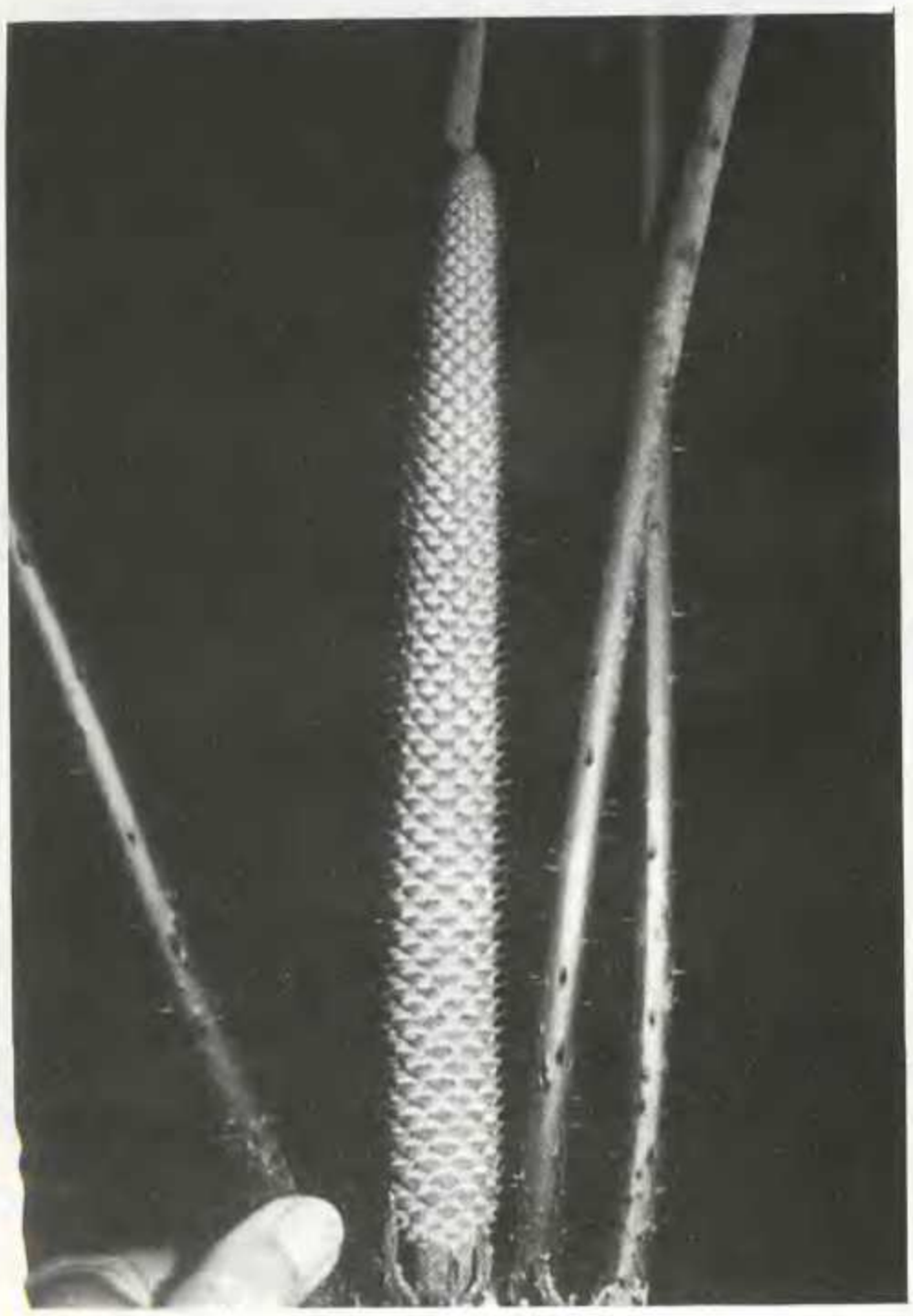

Figure 6 *Ceratozamia whitelockiana*; male cone.

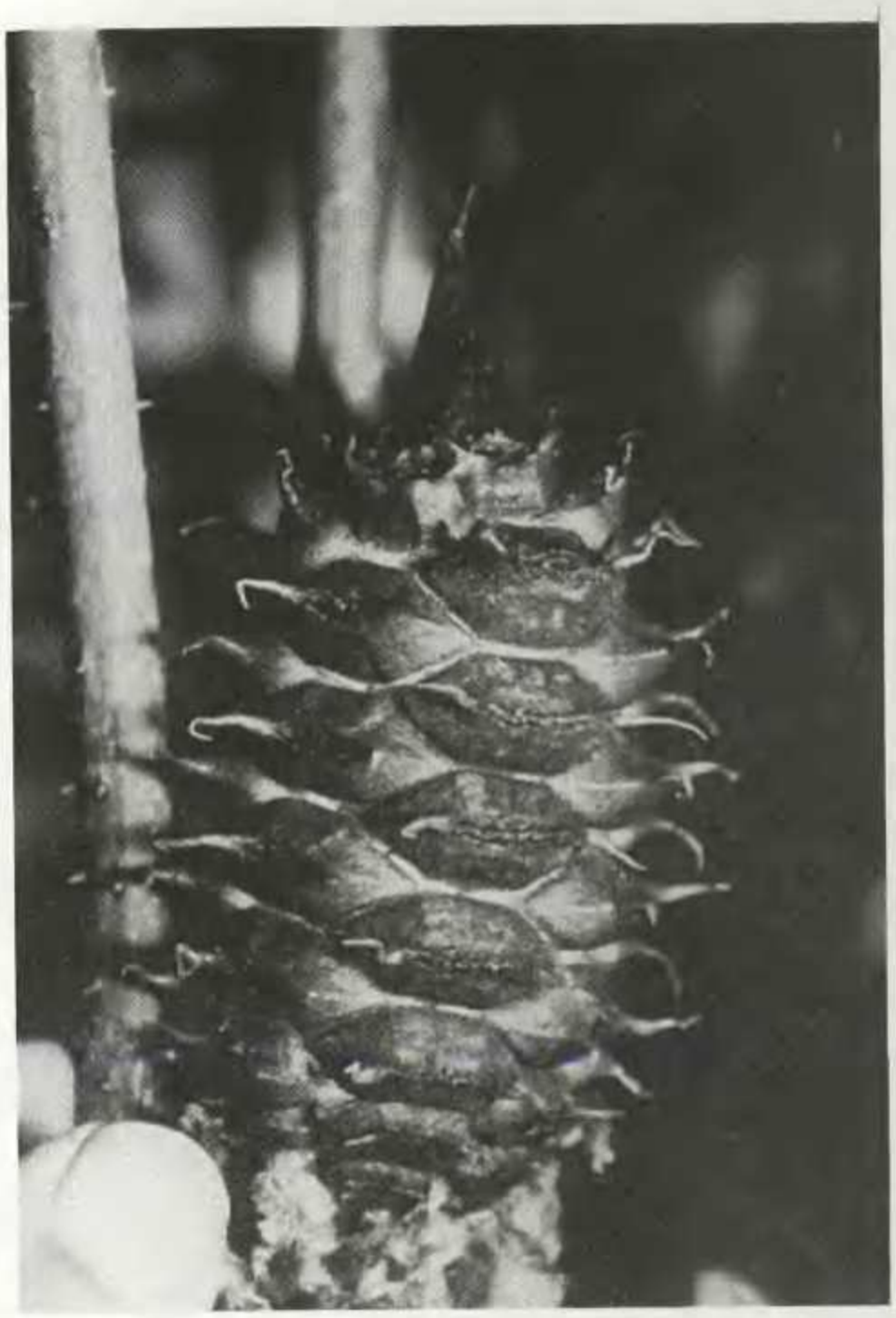

Figure 7 *Ceratozamia whitelockiana*; female cone.

and 20 cm in diameter; numerous, glabrous, dark-green arching leaves which are heavily armed with numerous spines; female cones which are on average 35 cm long and 12 cm in diameter are borne on a peduncle 10 cm long; male cones which are on average 38-43 cm long and 7-8 cm in diameter are borne on a peduncle 8-10 cm long and 2.5 cm in diameter. *Ceratozamia whitelockiana* has rough, cylindrical reddish stems that are much smaller than *C. mexicana* and its few, sparsely-armed, upright, glaucous, pea-green leaves with long petioles are strikingly different than the leaves of *C. mexicana* as are the much smaller male and female cones of *C. whitelockiana*.

Ceratozamia latifolia stems are globose, light brown, and frequently sucker, especially in cultivation; leaves are 90-150 cm long; leaflets are coriaceous, unequally attenuate, slightly overlapping, 20-30 cm long and 33-43 mm wide. *Ceratozamia whitelockiana* stems are solitary, even in cultivation; leaves are 2.0-2.5 m long; leaflets are papery, 30-50 cm long, 30-38 mm wide, and not overlapping.

Ceratozamia robusta has very large stems up to 1.5 m tall, heavily-armed, glabrous dark-green leaves up to 2.25 m long, female cones on average 38 cm long and 15.25 cm in diameter, male cones 45 cm long and 8 cm in diameter. *Ceratozamia whitelockiana* is a much different plant than *C. robusta* based on many characteristics, but especially in the detail of the male and female cones which, as reproductive structures, are characters of the highest weight.

Ceratozamia miqueliana has 7-10 leaves that are distinctively different from those of *C. whitelockiana*. The leaflets are fewer (about 15 pairs), wider (50-65 mm), unequally and abruptly attenuate. The petiole is heavily armed with long, curved spines which is in stark contrast to that of *C. whitelockiana*, which is much longer overall and sparsely armed with much shorter spines. However, there are many similarities between *C. whitelockiana* and *C. miqueliana* that suggest an affinity between the two taxa. Both species have subterranean to shortly arborescent stems of similar size, shape, and colour; each with rough, wrinkled, irregular leaf bases and brownish-red cataphylls. Both species have juvenile and adult emergent foliage which is a very distinctive glaucous, pea-green colour which matures into papery, slightly revolute leaflets. The mature foliage retains the glaucous coating for some time, eventually giving way to a more glabrous, medium green colour in old age. Male and female cones of both taxa are of similar size. The female cone in *C. miqueliana* averages

11 cm long and 6.5 cm wide and is borne on a short peduncle 30 mm long. In *C. whitelockiana*, it averages 15 cm long and 8 cm wide and is borne on a short peduncle 30-38 mm long. The male cone is 20 cm long and 4.5 cm wide in *C. miqueliana* and 26 cm long and 2.5 cm wide in *C. whitelockiana*. The closest population of *C. miqueliana* to *C. whitelockiana* is approximately 150 km.

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NEW PEST THREATENS *CYCAS*

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Received 7 January 1997

In most cycad growing areas of the world cycad growers enjoy relatively pest-free conditions for their plants. In these areas, cycads grown outdoors with proper nutrition and climatic conditions are tough durable landscape plants that need little or no applications of insecticides or fungicides. This was the case for South Florida for many years. In the last two years, however, there has been an outbreak of a new, serious pest of cycads in South Florida, which is potentially lethal to many cycads.

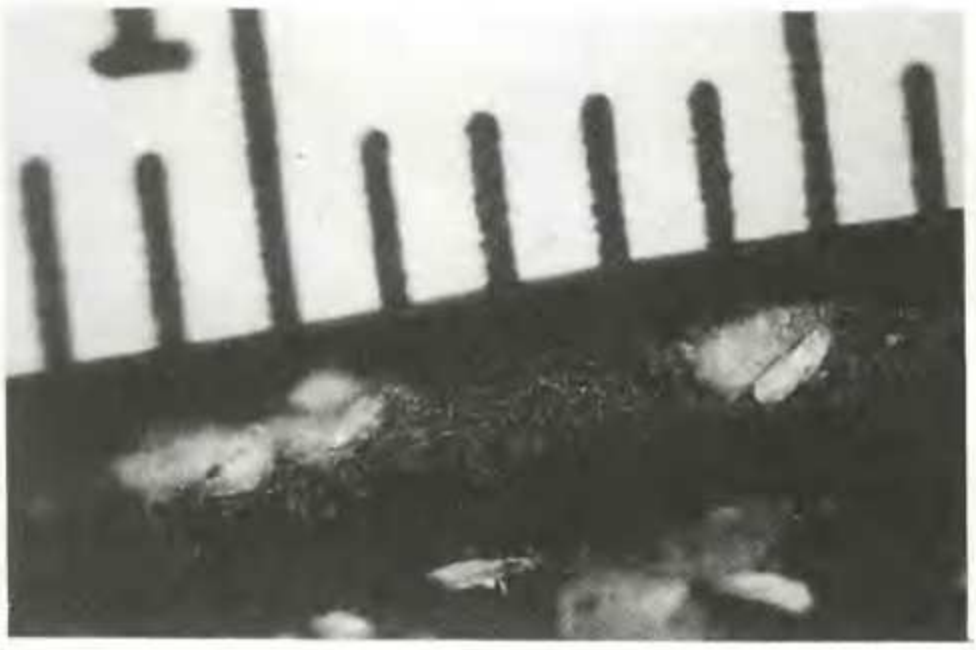

Figure 1 This magnified *Cycas revoluta* leaflet reveals the larger oval females of *Aulacaspis yasumatsui* and the smaller elongated males. Scale is in mm.

The pest in question is a scale insect, family Diaspididae, which preferentially attacks *Cycas*, but also infests other cycad genera. This insect has been identified as *Aulacaspis yasumatsui* Tagaki. This is a whitish-coloured insect 1.0-1.5 mm long (Figure 1). This scale insect was originally described from Thailand in 1977 and was subsequently found in southern China. It is probably native to Southeast Asia and is probably present in countries neighbouring Thailand and China. It appears to be adapted to feed specifically on the genus *Cycas*. An outbreak of this pest was first observed on *Cycas* plants at Fairchild Tropical Garden (FTG) in 1995 (Evans 1996). On most *Cycas* it breeds prolifically, quickly covering the foliage, cones and seeds, giving them a white appearance (Figures 2, 3). When this outbreak began, this scale insect was initially misidentified as *Pseudoaulacaspis cockerelli* Cooley, known commonly as the magnolia white scale or false oleander scale. *Pseudoaulacaspis cockerelli* was first recorded in South Florida in 1942 and is a serious pest, being known to infest about 200 different types of ornamental plants (Leibee & Savage 1994). Mild infestations of *P. cockerelli* on various species of cycads have been noticed at FTG since the early 1970's, so it was originally thought that this new scale was a severe outbreak of an old established pest.

In their natural habitats scale insects are preyed upon by various predators and parasites, which keep their numbers down. When introduced to areas where their predators are absent, scale insects may spread unchecked and literally engulf their host plants. Given such a situation, the only alternative are chemical pesticides. At FTG attempts were made to control the infestation of *Aulacaspis yasumatsui* on *Cycas* by first cutting off the most heavily infested foliage and then applying dimethoate (trade name Cygon), a potent systemic insecticide. Application of dimethoate once a week for three weeks failed to eliminate the scale and they soon

Figure 2 The petioles of this *Cycas rumphii* are white with an infestation of *Aulacaspis yasumatsui* and the leaflets are dying.

respread through the foliage. *Cycas revoluta* and *C. rumphii* appear particularly vulnerable to this scale. These cycads are widely planted as ornamentals in South Florida. In two years the infestation has spread several miles around FTG (Tasker 1996). *Cycas revoluta* and *C. rumphii* plants that become infested decline rapidly, with entire crowns of leaves yellowing or browning and dying as the scales suck the energy and nutrients from them. Subsequent flushes of leaves emerge stunted and twisted (Figure 4). These leaves soon die and the cycle is repeated. Large specimen plants may die in about a year's time. The less healthy the plant, the quicker it succumbs.

Within a species of *Cycas*, there appears to be some variability in susceptibility among different individuals. For instance, I have observed specimens of *C. media* heavily infested with this scale growing a few metres away from a specimen with only a mild infestation. My observations suggest that this scale insect spreads most rapidly on plants that are going through a flush of growth, where the insects can tap into the abundant flow of nutrients in leaves and cones. Some *Cycas* species are resistant. For instance, I have observed that *C. panzhihuaensis* plants are either free of this scale or suffer only mild infestations.

As the populations of this scale have increased on the *Cycas* collections at FTG and the nearby Montgomery Foundation, this insect has begun to heavily infest other cycad genera as well. It has been found on most cycad genera, except perhaps *Lepidozamia, Macrozamia*, and *Zamia*. Some of the more vulnerable species include *Encephalartos manikensis* (Figure 5), *E. gratus* (Figure 6), *Ceratozamia robusta* (Belize form), and some forms of *Dioon edule*, with cones being particularly vulnerable. Infestations on these other genera, while severe, do not reach the proportions found on *Cycas*.

This scale insect is so serious to *Cycas* that it threatens to eliminate *Cycas* as a viable ornamental landscape

Figure 3 The megasporophyll and seed of this *Cycas rumphii* are completely covered with Aulacaspis yasumatsui.

plant in South Florida. It appears that, unless insecticides are applied continuously, most *Cycas* plants in the landscape of South Florida will become disfigured, decline, and die. Every effort should be made to prevent the spread of this scale insect to other cycad growing areas, including other parts of Florida, California, and overseas. It is uncertain how this insect may behave in other climates or regions, however, it is strongly urged that *Cycas* plants not be transported from South Florida to other cycad growing areas. If plants of other cycad genera are shipped from this area, they should be carefully examined for any signs of this pest and treated with a heavy dose of insecticide as a precaution.

To date no treatment has been found that can eradicate this scale from large *Cycas* specimens planted outdoors. A recommended spray programme that appears to check an infestation of this scale consists of three parts: 1) spray first with a systemic insecticide, 2) spray once a week thereafter for three weeks with an oil insecticide that will clog the breathing pores of the insect - Superfine, a non-toxic paraffin insecticide is recommended, and 3) 4 weeks after the initiation of this spray programme, a contact insecticide, such as Diazinon, should be applied. Diazinon appears

Figure 4 The new leaves of this *Cycas rumphii* are deformed due to an infestation of *Aulacaspis yasumatsui*.

to be especially effective against the crawlers, the mobile immatures, of this scale. Such a spray programme must be continued or the insects will re-establish themselves on the plants.

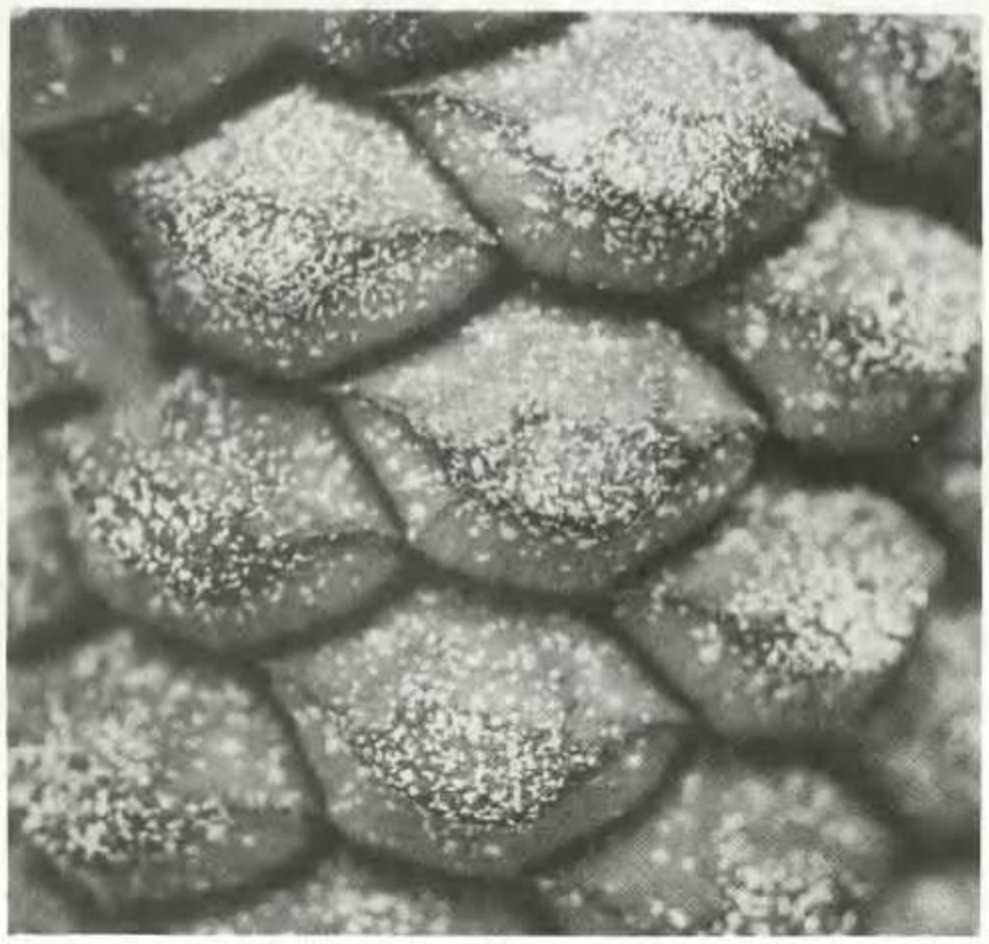

Figure 5 *Aulacaspis yasumatsui* infestation on a male cone of *Encephalartos manikensis*.

In Southeast Asia, most wild populations of *Cycas* do not appear to suffer severe outbreaks of *Aulacaspis yasumatsui*. A natural predator, perhaps a species of parasitic wasp, probably attacks this scale in the wild and keeps its populations at low levels. It is hoped that this predator can be found and introduced into infested areas to bring this serious pest under control.

Figure 6 *Aulacaspis yasumatsui* infestation of leaflets of *Encephalartos gratus*.

CONCLUSION

As more cycads are introduced from the wild into cultivation and as plants are transported from one part of the world to another, insect pests and diseases of cycads are also introduced into regions that originally were free of cycad pests. The introduction of these pests to new areas can have very serious consequences for the use of cycads as ornamentals and to naturally existing populations of cycads. A new insect or disease organism, suddenly released in an environment where its natural predators are missing can spread unchecked and decimate cultivated as well as wild plants. Furthermore, while one such pest may be a manageable problem for a plant, the presence of two or more introduced pests of cycads may be a debilitating or lethal combination. Recently, tissue samples of cycads that died at FTG were diagnosed with infestations of nematodes and ganoderma, a fungal disease that normally attacks palms. Perhaps a combination of introduced disease organisms were responsible for the death of these plants. One pest may weaken a plant and allow another normally non-lethal pest to finish the plant off.

In light of these observations, the need for a proper plant quarantine programme for cycads becomes all the more urgent. Whether plants are introduced to a new country or just into your private collection, all insects, diseased leaf parts, and soil should be excluded. Growing cycads from cleaned, disinfected seeds is the best option.

ACKNOWLEDGEMENTS

I thank B. Gaskell, C. Hubbuch, M. Perry, E. Shroyer, and T. Walters for sharing their observations with me.

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SHORT COMMUNICATIONS / KORT MEDEDELINGS

NUWE IDEE MAG HELP MET BEWARING

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Ontvang 10 Oktober 1996

Die afgelope tyd word daar regtig baie gedoen om broodbome te bewaar en dit is werklik goed om te sien dat daar so baie mense is wat omgee. Die meeste plante word ook deesdae in versamelaars se tuine aangetref en baie lede kan spog met 'n groot versameling. Spasie kan egter 'n beperkende faktor raak en veroorsaak dat slegs 'n sekere hoeveelheid plante aangehou kan word.

Die meeste versamelaars sal dus 1-3 plante van 'n spesie aanhou en die versameling mag in totaal tot 30 spesies besit. In sulke groot versamelings is die kans op kruisings baie groot en dit kan vererger word deur insekte wat stuifmeel kan oordra na verskillende plante toe. Die probleem met tuinplante is dat dit nie werklik help met die voortbestaan van die spesie nie. Baie van die spesies staan tans verspreid in die natuur en geslagtelike voortplanting is by sommiges onmoontlik. Dié wat wel in versamelings beland staan net so verspreid en dit is veral die geval by van die skaarser spesies waar net 1-2 plante van 'n spesie besit word. Die versamelaar mag dan ook nie eers stuifmeel van die spesie besit as dit benodig word nie.

In sulke gevalle word stuifmeel van 'n ander spesie geneem en die twee spesies word gekruis. Maar nog erger is dat daar soms geen moeite met bestuiwing gemaak word nie en dat 'n waardevolle bron van saad tot niet is. Die probleme wat dus by groot versamelings opduik mag in die toekoms probleme skep in die suiwerheid van spesies. Nou sal daar seker sommiges wees wat die feit probeer wegstry deur te noem dat plante in tuine die toekoms van 'n spesie kan verseker.

Maar dan moet ons tog weer besef dat dit die mens se skuld is dat die toekoms vir baie spesies nou so onseker lyk.

Dit het my laat wonder of daar nie ander maniere is om buite die habitat die kanse op kruisings te verminder of selfs heeltemal uit te sluit nie. En daar is maniere om dit te doen deur navorsing te doen en te kyk hoe die natuur die probleme uitskakel. Een van die maniere is om slegs te spesialiseer in een spesie. Dit mag drasties klink maar hou verseker tog voordele in as mens verder kyk. Deur te spesialiseer kan die kanse op kruisings eerstens verminder word of selfs heeltemal uitgeskakel word. Die probleem met die beskikbaarheid van stuifmeel sal nie weer opduik nie en volwasse plante sal 'n konstante hoeveelheid saad lewer. Dit kan ekonomies wees omdat die kunsmatige habitat homself nou sal onderhou en die plante wat natuurlik saam met die broodbome groei sal ook bewaar word. Daar moet egter op 'n spesie besluit word wat die beste in die omgewing sal groei. Dit sal dus nie wys wees om 'n spesie te kweek wat nie goed gaan aanpas in die omgewing nie. So byvoorbeeld kan 'n spesie wat natuurlik in woude groei suksesvol by die kus aangeplant word. Die bome van die natuurlike habitat word aangeplant en die woud word kunsmatig geskep. Dit hoef seker nie presies dieselfde te wees nie solank die plante wat aangeplant word net inheems is. Die biodiversiteit wat geskep word kan verstommend wees. Hierdie sisteem kan homself onderhou en kan dus van groot nut wees in die toekoms waar water gespaar moet word.

Indien 'n versamelaar egter ander spesies moet besit kan plante gekies word wat nie maklik met mekaar kruis nie. Een spesie van elke genus kan ook aangehou word, omdat genusse nie kruis nie. Die idee is nie dat versamelaars nou hierdie idee moet volg nie, want mens raak gebind aan jou plante. Dit mag egter van nut wees vir mense wat 'n versameling wil begin. Ek het nog nooit van ander mense gehoor met dieselfde idee nie. Dit sal my egter ook nie verbaas as mense die idee glad nie wil ondersteun nie. Al die spesies sal nog steeds bewaar word, maar die voortbestaan sal beter verseker word en die probleem met kruisings sal verminder word. Die vorme van *Encephalartos natalensis* wat tans geskei word en as nuwe spesies beskryf word gaan ook 'n probleem wees. Die vorme wat gekruis is was een spesie gewees, maar is na die skeiding aparte spesies. Die nageslag sal dus mos kruisings wees en suiwer *E. natalensis* sal slegs uit die habitat verkry kan word.

Die probleem gaan definitief nie maklik wees om op te los nie, maar gaan in die toekoms nog vele probleme veroorsaak Maar ons kan dankbaar wees dat die vorme geskei word, sodat daar nie verdere verwarring voorkom nie.

As daar ander lede is wat hierdie idee ondersteun is hulle baie welkom om aan my te skryf.

Ek glo ons kan verbeter in die toekoms en die suiwerheid en voortbestaan van broodbome vir die nageslag verseker.

PALM & CYCAD SYMPOSIUM - TOWNSVILLE, AUSTRALIA, 11-13 October 1996

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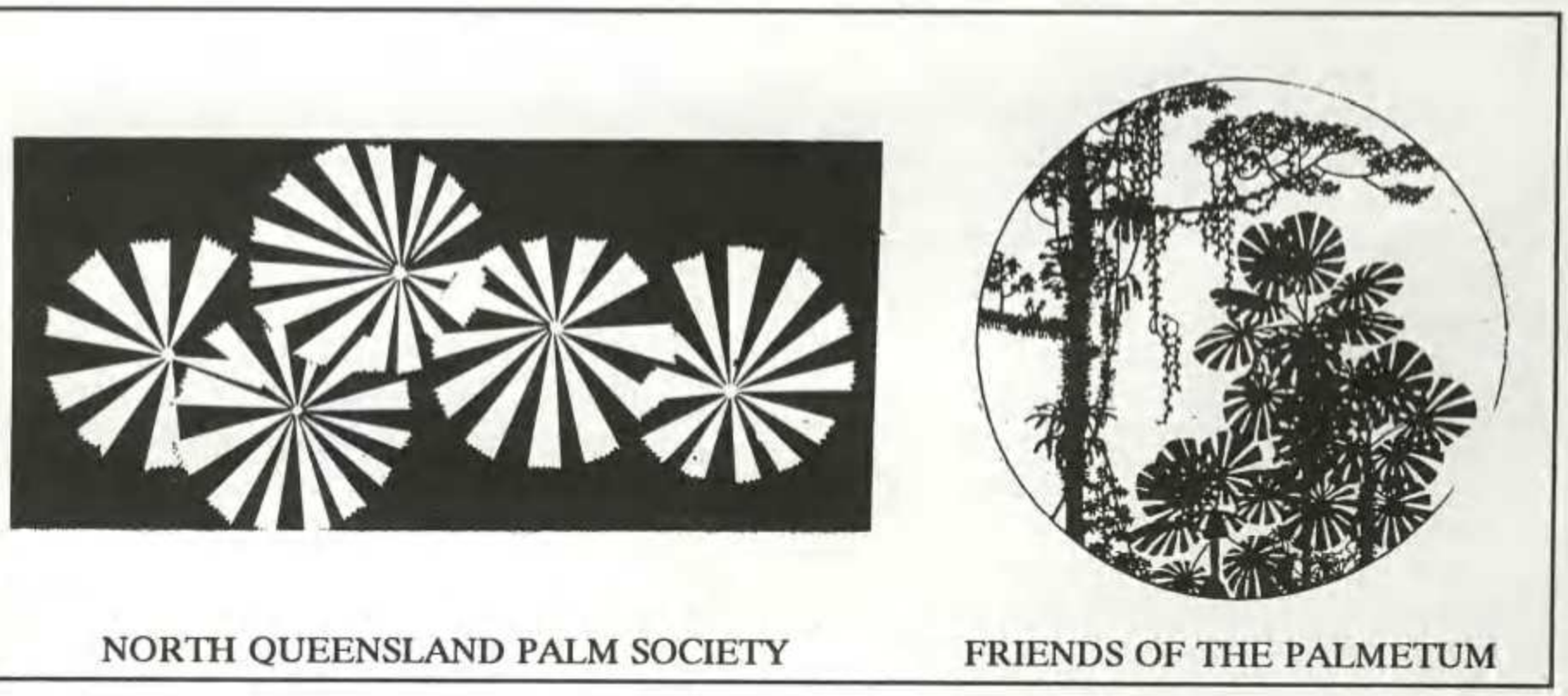
Received 6 November 1996



Several members of the Cycad Society of South Africa were among the 100-odd delegates to a Palm & Cycad Symposium held in Townsville, Queensland, Australia, over the weekend of 11-13 October 1996. The event, organised jointly by PACSOA (Palm & Cycad Societies of Australia), the North Queensland Palm Society, the Parks Services, Townsville City Council and the Friends of the Townsville Palmetum, was a novel extension of the previous year's evening lecture programme organised by PACSOA in Brisbane.

The lecture programme comprised 8 presentations by authorities in their respective fields, all well-illustrated with good quality slides and other audio-visual aids. Three lectures catered specially for the cycad enthusiasts at the meeting. Roy Osborne, previously of Durban, South Africa, and now from Brisbane, Australia, was "first up" with a talk entitled "The genus *Encephalartos* - discovery, distribution and diversity". Ken Hill of the Royal Botanic Gardens in Sydney, then brought delegates up-to-date with an account of the changes in taxonomy of the genus *Cycas*, with an emphasis on the 27 Australia species. David Jones of the Australian National Botanic Garden in Canberra (and Australia's most prolific horticultural writer), spoke on the six groups in the genus *Macrozamia*, also focussing on recent discoveries.

Other lectures in the programme were oriented towards the palm lovers : Don Hodel of the University of California in Los Angeles, gave three presentations, including "What's new in *Chamaedorea*?" and an entertaining account of gardening at the home of his mother-in-law in Tahiti. John Dowe from the Townsville Palmetum, spoke on *Linospadix* (the walking-stick palms) and Michael Ferrero of Flecker Botanic Gardens in Cairns, told delegates of palms in New Guinea.

Apart from the lectures, delegates were treated to a walkabout of Townsville's unique Palmetum. Many of the attendees had been delegates to the CYCAD 90

Figure 1 Stallholders doing brisk business at the 8th Annual Palmetum Plant Sale, Townsville, Queensland, Australia, on 13 October 1996. Palms, cycads and other plants were on offer from the Palmetum and from private growers. Photo: Roy Osborne.

Conference in Townsville in 1990 and were astonished by the growth of the palm specimens in the 5 year interval between the two events. Social events of this year's symposium included functions attended by the mayors of the twin cities of Townsville and Thuringowa. The weekend also saw the 8th Annual Palmetum Plant Sale at which members of the public could buy excess stock from the Palmetum and also plants from sales tables of local PACSOA members. A tour of local private gardens ended with a visit and barbeque at the cycad garden of the enigmatic Lorraine Tooth, where visitors saw an astonishing number of *Encephalartos* in cultivation in containers under shade provided by numerous interesting palms.

All delegates agreed that this event was a great success and expressed the hope that similar symposia would be held at different centres in the future years, Sydney and Darwin being mentioned as possible host centres for the next two such events.

BROODBOME BY HAROLD JOHNSON NATUURRESERVAAT

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Posbus 620, 2940 Newcastle

Ontvang 19 Desember 1996

Die Harold Johnson Natuurreservaat is op 3 Mei 1967 geproklameer en beslaan 100 hektaar grasveld en kuswoud. Dit is geleë op die suidelike bank van die Tugela, sowat 6 km van die riviermond af. Die reservaat is sowat 100 km noord van Durban en die klimaat is baie warm in die somer en matig in die winter. Dit is onder beheer van die Natalse Parkeraad en die park is geproklameer om die unieke kuswoud te bewaar.

Met 'n onlangse besoek aan reservate in Natal, het ek

Figuur 1 *Encephalartos natalensis*; **plant met basale suiers.**

Figuur 2 Hierdie *Encephalartos villosus*-**plant het in die woud opgekom. Dit staan sowat 200 m van die ander plante af. Die saad is moontlik deur knaagdiere in die woud in versprei.**

Figuur 3 'n Vroulike *Encephalartos villosus*-**plant waarvan die keël besig is om uitmekaar te val en die sade vry te stel.**

Figuur 4 'n Vroulike eksemplaar van *Encephalartos villosus* **met 'n ryp keël.**

besluit om dié reservaat te besoek. 'n Mens is geneig om so maklik die kleiner parke mis te kyk, omdat hulle nie bekend is nie. Ek was verbaas om te sien dat daar broodbome aangeplant is. Sover ek weet is die naaste kolonie broodbome by Ngoya en dit is seker nog 40 km noord. Ek was opgewonde om by die plante uit te kom, omdat ek wou sien watter spesies dit was. Dit was van die groter spesies gewees en ek kon dadelik *Encephalartos natalensis* (Figuur 1) en *E. villosus* (Figure 2-4) uitken. Baie van die plante het keëls gedra, meer as wat ek nog ooit voorheen gesien het. Die rede hiervoor kon wees omdat dit so 'n goeie seisoen was, en die kondisie van die plante was oor die algemeen goed, alhoewel dit nie so goed was soos plante wat ek al in

tuine gesien het nie. Mens kan ook verwag dat daar nie juis tyd is om na die plante om te sien nie, en geen bykomende voeding word dus verskaf nie.

Figuur 5 Hierdie volwasse vroulike plant is een van die mooi *Encephalartos aemulans*-plante wat hier op die reservaat te sien is.

Figuur 6 'n Enkele jong manlike *Stangeria eriopus*-plant.

Dit was egter 'n groter verrassing toe ek drie groot *Encephalartos aemulans*-plante gesien het (Figuur 5). Die twee groot, pragtige vroulike keëls het tussen die blare uitgetroon. Daar was ook wollerigheid op die megasporofille (vrugskubbe) wat so kenmerkend van die spesie is. Die sade was reeds rooi gewees en het gekontrasteer met die vrugskubbe. Die keëls was baie groot en beslis van die grootste wat ek nog by die spesie gesien het. Hulle was 500 mm lank en het 'n omtrek van 700 mm gehad. In die kroon van een van die ander plante het ek drie droë manlike keëls gesien. Dit was 'n verrassing om *E. aemulans* buite die habitat te sien omdat hulle so goed in die habitat bewaar word. Ek het later die middag op 'n volwasse *Stangeria eriopus*-plant afgekom (Figuur 6). Dit was 'n jong manlike plant wat 'n vars keël gedra het. Beamptes in die reservaat kon egter nie aan my sê waar die plante vandaan kom nie. Dit wil voorkom asof dit dan gekonfiskeerde plante mag wees wat hier aangeplant is.

In ander parke in Natal wat onder Natalse Parkeraad beheer word, word broodbome ook buite die habitat aangeplant as dekorasie. So kom daar dan ook 'n groot verskeidenheid spesies voor en die probleem met kruisings is dus algemeen. In versamelaars se tuine kom ook verskillende spesies voor, maar hier word sover moontlik voorsorg getref om kruisings te voorkom. Omdat daar soos in die genoemde voorbeeld nie moeite met plante gedoen word nie sal hierdie *Encephalartos aemulans* geen vrugbare saad produseer nie. Ongelukkig is dit so dat die Natalse Parkeraad nie tyd het om aandag aan die probleem te skenk nie. Die manlike en vroulike plante het wel naby aan mekaar gestaan, maar omdat windbestuiwing nie effektief is nie sal net 'n paar sade vrugbaar wees. As daar wel insekte is wat kan help met die taak van bestuiwing sal kruisbestuiwing ook hoog wees.

Dit is dus ongelukkig korrek om te sê dat die plante wat in reservate aangeplant word, soos bogenoemde geval, geen rol speel in die bewaring van die spesie nie. In hierdie geval sou dit beter wees om eerder net een spesie aan te plant. 'n Beter oplossing is om so gou as moontlik die plante aan privaat versamelaars te verkoop. In versamelings waar aandag aan plante geskenk word sal voeding voorsien word en georganiseerde bestuiwing toegepas word. Die plante sal dus in die algemeen 'n beter rol speel in die bewaring van 'n spesie. Die Natalse Parkeraad speel wel 'n rol waar plante in die habitat bewaar word. In sulke gevalle is dit goed om te sien dat dit 'n sukses is.

Dit sal verblydend wees as daar aandag aan die probleem geskenk word. Die suiwerheid van die genepoel is baie belangrik en tans die laaste uitweg, omdat baie plante in hul habitat reeds verwyder is, en daar geen ander uitweg is nie.

TAPROOT GROWING IN WRONG DIRECTION IN *ENCEPHALARTOS HILDEBRANDTII*

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Received 7 January 1997

Figure 1 A seedling of *Encephalartos hildebrandtii* showing the three normal root types: taproot, lateral roots, and coralloid roots. It also has an unusual upward-growing taproot growing out from the stem-root junction on the right side of the plant.

Recently I observed an unusual root on a seedling of *Encephalartos hildebrandtii* in cultivation. It arose from the junction of the stem and taproot and had the thickness of a taproot. However, instead of growing downward it grew upward (Figure 1).

Cycads normally form three types of roots: 1) taproots - thick roots which grow down toward gravity, 2) lateral roots - thin roots which grow outward from the taproot, and 3) coralloid roots - thin roots which grow out and up from the taproot, then branch profusely to form a coral-like mass (see Figure 1 for examples of all three types). The unusual root in question produced lateral roots and coralloid roots from its side like a normal taproot. Its growth stopped at the soil surface, where conditions became unfavourable for further growth.

Presumably there are genes in the plant which control the direction of root growth. In this specimen a genetic mutation appears to have occurred in a particular section of the root which caused a taproot to form and grow upward toward the light instead of downward. If this mutation had affected the entire root system the plant would have a difficult time seeking moisture and anchoring itself and would probably not survive long.

[It could be that the unusual root in question originated from the stem, in which case it would be an adventitious root and not a taproot. I have observed that adventitious roots produced by suckers became quite fleshy (thick) in course of time. When a seed germinates the radicle (rudimentary root of the embryo) becomes the *first* root and is called the primary root or taproot. As an embryo has only one radicle I don't think a plant can have more than one taproot. - **Editor.**]

FOTO'S TE LAAT ONTVANG VIR PUBLIKASIE IN "*ENCEPHALARTOS*" 48

Vir twee van die bydraes wat in *Encephalartos* **48** verskyn het, het die foto's my te laat bereik om saam met die artikels te plaas. Die tydskrif was óf reeds persklaar óf by die drukker toe die foto's my bereik het. Met volledige verwysing na die betrokke bydraes word die foto's egter in hierdie uitgawe van die tydskrif gedruk. - **Redaktrise.**

NUUS OOR DIE TRANSVAALSE STREEKTAK : Hanneke Grobbelaar (*Encephalartos* **48**: 32, Desember 1996)

Besoek aan *Encephalartos laevifolius*-kolonie in habitat naby Kaapsche Hoop op 6 September 1996. Foto's: Dr P. Snyman.

Figuur 1 ***Encephalartos laevifolius*****; manlike plant met keëls.**

Figuur 2 'n Manjifieke eksemplaar van ***Encephalartos laevifolius*** **in die habitat.**

Figuur 3 ***Encephalartos laevifolius*****; nuwe blare maak hul verskyning tussen die vroulike keëls. Let op die swart gebrande stam na die veldbrand.**

Figuur 4 ***Encephalartos laevifolius*****; nuwe blaardos na die veldbrand. Let op die swart gebrande stamme.**

***ENCEPHALARTOS LEBOMBOENSIS* :**
Erik Rouwenhorst (*Encephalartos* **48**: 25-27, Desember 1996)

Figuur 1 Die habitat van die *Encephalartos lebomboensis*-kolonie bestaan uit sandsteenkranse met klowe wat dig begroei is met lowerryke inheemse bome en struike.

Figuur 2 Een van die mooi *Encephalartos lebomboensis*-plante in die habitat. Let op die lang pinnas van die blare.

Figuur 3 Hierdie groot *Encephalartos lebomboensis*-plant is stewig vasgeanker in 'n rotsspleet.

TRANSVAALSE STREEKTAK: PROGRAM VIR 1997

Hanneke Grobbelaar
Posbus 15357, Lynn-oos, 0039, Pretoria

Ontvang 13 Januarie 1997

8 Maart 1997: Besoek aan tuine van ons lede in Groblersdal. Vir meer besonderhede skakel Hanneke by (012) 808 0995.

3 Mei: Charles de Kock sal vir ons 'n video van die broodbome van Sjina vertoon en ons ook een en ander vertel oor die "CYCAD 96" belewenis. Die aanbieding sal om 14h00 in die hoofgebou van die Nasionale Botaniese Instituut in Pretoria plaasvind.

5 Julie: 'n Besoek aan 'n *Encephalartos transvenosus* kolonie in die Happy Rest Natuurreservaat naby

Louis Trichardt is gereël. Deelnemers moet om 08h00 by die Schoemansdal Veldskool in die reservaat bymekaar kom (Louis Trichardt - Vivo pad). Verblyf kan in die koshuis van Schoemansdal Veldskool gereël word. Koste is R40.00 per persoon, met 2 of 3 persone per kamer. Slegs beddegoed word voorsien, maar 'n kombuis toegerus met 'n stoof en 'n yskas sal tot ons beskikking gestel word. Indien u hiervan gebruik wil maak, is dit noodsaaklik dat u vir Hanneke (Tel. 012-808 0995) voor einde Maart laat weet en 'n deposito van R10.00 per persoon betaal.

6 September: Pogings word aangewend om 'n uitstappie na die habitat van *E. inopinus* naby Penge te reël. Indien lede in hierdie verband hulp kan verleen sal dit hoog waardeer word.

1 November: Afsluitingsfunksie 14h00 - 'n Lid van die Gautengse Afdeling Natuurbewaring sal ons toespreek oor die huidige stand van ons inheemse broodboombevolkings en die nuwe ordonnansies aangaande broodbome.

16h00 - Braaivleis by Hollandhuis. Pap en vleis sal gratis beskikbaar wees. Lede moet eie drinkgoed en eetgereedskap voorsien. Lede wie se vanne met **A-M** begin moet asseblief mengelslaai bring en diegene wie se vanne met **N-Z** begin moet asseblief vrugteslaai bring. R.S.V.P. aan Hanneke voor 24 Oktober 1997.

DR PIET VORSTER BESOEK TRANSVAALSE STREEKTAK

Sowat 35 persone het op 2 November 1996 die afsluitingsfunksie van die Streektak bygewoon. Tydens die funksie het dr Piet Vorster van Stellenbosch 'n baie interessante en gewaardeerde lesing oor *Encephalartos aemulans, E. aplanatus, E. brevifoliolatus, E. msinganus, E. senticosus* en *E. whitelockii* gelewer wat hy met uitstekende skyfies toegelig het. Dit was aangenaam om die man wat in die jongste tyd so aktief is in die beskrywing van nuwe broodboomspesies in lewende lywe by ons te gehad het.

CYCAD WEEVILS: COMMENTS ON ARTICLES BY P.I. FORSTER AND E. ROUWENHORST

Rolf Oberprieler
Biosystematics Division, Plant Protection Research Institute, Private Bag X134, 0001 Pretoria

Received 18 January 1997

In the December issue (No. 48) of *Encephalartos*, three contributions make mention of weevils associated with cycads and raise some questions regarding these beetles. The following comments on these issues may be helpful to the authors as to other cycad enthusiasts.

I. *Tranes*

In an article on the Australian cycad *Lepidozamia hopei*, Paul Forster correctly surmises that a species of *Tranes* may (indeed should) be associated with the cones of this cycad, given that its relative in NSW, *L. peroffskyana*, is known to harbour masses of *Tranes* weevils (apparently *Tranes lyterioides*) in pollen-shedding cones.

As it happens, there is a larger species of *Tranes*, *T. insignipes* Lea, known from exactly the area in north-eastern Queensland where *L. hopei* occurs. This weevil appears to be quite rare (at least in collections), but all the records I have seen of it so far seem to originate from within the range of *L. hopei*. Since it is apparent that all *Tranes* species are strictly associated with cycads and more specifically with the genera *Macrozamia* and *Lepidozamia* (but not *Cycas*), and in view of the fact that *L. hopei* is the only member of the former two genera in north-eastern Queensland, it is most likely that *L. hopei* is the host of *T. insignipes*. Apart from its larger size and black-and-white-patterned band across the elytra, the male of *T. insignipes* is characterized by conspicuous brushes of golden hairs on its legs. Good colour photographs of it can be found in Zimmerman's *AUSTRALIAN WEEVILS* Vol VI, plate 594, nos. 3 and 4.

As is the case with the other true species of *Tranes* (in contrast to the stem-boring *Melanotranes*), adult *T. insignipes* should also occur on and in ripe male cones and could play a role in the pollination of its host, while its larvae are likely to burrow in the sporophylls and cone axis. As Paul Forster urges, efforts should be made to investigate the precise nature of this inferred

association between *Lepidozamia hopei* and *Tranes insignipes*.

II. *Antliarhinus*

In the second article referring to weevils associated with cycads, Erik Rouwenhorst commendably advocates a total, habitat-orientated approach to cycad insects rather than brazenly treating every one of them as a "pest". This I would whole-heartedly support, especially since we now have firm evidence that at least some of these insects are involved in the pollination of their hosts, and thus of vital importance for the survival of these relict plants in the wild. With regard to the weevils associated with South African cycads, however, we must realize (1) that not every snouted beetle (or weevil) on cycads belongs to the genus *Antliarhinus*, (2) that not all species of *Antliarhinus* or of other cycad-associated weevils destroy cycad seeds, and (3) that not all such weevils are automatically cycad pollinators.

Besides *Antliarhinus*, six other genera of weevils (not to mention other beetle groups) also occur on *Encephalartos* in South Africa, often on the same species and even individual of cycad. On ripe male cones in particular, it is usually a species of *Porthetes* that abounds in great numbers, while *Antliarhinus* only very rarely (if ever in some species) visits ripe male cones. These two rather different genera of weevils were already confused early this century by Rattray and Marloth (see my article in *Encephalartos* **48**: 10-12), leading to great misconception about their respective true associations with cycads, while they are quite unrelated and occupy very different niches in cycad cones. Similarly, the larger *Phacecorynes*, which bores nearly exclusively in dead cycad trunks but sometimes visit ripe male cones, is quite different from both *Antliarhinus* and *Porthetes*.

Cycad seeds are habitually destroyed by the larvae of only two weevil species, both belonging to *Antliarhinus* and both only occurring in South Africa. The six known remaining species of *Antliarhinus*, which occur from South to East Africa, develop in the female cone axis and sporophylls instead and bear no evident ill effect on their hosts. Similarly, all the other cycad-associated weevils in Africa (and in the world) live only in these tissues of the cone (or in trunks and leaf stalks) and only damage seeds accidentally or if these have died for other causes. Thus, only a very small percentage of the diversity of cycad weevils is responsible for the large-scale seed destruction familiar to the South African cycad grower.

Concerning cycad pollination by weevils, all *Antliarhinus* species are the most UNLIKELY candidates for transferring pollen from male to female cones, as their entire life cycle is (with rare exceptions) conducted in the female cones only and they are only very occasionally found in significant numbers in ripe male cones. The common weevils in pollen-shedding male cones instead belong to *Porthetes*, and these weevils not only visit female cones on a regular basis but are also extremely host-specific. Of all the African cycad weevils, therefore, it is this genus that constitutes the most likely pollinating agents of *Encephalartos*, as was already suggested by Pegler and Pearson nearly a century ago. However, such a surmised pollinating role is not yet conclusively proven; the so far only experimentally demonstrated case of beetle pollination in South African cycads (of *E. cycadifolius* by John Donaldson and co-workers) involves beetles of the family Languriidae, not weevils.

Having more or less ruled out *Antliarhinus* as effective cycad pollinators does not, however, mean that their role on cycads (of the seed-feeders in particular) is only a negative one. There is indeed some evidence that female cones infested by *Antliarhinus* can have a higher percentage of fertile seeds than those that are not infested, but it is unclear at present whether this is the rule and a direct consequence of the *Antliarhinus* infestation. Several possible scenario's need investigation here, e.g. that *Antliarhinus* may well effect some degree of active pollination, that it may help with the dissemination of pollen deposited on/in the cone by some other agent, that there may exist a synergistic effect with the true pollinating agent (its presence may allow such pollinator easier access), or that certain cones are chemically more attractive or accessible to all insects (including *Antliarhinus* and also a pollinator) than others.

I quite agree with Erik Rouwenhorst that the entire pollination ecology of all species of *Encephalartos* (as of other cycads) needs to be investigated at much greater depth and detail to determine the exact roles and functions of the various symbiotic insects in it and the identity of the true pollinator(s). His concerns about insects cross-pollinating different cycad species in cultivation under the noses of the human hand-pollinators are also very real, even though *Antliarhinus* is probably not the culprit here. Again, a careful study of this phenomenon needs to be undertaken. BUT: with several different weevils and also other insects involved in this pollination scenario, the situation is always much more complex than meets the eye and needs a holistic ecological-taxonomic approach. Finally, regarding Erik's second article (on *E. lebomboensis*), the weevil referred to as "having been seen on the cones" of this cycad species is also most likely to be a species of *Porthetes* rather than an *Antliarhinus*, although *A. zamiae* has been recorded from *E. lebomboensis* as well. This species of *Porthetes* is as yet undescribed but develops in the sporophylls of both male and female cones of *E. lebomboensis* and of the closely related *E. senticosus*.

ENCEPHALARTOS WOODII : FAR FROM HOME

This photograph of the *Encephalartos woodii* specimen in Longwood Botanical Gardens, Pennsylvania, U.S.A. was sent to Mrs Ita van der Walt of the Cycad Nursery in Montana Park, Pretoria.

The lady in the foreground was reading the following inscription on the plaque:

Encephalartos woodii
Cycad Family (Cycadaceae)
Nativity: South Africa

This large palm-like plant is probably extinct in the wild. Only male plants are known to exist. Longwood's specimen is a vegetative offset from a male plant collected in 1903 that is now growing in the Durban Botanic Garden in South Africa.

Formerly all the living genera of cycads were classified in the one family Cycadaceae, but since 1959 the three distinct groups of cycads are accommodated in separate families. Thus *Encephalartos* is one of the genera falling under the family Zamiaceae. **- Editor.**

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Geagte Redaktrise

WAARDE VAN BROODBOME

Ek en 'n vriend was onlangs na Middelburg op die "Broodboom en suikerbos" roete. Daar was derduisende *Encephalartos lanatus*- en 'n klompie *E. middelburgensis*-plante. Die *E. lanatus*-plante was almal in keël reg vir bestuiwing.

Ons kon nie 'n ENKELE *E. middelburgensis* keël, manlik of vroulik sien nie. Die keëls is verwyder. Party van die blare is selfs afgesny - seker om by die keëls te kom. Is daar 'n verduideliking hiervoor?* Ons kon geen klein plante of saailinge naby die grotes sien nie maar daar was wel suiers.

Ek wil ook graag weet of daar 'n manier of formule is waarop die waarde van broodbome bepaal kan word. Ek neem aan dat die spesie, hoogte en deursnee van die stam die bepalende faktor is. Kan iemand hier raad gee?**

Leon van Rooy, Posbus 1019, 1240 Witrivier.

Ontvang 19 Desember 1996

[* Ek is bewus van die feit dat bobbejane 'n paar jaar gelede die vroulike keëls van die *E. middelburgensis*-plante in die omgewing van die wandelpad beskadig het en dat 'n verantwoordelike persoon toe die keëls verwyder het. Moontlik is dit nog die geval. **Dit sal op prys gestel word indien enige van ons lesers wat kennis besit oor hoe die waarde van broodboomplante bepaal word aan ons sal skryf om hul kennis met ons te deel. - **Redaktrise.**]

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Dear Editor

MATURATION OF CYCAD SEEDS

I am writing this letter with a request that you might print it in your magazine so that your readers might be able to help me.

I had pollinated my *Cycas circinalis* with *C. rumphii* pollen and got a bumper crop. After they were fully ripe, I picked them. However, on the float-test I found most of them floating. I understand that the float-test is not necessarily a very scientific method to check the viability because some seeds are sea dispersed so that they can float and therefore they may not necessarily be sterile. I also understand that they go through an after ripening maturation process when the embryo developes.

Three seeds were dissected and two of them were clear, whereas the other one had a small embryo.

My questions to you and your readers are:

(1) Such seeds which have embryos, would they mature on storage?
(2) If so, what should be the method of storage?
(3) What should be the media and temperature at which they should be stored?

I hope I will be able to get an answer by your courtesy.

***Shri Dhar,** 20 Ballygunge Park Road, Calcutta - 700 019, India. Fax: +9133-2477834.*

Received 4 January 1997

[It is common knowledge that, after the female cone fragments, fresh seed of most South African *Encephalartos* species needs a ripening period of several months for the embryo to mature. An exception is *E. transvenosus* where germinating seeds are occasionally found in ripe fragmenting female cones. Here in Pretoria, I have found that in most of the *Encephalartos* species about 5-7 months elapse between pollination (usually late-March to early-May) and fragmentation (October to December) of female cones. In *E. friderici-guilielmi* and *E. lanatus* this period is only about 2½-3 months. However, in *E. transvenosus* female cones only fragment about a year after pollination and by then the embryos are usually fully developed.

After cleaning fresh *Encephalartos* seeds I keep them for about an hour in a solution of Kabtab fungicide, after which I arrange them in a single layer on newspapers to become dry. After they are completely dry, I store the seeds in clear tied up plastic bags (e.g. freezer bags for food) in one of the wall cupboards in my house. Seeds need moisture and heat to germinate and, as I do not have access to any hothouse or hotbed facilities, I have to wait until it gets warm enough after winter before planting the seed (usually late-September to mid-October here in Pretoria).

Before or after cleaning fresh *Encephalartos* seeds I dissect some to look for embryos. I have never found embryos in any of the "floaters" and some (or even all) of the "sinkers" may also be without embryos. However, I found that in seeds of *E. senticosus* (recently separated from *E. lebomboensis* as a distinct species) no embryos could be observed with the naked eye at that stage.

Another 2-3 months elapse before the suspensor (spiral cord) can be observed. In January 1991, while still at the University of Pretoria, I put *E. senticosus* seeds (cleaned in December 1990) in batches of 100, tied up in clear plastic bags, in incubators kept at constant temperatures of 15°C, 20°C, 25°C, and 30°C respectively, and another batch at room temperature (fluctuating through late-summer, autumn, winter and spring) in a wooden cupboard. On a monthly basis I dissected 10 seeds from each batch. I found that embryos in seeds kept at 25°C and 30°C matured in a considerable shorter period (and about at the same time) than the others, and that embryos in seeds kept at 15°C were still immature when the experiment was terminated in October. If you decide to store your *Cycas* seeds at 25°C or 30°C you will have to dissect some of them periodically to see whether the embryos are fully developed or not. However, in doing this you are going to destroy some potential plants. - **Editor.**]

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Dear Editor

DISAPPOINTING SEEDBANKS

Greetings from New Zealand, I have been a member of the S.A., U.S.A., Aust. and N.Z. Cycad Soc. for three years. The town I live in, Katikati, is in the Bay of Plenty. An area which is true to its name. Sub-tropical to temperate in climate it is a major area for growing Kiwi-fruit, avocados, citrus, flower crops and pastoral farming. After ten years growing *Cymbidium* orchids for export, we decided to sell and concentrate on my electrical business. In 1992 we bought 2½ acres on the side of a hilltop and have called it Hilltop Gardens. We have built a three-level house which is built into the hill and have surrounded it with gardens. We have planted over 50 cycads in the garden and have developed a small nursery. At the moment we have about 25-30 different species. My aim is to plant in the garden in groups of five as many cycads as my climate will allow. Unfortunately we get a light frost in winter and have a high rainfall of about 1350 mm per year.

I have found your "*Encephalartos*" magazine interesting, but have found some of the scientific articles somewhat Dry, and some of your best articles seem to be in Afrikaans which is a great pity for most members. Is it possible to reprint the article in the December 1996 issue on *Massospondylus* in English? I would love to know what it is about!

Your seedbanks are also very disappointing. I have written to all your seedbank officers and never had a reply.

I have found the Australian Soc. the best with one seedbank and a very active organization. If you want seed you can just send your bankcard number and the seeds arrive. Not having to worry about buying overseas money which costs you $10.00 to buy $10.00. I know you have restrictions on seed exports but small quantities to Cycad Soc. members is what CITES was supposed to encourage.

Our garden and nursery is always open to overseas visitors and you will be most welcome. If you ever want any varieties of cycad seed or N.Z. native flora that I can help you with to buy or swop I will try to help.

Michael Long, Hilltop Gardens, Bay of Plenty, Katikati, New Zealand. Fax 6475491613.

Received 13 January 1997

[I refer you to Cynthia Giddy's letter on "South African Department of Environment and CITES regulations" (*Encephalartos* **43**: 37, September 1995) in which she explained why the Nature Conservation Authorities in South Africa may not issue CITES export permits for *Encephalartos* or *Stangeria* seed, even in small quantities. Another problem is that our seedbank officers have little success in obtaining seed, even of the more common cycad species.

Because of high printing costs it is not possible to print an article in both Afrikaans and English. However, the article on "*Massospondylus*" consists mainly of a description of this dinosaur, with a single reference to cycads in the caption of the figure, namely "*Massospondylus* busy eating cycad leaves". - **Editor.**]

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Dear Editor

CYCAD CENTRE

We have had an extremely busy three months - having taken over here at GIDDYS and transforming a whole lot of things overnight - BED AND BREAKFAST has been going very well and we have had some extremely interesting people stopping over - to all the folks who have supported us so well in the last few months we say thank you "verrrrry" much we are most grateful.

The open day went off fantastically and a good time was had by all - there is another one coming up pretty soon and we will advise the people of the date.

The good news is that so many plants coned in 1996 that we have mountains of seed available and even though a whole lot of people have given us a lecture about selling seed now that we have a nursery, Danie and I are determined that conservation is our alpha concern and that we will continue to sell seeds to clients so that they

too can enjoy growing babies up.

On the Cycad Society side we have had a bit of a lull but unfortunately I (Avis) was so busy moving homes, plants and trying to get ourselves up and going here that I admit to having been a bit lazy - but here is a new year and trusting that we will get ourselves up and going once again.

Douglas Goode has done an art print on *Encephalartos hirsutus* and it is really beautiful. It is available from us at R30.00 per copy without postage - we are also doing laminated copies of all the posters and this new art print, so if you are interested please call us.

Please note our new address. The Durban box number is still being used - but it is more convenient to collect the post here at Umlaas Road.

Avis Meresman and Danie Nel, P.O. Box 45, 3730 Umlaas Road.

Received 16 January 1997

Dear Editor

***CYCAS SIAMENSIS* : NEW LEAVES BROWN AND TWISTED**

Figure 1 ***Cycas siamensis*; plant showing old normal leaves and new twisted leaves.**

I have a problem with my *Cycas siamensis*, an article on which has been printed in your journal earlier. Unfortunately, it is infected by some disease through the roots or otherwise, I do not know. In the beginning when the new leaves emerged, they looked quite normal but gradually they turned brown and twisted (Figures 1, 2).

I am writing this hoping that some of the readers of "*Encephalartos*" might be able to advise me about its

Figure 2 *Cycas siamensis*; **close-up of the new twisted leaves.**

treatment. I will also be grateful if you could pass on this letter to the right person in your organisation, who could also advise me.

Shri Dhar, *20 Ballygunge Park Road, Calcutta-700019, India. Fax: +9133-2477834.*

Received 16 January 1997

CYCADS IN CONTAINERS / BROODBOME IN HOUERS

CYCADS IN CONTAINERS

Piet Vorster
Botany Department, University of Stellenbosch, Private Bag X1, 7602 Matieland

Received 27 December 1996

Most cycads in collections start their lives in containers. Seedlings have to be established in containers, because initially they are too small to compete with other plants in the open ground; and it is usually wise to establish

suckers in moveable containers where one has control over water, temperature, and light. When a potted cycad not previously grown in my garden is ready to be planted out in the open ground, I like to move it around for a year or two *in its container* until I am sure that I have found a place where it will grow well.

Why then do we keep cycads in containers when they are strong enough to go into the open ground? The argument that potted cycads take up less space than plants in the open ground, is surely spurious. For me the beauty of a cycad lies in its luxurant growth, but plants are unlikely to retain that trait on a permanent basis within the restricted confines of a container. If kept long enough in containers, most cycads will take on a stunted bonsai-like character, which to me is a caricature of their real charm. Container culture *is* nevertheless useful when one is not yet permanently settled, because it enables one to move the collection to a new location with relative ease.

I am not at all sure that cycads can successfully be grown in containers on a permanent basis. In my experience they all too often have to be transplanted every few years into ever bigger pots, until finally they stand in the biggest pots on the market which are so heavy that they can only be moved with the assistance of usually unwilling friends. And then, finally, the roots split those expensive pots apart, so that one has no choice but to plant the monsters out into the open ground.

The problem arises because cycads have enormous root systems in relation to their exposed parts (Figures 1, 2).

Even species with comparatively insignificant exposed parts, like *Encephalartos villosus*, have enormous root systems; indeed, I believe that one of the reasons why *E. villosus* so seldom does well in pots, is that there is never enough space for its enormous root system. These root systems grow continuously, with the result that the plants soon become pot bound, deteriorate, have to be transplanted into bigger pots with more space for the roots to expand.

There are, nevertheless, some notable examples of old potted cycads. Perhaps the most famous one is the *Encephalartos altensteinii* at Kew Gardens which was received from Francis Masson in 1775 when its crown was at ground level, and which now has a trunk of more than 4 metres tall. At present this plant grows in a wooden box about a meter square, but it was most probably re-potted over the years. (See Figure 3). In front of the city hall in Pretoria there are some very nice specimens of *Encephalartos horridus* and *E. lehmannii* in large granite pots, in which they have been growing since the 1930's.

Whether permanent or not, container culture puts constraints on the art of growing cycads, and there are a number of factors to be considered before embarking on such a course.

Figure 1

Figure 2

Figures 1 & 2 A root block of a seed grown *Cycas thouarsii*, shaken out of a 40x40x40 cm pot.

Figure 3 ***Encephalartos altensteinii*****: the potted plant at the Royal Botanic Gardens, Kew, received in 1775 and photographed in 1985.**

Dimensions of containers. One of the most important prerequisites for a cycad pot, is that it must be deep enough. All cycad seedlings have long taproots, and the container must be deep enough for the taproot to grow downwards unimpeded. For this reason containers for seedlings should ideally be at least 30 cm deep. For larger plants the containers should be deeper, but I cannot say what the maximum depth must be: roots completely filled containers as deep as a metre. The width is perhaps less important, although in the open ground cycad roots appear to spread further horizontally than vertically. The width of the container should be sufficient so that the pot is balanced and not get blown over by the wind. A practical consideration is firstly that one does not wish to fill up valuable nursery space with pots which are unnecessarily large, and secondly pots should not become too large to move. Finally, after having taken care of the minimum depth, the size of the pot should visually balance the size of the plant.

When to transplant. Cycads can grow surprisingly fast, and from time to time need larger containers. They "resent" ***any*** disturbance to their roots, therefore should be transplanted as seldom as possible. I usually only transplant once a root mat is visible on the soil surface, or the container cracks or start bulging irregularly from the pressure of the root mass.

Shape of containers. This should be such that the plant can readily be shaken out of the pot without undue damage to the root mass. Obconical "succulent plant pots" are unsuitable because they have insufficient volume for the large root mass to develop. Bulging pots are also unsuitable because the root mass fills the bulge and on transplantation is impossible to get out without either severely damaging the roots or breaking an expensive pot. I therefore use either parallel-sided pots or pots tapering only slightly towards their bases, from which the root mass can be shaken out with relatively little damage. It is immaterial whether the pots are round or square.

Material of containers. The cheapest containers are black plastic nursery bags which come in various shapes and sizes. Unfortunately the local industry seems incapable of manufacturing these bags sufficiently strong, with the result that they tear when picked up at their upper rims for moving, and far too soon split lengthwise from old age. In both cases it becomes impossible to feed and water the plants properly, so that one has to transplant with resultant disturbance to the root system. Another disadvantage, which I do not consider to be serious in a nursery environment where the bags stand close together and in the shade cast by the cycad leaves, is that the black material rapidly becomes very hot in the sun and burns the roots within.

An important consideration is that pots should readily lose rather than retain water, because cycad roots are very sensitive to soggy conditions. Porous pots made of clay or asbestos cement would therefore be preferable to plastic, metal, or glazed clay pots.

At present clay pots are almost a thing of the past, but asbestos cement pots come in a range of shapes and sizes. Asbestos cement is alkaline, therefore such pots should be painted ***on the inside*** with a watertight alkali-resistant paint before filling them with soil.

Tins and drums made of metal are not suitable, even when painted with tar on the inside: they rust rapidly, probably because of the corrosive nature of chemical fertilizers.

A very promising product is being marketed by *S.A. Nursery Supplies* under the name *shrub pots (black)*. These are made of a thin but apparantly long-lasting plastic material, in thickness intermediate between black plastic bags and conventional pots. They are economical up to a diameter of 20 cm (catalogue no. CPL 076), but larger sizes are pretty expensive. These 20 cm pots are not really deep enough for cycads, and I have wondered

whether the Society could persuade the supplier to make us a quantity of pots, 20 cm across and 30 cm deep, if there is sufficient interest.

Inexpensive and long-lasting containers can be made by cutting off the tops of 20 liter plastic barrels in which industrial chemicals are sold. Only those made from dark blue or black plastic should be used, because in my experience those made from white plastic soon become brittle and shatter.

Soil. The main requirement of soil when growing cycads, is that it should drain very well. This is especially true when growing cycads in containers. I found washed sand with grains about 2 mm across excellent for rooting suckers in pots; but surprisingly I got poor results afterwards, probably because it is so well drained that it does not retain nutrients. Instead I now use a rather fine grey sand, of more or less neutral acidity, and practically devoid of nutrients (but see below under *nutrients*). Often when I get potted plants from people in the summer rainfall area, I am amazed by the lovely loamy soil. This apparently works well in the summer rainfall area where the rains are of short duration and interspersed with dry spells during which the pots dry out. However, in the Western Cape where I live, the rains come down as a drizzle over a period of days, and a wet pot does not dry out over a period of six months. Here the heavy loams is deadly, but my fine sand is drained well enough never to become too soggy, while retaining sufficient moisture for a long time - even in summer I only have to water once a month.

Some growers use milled pine bark which has been left to age by leaching out excessive resins, and get excellent results. The one problem is that the bark does not last very long compared to the periods the cycads are expected to remain undisturbed in the pots. Accordingly the level of bark in the pots tend to subside, with the plant following suit so that the pot cannot just be filled up from above but has to be turned out so that the plant can be raised again.

Soil acidity is an important, but perhaps overrated factor. More or less neutral acidity is best for optimal uptake of a wide range of mineral nutrients. It is often claimed that cycads should be grown in acid soil, apparently because in South Africa most wild plants grow in acid mountain soil; but in Asia and Mexico many species grow on limestone which is alkaline. While it is possible that some species are very specific in their soil acidity requirements, it is my experience that practically all species grow well in a neutral soil. Most also react well to a *slightly* acid soil, but an alkaline soil spells trouble. Perhaps the limestone soils in Asia and Mexico are not so alkaline as one may think. In some parts of the country the water contains high levels of calcium carbonate which gets deposited as a white encrustation on the soil surface. Once this happens, plants no longer grow well. It can usually be rectified by watering the plants with weak used tea, or mulching with used tea leaves. The perceived acidity of milled pine bark may be a problem, but in practice I have not noticed detrimental effects as long as the bark has been aged properly.

Water. Cycads are seldom killed by too little water, but easily by too much. The golden rule is that the soil should be moist, but not wet or soggy. If the pot is not stuffed with too many roots, one can test the moisture status by sticking a finger in. Unfortunately the wet mud usually sits in the bottom of the pot, so a certain amount of intrinsic wisdom is required. A practical indication of the moisture status of the soil is to allow a small weed plant to grow in the pot. When the weed shows signs of drought stress, it is time to water the pot well and then allow it to dry out until the weed again shows signs of distress.

Drowning is a real danger if the drainage holes are underneath the pot and gets blocked by roots. By the time one notices water standing in the pot, or worse still, the leaves turning yellow, it is often too late to save the plant. For this reason it is a good idea to have drainage holes in the side of the container, so that one can periodically clear them with a tool like a screwdriver.

Nutrients. Growers can be very dogmatic about this subject, forgetting that it is influenced by a number of factors. Most important of these are that we don't really know what nutrients cycads need and in what ratio, and that different soils have different nutrient compositions. For this reason I prefer my nutrient-less sand to apparently richer soils, because the nutrient cocktail which I feed to my plants is not getting modified in composition by other nutrients already present in the soil. It should be remembered that it is not only the absolute amounts of different nutrients which are important, but also their ratio towards each other. In this respect I refer to the note by Vorster, Hunter & Conradie, *Feeding nitrogen to cycads*, in *Encephalartos* **45**: 19-20 (March 1996), on a potassium deficiency which we believe was caused by an excess of nitrogen.

Potted cycads have to stay in their containers for a long time, usually much longer than other potted plants. Over this period they are likely to deplete their soil of certain scarce micro-elements, a problem not likely to arise with plants spending comparatively short periods in containers. It is therefore likely that plants fed only on a N:P:K mixture are likely to develop nutrient deficiences after some years, and such deficiencies can be very difficult to rectify. For this reason I feed my plants on a commercial hydroponic solution containing macro- and micro-nutrients in the ratios required by most plants, and watering with pure tap water in between to flush out any unused nutrients. The July 1996 catalogue of *S.A. Nursery Supplies* lists three slow-release fertilisers ("Osmocote") containing N, P, and K

as well as trace elements released over periods of 3 to 4, 5 to 6, and 8 to 9 months respectively; but at about R450 for 25 kg this would represent a major capital outlay. Still, it could lighten the workload in the nursery to a considerable extent. When using these expensive fertilisers, one will have to guard against washing the granules out of the pots when watering, as well as against heavy rain splashing the granules out.

Light. Cycads are light seekers. Even species occurring "naturally" within forests grow more luxuriantly and cone more readily under higher light levels. For this reason the indoor cycad is a myth, except perhaps when placed next to a sunny window. Potted cycads, like any other, should be exposed to the strongest possible light in which they will not get burnt.

These then are a few guidelines which work well for me in the Western Cape with its wet winters and dry summers. No doubt some of these recommendations will not work under different local conditions, but they may serve as pointers to potential problems.

NEW SCIENTIFIC REPORTS

Braun, H.*, Czihal, A., Shutov, A.D. & Baumlein, H. 1996. A vicilin-like seed protein of cycads: Similarity to sucrose-binding proteins. *Plant Molecular Biology* 31(1): 35-44.
[Seed storage globulins of the 7S and 11S type are synthesized in the seeds of angiosperms and gymnosperms. The authors have isolated and characterized a vicilin-like gene expressed in the cycad *Zamia furfuracea*. Sequence comparisons reveal clear similarities to a sucrose-binding protein isolated from soybean. They suggest the existence of a superfamily of related genes including both vicilin-like and legumen-like seed globulin genes as well as genes coding for spherulins, germins and sucrose-binding-proteins.]
**First Author's address: Inst. Pflanzengenetik Kulturpflanzen-forschung, Correnstr. 3, D-06466 Gatersleben, Germany.*

Briggs, B.G. 1996. L.A.S. Johnson: A botanical career. *Telopea* 6(4): 511-520.
[A summary is given of the career of Lawrence (Lawrie) Johnson, who is celebrated in this special issue of *Telopea*. As botanist (1948-1972) and director (1972-1985) at the Royal Botanic Gardens Sydney he has contributed to plant systematics, especially in the Casuarinaceae, Zamiaceae, Oleaceae, Juncaceae, Myrtaceae (most notably in *Eucalyptus* and *Corymbia*), Proteaceae and Restionaceae. He has been responsible for major improvements of the botanical curation of the National Herbarium of New South Wales and, as director, the construction of the Robert Brown Building (which houses the herbarium and scientific division), early stages in the development of the important satellite gardens at Mount Tomah and Mount Annan, and planning of the Tropical Centre glasshouses and of the Flora of New South Wales. In his seventy-first year he continues in research, is enthused by the new phylogenetic insights arising from DNA research, and continues to maintain high scientific standards and contribute to knowledge of plants and their evolution.]
Author's address: National Herbarium New South Wales, Royal Botanic Gardens, Sydney, NSW 2000, Australia.

Jager, A.K.* & van Staden, J. 1996. Somatic embryogenesis and organogenesis in *Encephalartos dyerianus* and *E. natalensis*. *Plant Cell Tissue and Organ Culture* 45(2): 99-102.
[Callus cultures were initiated from zygotic embryos of *Encephalartos dyerianus* and *E. natalensis*. Callus of both species were transferred onto a modified B5 medium containing different combinations of 2,4-dichlorophenoxyacetic acid and kinetin. Somatic embryogenesis and shoot organogenesis occurred in both species. The embryos were dicotyledonary. To date none of the embryos have matured.]
**First author's address: NU Res. Unit Plant Growth Development, Dep. Botany, Univ. Natal Pietermaritzburg, P/Bag X01, Scottsville 3201, South Africa.*

Ornduff, R. 1996. Gender performance in a cultivated cohort of the cycad *Zamia integrifolia* (Zamiaceae). *American Journal of Botany* 83(8): 1006-1015.
[A progeny of the native Florida cycad *Zamia integrifolia* grown from seeds planted in 1986 was monitored until 1995 to record mortality and the nature and time of expression of primary and secondary sex characters. In addition to gender-specific cone morphologies, males and females differed in secondary sex characters such as age at first cone production, frequency of cone production, mean cone numbers in second and later coning episodes, and, in older plants, mean leaf and branch numbers. Gender differences expressed themselves at different stages in the life history: their nature and extent varied during the years following sexual maturation. By 1995, 46% of the plants in the

progeny had died, most of them before producing cones. Prior to 1988 the mean leaf number of plants that died did not differ from that of survivors, but the mean leaf number of plants dying between 1988 and 1989 was 0.4 times that of the survivors during that period, suggesting reduced vigour prior to death. Mean age at first cone production was 5.8 yr for males and 6.6 yr for females. Mean dry masses of individual male cones increased between the first and second coning episodes, but not between the second and third coning episodes. Mean dry masses of the entire cone crop of individual males increased through the third coning episode due to an increase in mean cone number per episode, but mean cone number was unchanged between the third and fourth coning episodes. Mean dry mass of unpollinated female cones did not change between the first and second coning episodes; mean cone numbers did not change between the first and third coning episodes. After the first coning episode, males produced higher mean cone numbers than females. By 1995, the mean dry mass of an individual male's cone crop was greater than that of a female. Coning frequency of males was 1.7 times greater than that of unpollinated females, suggesting a gender difference in the genetic control of coning frequency. Coning frequency of females pollinated 1 or 2 yr previously was reduced compared with that of unpollinated females. Cone production did not affect subsequent leaf production by either gender. Mean leaf numbers increased in some years and not in others. Mean leaf numbers of males and females did not differ prior to cone production. After cone production mean leaf numbers of males were greater than that of females. Mean age of males producing first branches was 6.3 yr, with a mean of 2.5 branches per plant. Mean age of females producing first branches was 7.7 yr, with a mean of 2.5 first branches per plant. By 1995 the mean branch number of males was 5.7 per plant and of females was 2.7 per plant. Between 1993 and 1995 the mean branch number of males and females increased incrementally, but mean leaf numbers did not change. In early years of branching, leaf number increased with branch number; higher mean leaf numbers of males of an age class thus reflected their earlier branching. Males produced first cones earlier than females. Since branch production was associated with cone production, higher branch numbers of males in an age class reflected their earlier first cone production. In 1995 the sex ratio of known males and females in the progeny was 1:1, with a few individuals not having produced cones by that year.]

Author's address: Dep. Integrative Biol., Univ. California, Berkeley, CA 94720-3140, U.S.A.

Yang, S-L.* & Meerow, A.W. 1996. The *Cycas pectinata* (Cycadaceae) complex: Genetic structure and gene flow. *International Journal of Plant Sciences* 157(4): 468-483.

[The *Cycas pectinata* complex is a group of poorly understood Asian cycads threatened by habitat destruction and overcollecting. We estimated the genetic variation in 17 isozyme loci across 39 populations representing 10 taxa in this complex from China, India, Thailand and Vietnam. Three species from Thailand and an Indian endemic were also examined for comparison. Lower levels of intrapopulation variation than those reported for other gymnosperms were found in the *C. pectinata* complex. Our results support the hypothesis that low intrapopulation variation with relatively high spatial differentiation is a biological and evolutionary characteristic typical of cycads, unlike other gymnosperms. Large numbers of historically shared alleles and high genetic identities confirmed the close relationships of taxa in the complex. Strong gene flow occurred among local populations 2-7 km apart. Long-distance gene flow was restricted. The estimates of gene flow among taxa were generally low except between *C. pectinata* var. *pectinata* and the three southern Thailand endemics. *Cycas* sp. "clivicola", possessing the least gene diversity in the complex, is likely the youngest species. *Cycas siamensis* has the highest gene diversity in the complex and is probably the oldest species, centred in southern Thailand. This region harbouring more morphologically distinct taxa than any other, is a diversity centre for the complex. These populations in southern Thailand should be given priority in conservation.]

**First author's address: Univ. Florida Res. Educ. Cent., 3205 College Ave., Fort Lauderdale, FL 33314, U.S.A.*

Zhang, Z.X.*, Anderson, D.W., Mantel, N. & Roman, G.C. 1996. Motor neuron disease in Guam: Geographic and familial occurrence, 1956-85. *Acta Neurologica Scandinavica* 94(1): 51-59.

[The authors investigated the geographic and familial occurrence of motor neuron disease (MND) on Guam, and then considered etiologic hypotheses related to cycad use and metal intoxication. The research was based on 303 Chamorros from Guam and 3 Chamorros from other Mariana Islands, all with MND onset on Guam during 1956-85. The MND risk in susceptible sibships was about 7-28 times greater than that in the general population. The cycad hypothesis conforms somewhat better than the metal intoxication hypothesis with the data presented.]

**First author's address: National Inst. Health, National Inst. Neurological Disorders Stroke, Federal Building, Room 7C-16, 7550 Wisconsin Ave, MSC 9135, Bethesda, MD 20892-9135, U.S.A.*

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

DONATIONS RECEIVED / DONASIES ONTVANG

12 DECEMBER/DESEMBER 1995 TO/TOT 10 DECEMBER/DESEMBER 1996

THE FOLLOWING DONATIONS TO THE CYCAD SOCIETY OF SOUTH AFRICA ARE ACKNOWLEDGED WITH THANKS:
DIE VOLGENDE DONASIES AAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA WORD MET DANK ERKEN:

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
2003	Barreto, J.	R 50.00	0601	Hart, G.B.	R 20.00
2082	Barry, C.T.	10.00	1535	Hinterding, M.M.	30.00
2053	Benade, J.	50.00	1168	Isacks, G.R.	2.50
1940	Benadie, J.G.	10.00	1388	Jones, S.	20.00
1227	Besseling, H.M.	10.00	1531	Joubert, I.J.	10.00
0776	Besseling, J.	25.00	1462	Kable, A.J.	10.00
0399	Bischofberger, K.	22.50	0223	Kachelhoffer, N.J.	50.00
1669	Botha, K.D.	50.00	1989	Kempkes, I.	30.00
0848	Bothma, J.W. (mev)	10.00	0731	King, A.	20.00
1807	Brumme, D.	10.00	1867	Kockott, C.P. (Mrs)	50.00
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1206	Coetzee, S.D.	10.00	2114	Leeb, G.A.R.	42.50
2029	Crous, D.	10.50	1166	Lightley, C.G.	2.50
0410	De Haas, G.	12.50	2117	Liotta, R.	10.00
2106	De Jager, A.P.	10.00	1781	Long, M.	29.50
1962	De Jager, S.	20.00	0157	Loubser, J.D.	22.50
1374	De Kock, K.N.	12.50	1324	Lovatt, M.	50.00
1919	Dennill, I.B.	20.00	2094	Lubbe, C.E.J.	50.00
2093	Dippenaar, G.D.C.A.	25.00	1587	Lubbe, D.P.	30.00
1403	Doddemeade, P.W.	10.00	1973	Marais, R.E.B.	10.00
1195	Doherty. R.P.	10.00	1109	Meyer, P.K.	10.00
1801	Dowdy, T.V.	19.50	1809	Middlewick, G.C.	25.00
1548	Du Preez, R.J.	25.00	2048	Millar, R.E. (Mrs)	20.00
1428	Du Rand, L.	50.00	2110	Minnaar, J.J.	50.00
2013	Dürbaum, J.	24.00	0006	Minnie, O.J.	10.00
1713	Duvenhage, H.J.	10.00	2014	Moola, Y.	25.00
2011	Eloff, F.	50.00	2086	Mostert, P.J.	12.50
0817	Erasmus, C.S.	37.50	1218	Muller, D.	23.00
1863	Erasmus, P.M.S.J.	12.50	2016	Müller, G.	50.00
1963	Fokkens, J.F.	57.50	1722	Muller, T.I.	12.50
1901	Fourie, G.B.	10.00	0237	Nell, J.M.	25.00
1632	Füglister, F.J.	15.00	1784	Nel, P.W.	30.00
2113	Gielink, C.C.	70.00	1194	Niemand, H. & D.	37.50
1991	Gillespie, M.D.	23.00	0829	Niewoudt, C.F.	12.50
2025	Girona, J.A.	157.50	1503	Niewoudt, J.	10.00
1614	Gneitung, C.F.H.	50.00	2009	Niewoudt, M.C. (mev)	20.00
1789	Greyling, J.J.	12.50	0094	Olivier, L.H.	50.00
1361	Habekost, F.	30.00	2085	Piek, J.P.	10.00
0420	Hanaczeck, H.W.	32.50	2043	Pretorius, De V.	50.00
1600	Harris, R.	32.50	1917	Quinn, P. & L.	50.00

Number Nommer	NAME/NAAM	Amount Bedrag	Number Nommer	NAME/NAAM	Amount Bedrag
2064	Randlehoff, C.J.	R 10.00	0265	Tarr, A.A.	R 12.50
1370	Richter, M.P.	100.00	1793	Tomiyama, H.	50.00
1222	Riordan, S.	15.00	0178	Topham, C.W.	12.50
2005	Roos, P.B.	32.50	2032	Van Aswegen, A.C.	25.00
0937	Rossouw, N.B.	10.00	1478	Van den Berg, M.J.	10.00
1442	Roux, J.J.	10.00	0991	Van der Linde, C.M.	10.00
1633	Roux, T.	10.00	2102	Van Rensburg, D.E. (mev)	10.00
0311	Schimmer, C.M.	10.00	1258	Van Rooy, L.	10.00
1984	Schmidt, E.V.	30.00	1937	Van Wyk, M.R.	10.00
1446	Schmidt, Ralf	25.00	1756	Van Zyl, E. (mev)	20.00
2129	Scholtz, W.C.	22.50	1643	Van Zyl, P.C.	20.00
2000	Scott, J.J.	10.00	2060	Veldkamp, J.A.	10.00
0477	Scriba, J.H.	50.00	1703	Veldkoen, G.	10.00
1203	Shaw, A.	20.00	0681	Venter, E.F.C.	22.50
1959	Smalberger, H.C.	42.50	1609	Viljoen, J.J.	20.00
2045	Smit, D.J.	10.00	0071	Visser, Ben	5.00
1821	Smit, J.	10.00	2013	Visser, G.E.	76.50
2120	Snyman, A.D.	20.00	2092	Visser, J.B.	25.00
1401	Strobos, J.G.	20.00	2041	Watkins, C. (mev)	20.00
1264	Subroyen, M.	10.00	2119	Web, A.R.F.	50.00
1986	Swanepoel, A.C.J.	20.00	0448	Wessels, F.H.	51.00
0139	Swanepoel, J.	10.00	1990	Williams, S.M.	10.00
1425	Sydow, J.	10.00	0008	Wohlberg, H.E.	20.00
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NEWSPAPER CLIPPINGS / KOERANTUITKNIPSELS

Beeld

Vrydag 15 November 1996

Ses vas oor smokkel van tientalle broodbome

Sarie van Niekerk

Lede van die Polisie se eenheid vir bedreigde spesies laai broodbome af waarop gisteroggend vroeg in Boksburg beslag gelê is.

Foto: SARIE VAN NIEKERK

BOKSBURG. – Ses vermeende broodboom-smokkelaars is gisteroggend vroeg hier in hegtenis geneem nadat hulle ongeveer R250 000 se broodbome onwettig van Mpumalanga na Gauteng vervoer het. Beslag is gelê op 35 bome en twee voertuie.

Woordvoerders van die teenstropingseenheid van die Polisie se eenheid vir bedreigde spesies en die parkeraad van Mpumalanga, het gesê die bome, wat almal vroeër met mikroskyfies gemerk is, is reeds Dinsdag uitgetrek gevind in die Starvation Creek-reservaat naby Nelspruit.

"Ons het die plek dopgehou en vanoggend (gisteroggend) twee-uur het die twee voertuie en die ses verdagtes daar opgedaag en die bome begin oplaai. Ons het 'n vermoede gehad dat die bome op pad was na Johannesburg. Ons het hulle agtervolg tot in Boksburg waar hulle in hegtenis geneem en beslag gelê is op die voertuie en die bome."

Die woordvoerders het gesê hulle is oortuig daarvan dat die vyf mans en een vrou deel is van 'n groot sindikaat wat vir die onwettige verkoop van broodbome verantwoordelik is. Al die beskuldigdes is van die Mariti-Trustgebied in Hazyview, Mpumalanga.

Hulle het ook gesê een van die voertuie is gisteroggend reeds vir die vierde keer gebruik om broodbome mee te vervoer.

Die leier van die groep wat gisteroggend in hegtenis geneem is, is ook reeds op borgtog van R5 000 vrygelaat in twee soortgelyke sake.

Die ses beskuldigdes, wat almal aangehou word, sal binnekort in Boksburg in die hof verskyn.

'n Boete van tot R200 000 of gevangenisstraf van tot twintig jaar kan opgelê word as hulle skuldig bevind word.

VRA VIR ERNST

Broodbome is eiesoortige tuinplante

'n WISSELVALLIGE broodboom het mev. Sue Troskie van Pierneefrant in die war. In die verlede het die boom elke November getrou nuwe blare uitgestoot, soms sewentig tot tagtig blare op 'n keer.

In November 1994 het dit pleks van nuwe blare klein, blaaragtige, witterige skubblare opgelewer met saadjies soos mieliepitte diep binnein. Die daaropvolgende November het die plant niks opgelewer nie, maar verlede jaar weer daardie eiënaardige skutblare gedra.

Andersins is die plant pragtig en groot.

Mev. Troskie vra watter soort broodboom is dit en of dit ooit weer nuwe blare sal uitstoot.

Mevrou, volgens u foto is dit 'n sagopalm (*Cycas revoluta*) wat in die natuur beperk is tot die eilande in die suide van Japan. Hoewel die plant herinner aan 'n palmboom, is dit nie daaraan verwant nie, maar wel lid van die broodboomfamilie (*Cycadaceae*).

Vanweë sy aantreklike, palmagtige voorkoms word dit deesdae wêreldwyd in warm en gematigde klimaatstreke gekweek. Dit bereik 'n hoogte van sowat 3 m, groei in groepe as gevolg van suiers aan die

Die sagopalm (*Cycas revoluta*) is nie 'n palmsoort nie, maar behoort aan die broodboomfamilie (*Cycadaceae*).

boombasis (soms sytakke), en stoot veervormige heldergroen blare in November/Desember uit.

Soos ons inheemse broodboomsoorte is die sagopalm 'n pragtige aksentplant en geskik vir tuine in Gauteng. In sy natuurlike staat na aan die kus verkies dit 'n koel klimaat. Dit is dus wyd aanpasbaar, aard goed in planthouers en behoort by die meeste groterige kwekerye beskikbaar te wees.

Die eienaardige skutblare van die plant op die foto is vroulike blomblare (sporofiele) en beteken die plant is nou geslagsryp. By die *Cycas*-geslag word die vroulike sporofiele in 'n los kroon gedra – 'n diagnostiese kenmerk wat juis op die verskil dui van die inheemse broodboomfamilie (*Encephalartos*).

Die sporofiele verskyn gewoonlik in November of Desember en manlike en vroulike plante kom voor. Elke sporofiel dra tot meer as twee saadknoppe; die bevrugte saad word tot 3,5 cm lank en verkleur tot 'n aantreklike oranje, rooi of geel.

Die manlike keëls is langwerpig en lyk meer na die keëls van die inheemse broodbome. Tipies van die broodboomfamilie vorm die plante nie elke jaar blare nie en kan dit soms 'n jaar of twee oorslaan – presies wat met mev. Troskie se plant gebeur het. Aanstaande jaar behoort die plant weer normale blare te vorm.

Die sagopalm plant maklik voort van sy saad of suiers. Sny die suiers teenaan die stam af en laat dit wortel skiet in sanderige grond. Saai die saad in vlak kissies.

Hoewel die saad – soos ook dié van ons broodbome – deur die boom vrygestel word, het dit 'n na-rypwordingtydperk. By rypwording is die embrio nog nie volgroei nie en kan dit tot agttien maande duur voordat dit sal ontkiem. Moenie moedeloos word nie as die vars saad nie gou ontkiem nie.

Wêreldwyd is daar sowat tweehonderd broodboomfamilies – met die grootste verskeidenheid in Sentraal-Amerika.

Die grootste is ons eie broodboomgeslag (*Encephalartos*) waarvan daar sowat sestig soorte voorkom. Onlangs is nog 'n paar nuwe soorte beskryf. Die genus *Zamia* is net so groot (ook sowat sestig soorte).

'n Mens sal die meeste van die *Encephalartos*-soorte in die subtropiese en tropiese streke van Afrika aantref. Een soort (*E. longifolius*) kom in fynbos voor en 'n ander paar soort in die oostelike, droë, Karooagtige dele van Oos-Kaapland.

● Plantbrokkie:

Watter inheemse broodboom lyk net soos 'n varing? Die *Stangeria eriopus* wat in die woude en grasveld van die oostelike dele van Suid-Afrika aangetref word.