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# ENCEPHALARTOS

Tydskrif van die Broodboom Vereniging van Suid-Afrika

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# BROODBOOM VERENIGING VAN SUID-AFRIKA

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# ENCEPHALARTOS

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**On the cover:**

Female cone of *Encephalartos dolomiticus* in the gardens of Exclusive Cycads. Photo: Mike Hurter

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# VAN DIE PRESIDENT / FROM THE PRESIDENT

Ons is in die middel van die winter in die Suidelike Halfrond en die meeste van my broodbome is in 'n rus stadium, behalwe my *Encephalartos arenarius* wat nog altyd eerder hierdie tyd blare stoot.

Ek was bevoorreg om op 20 Junie die Wes-Kaap Streektak se aktiwiteite by te woon en die oorhandiging van Erelidmaatskap aan Piet Voster te behartig. Tydens die dag se verrigtinge is verskeie tuine besoek en 'n gevestigde broodboomtuin bly maar mooi. Die groen-blaar spesies is defnitief baie meer gelukkig as die blou-blaar spesies, onder normale tuinomstadighede, in die winter reënvalstreek. Een van die tuine het ook gewys hoe 'n mens vir die blou-blaar en die tropiese *Encephalartos* spesies voorsiening kan maak.

Ek is reeds twee jaar in my amp en ek kan dit amper nie glo nie. Die huidige Raad se termyn verstryk Desember 2009 en daar word gevra vir nominasies. Enige Vereniging se sukses en gevolglike gewildheid word deur sy onderskeie streeksbesture en gevolglike Raad bepaal. Die mense in hierdie ampte doen dit vrywillig en offer baie van hul tyd op. Hierdie ampsdraers word deur die lede verkies om hul belange te verteenwoordig en om die Vereniging op alle vlakke te verbeter, met ander woorde, die lede maak die Vereniging. Verskeie van ons huidige streke sukkel om aan die gang te bly as gevolg van swak bywoning van uitstappies en ander aktiwiteite, of die totale gebrek aan enige beplande aktiwiteite deur sodanige besture. As jy as lid voel dat jou bestuur nie doen wat hulle moet nie, raak betrokke, neem leiding en offer jou tyd op. Ek doen dit vir die liefde en passie—met tye nogal stekelrig, maar tog lekker!

Lede moet hulself vra of hulle aktiewe of passiewe lede is, met ander woorde, dra jy by om die Vereniging te verbeter of is jy 'n 'what's in it for me'-lid? Laasgenoemde was gedemonstreer, in die vorige uitgawe, in 'n brief waar die skrywer die volgende stelling maak, 'The reason why a lot of people do not renew subscription or join the Society is because no real effort is made to assist new collectors to follow the rules by giving them the reward of seed/seedlings'. Hierdie stelling is baie teleurstellend en lede wat die Vereniging en selfs Natuurbewaring die skuld wil gee, om hul onwettig versamelde broodbome te regverdig, hoort defnitief nie in die Vereniging nie! Ek versoek weereens al ons lede asseblief om binne die riglyne van die betrokke Regulasies en Wette hul stokperdjie en/of kwekerye te beoefen. Die artikel oor die *E. lehmannii* sade van die Noorsvlakte is prysenswaardig, maar ek hoop die skrywer het die volledige projek op die betrokke plaas gedoen en die plaaslike owerheid daarvan in kennis gestel.

Geniet hierdie uitgawe en raak aktief betrokke by die gemeenskap wat hierdie wonderlike groep plante geniet.

Groete
Xander

We are in the middle of winter in the Southern Hemisphere and most of our cycads are in a dormant stage, except for my *Encephalartos arenarius* which seems to be pushing leaves normally this time of the year.

I had the privilege to attend the Western Cape Regional Branch's activities on 20 June and presented the Honorary Membership to Piet Vorster. We visited several gardens and an established cycad garden is always a lovely sight to behold. Under normal garden conditions, the green-leaved species do much better than the blue-leaved species in the Western Cape with its winter rainfall regime. One of the gardens we visited demonstrated to us how one can cater for the needs of blue and tropical cycad species in this region.

I have been president of the Society for almost two years and the current Board's term expires in December 2009. We are requesting nominations and most of the Regional Branches will have elections for new management committees soon. A Society's success and popularity are determined by the relevant Regional Branch committees and ultimately by its Board. These individuals do the work free of charge and spend a lot of their time on official duties. They are elected by members to represent their interest and to better the Society. Therefore, the members make or break the Society. Currently several of our branches are struggling to keep going as a result of poor attendance of activities or the complete lack of organising activities by the relevant management committees. Please, if you feel that your committee is not doing what they should, get involved, contribute some of your time and organise an excursion. I do the work for the love and passion—rather prickly at times, but still enjoyable!

Members should ask themselves if they are active or passive members, in other words are you helping to better the Society, or are you a 'What's in it for me'-member? The latter was demonstrated in the previous issue when the writer of a letter made the following statement, 'The reason why a lot of people do not renew subscription or join the Society is because no real effort is made to assist new collectors to follow the rules by giving them the reward of seed/seedlings'. This statement is rather disappointing and people that want to blame the Society, or even Nature Conservation, to warrant the acquisition of illegal cycads should not be members of this Society. Please practice your hobby or nursery within the relevant legal guidelines. The article on the *E. lehmannii* seeds of the Noorsvlakte was inspiring and I must congratulate the author on a job well done, but I hope he has done it on the relevant farm and informed the local authorities.

Enjoy this issue, get involved and become an active member of the community that share a love for this amazing group of plants.

Regards
Xander

## NUUS VAN DIE WES-KAAP TAK / NEWS FROM THE WESTERN CAPE BRANCH

Die somer het tot 'n einde gekom en die broodbome het blare gestoot en die nuwe keëls is rustig besig om te ontwikkel. Dit was 'n goeie seisoen in die Wes-Kaap en die meeste gebiede het goeie reën gehad.

Al die Wes-Kaapse lede van die Broodboom Vereniging van Suid Afrika het hul eksemplare van *ENCEPHALARTOS* 96 ontvang en die artikels geniet. Lede in die Wes-Kaap word aangemoedig om artikels te skryf en om foto's te neem van hul plante en keëls vir plasing in die tydskrif.

Die grootste nuus in die *ENCEPHALARTOS* is egter die uitstel van die implementering van Arikel 25 van die TOPS regulasies. Dit gee vir al die lede nog die geleentheid om van die gelyste broodboomspesies te bekom.

Op hierdie stadium het die Wes-Kaap Tak van die Broodboom Vereniging reeds verskeie aksies agter die rug en is ons hard besig om te verseker dat die res van die jaar se beplande aksies deurgevoer word. Die sukses van die aksies berus daarop dat die lede dit bywoon en deelneem. Ons het ook die naamlys van Ian Bassingthwaighte, sekretaris van die Vereniging, ontvang van al die lede wat in die Wes-Kaap woon. Dit is nou vir ons moontlik om vroegtydig te verseker dat al die lede gekontak kan word en inligting ontvang rakende ons beplande aksies.

Die beplande aksies vir die res van die jaar sluit in 'n opleidingsessie in September en 'n welverdiende afsluitingspiekniek in November.

Soos voorheen gemeld, word lede uitgenooi om enige voorstelle, gedagtes, kritiek of inligting aan my te stuur. So kan ons verseker dat die Vereniging relevant bly.

### Gathering—February 2009 at Brackenfel High School

We were fortunate to have Phakamani Xaba of SANBI's Kirstenbosch National Botanical Garden with us presenting a particularly informative and interesting talk on the influence of burning cycles on seedling growth and survival in the cycads' natural habitat. The presentation focused on the species *Encephalartos cycadifolius* and *E. fridericii-gulielmi*.

The photographs of the plants in habitat were remarkable. We would like to encourage Phakamani and his team to continue with the research. We are already looking forward to his next presentation.

### Kirstenbosch Garden Fair 2009

The participation of the Branch in the Kirstenbosch Garden Fair can now be described as a huge success. I would like to refer to the article in the *ENCEPHALARTOS* 96. During the members meeting held in November of 2008, I tried to explain to everyone present that this would be our first Garden Fair and a large amount of uncertainty exist. The members unanimously gave their full support to the management committee and Piet Vorster

Figure 1.—Frederick and Julia de Jager.

Figure 2.—Frederick, Annatjie, Julia and Aubrey at the permit table.

Figure 3.—Charl at the cycad dispatch table.

said, 'We must see the event as an opportunity to promote the Society, and in any event the income might exceed the expenses. The Society must make the investment'.

All the objectives set out by the management committee for the Garden Fair were met. The most important aspect of our participation is the contact made with the general public to promote cycads and the contribution that could be made to the Botanical Society of South Africa to meet their objectives for conservation and awareness of indigenous plant protection and conservation in general. If at all possible, the Western Cape Branch of the Cycad Society will participate in next year's Garden Fair.

It was a learning experience for all the participating members and, above all, a good team-building and joyful event.

Figure 4.—The fynbos section at the Garden Fair.

Figuur 5.—Lede van die Wes-Kaap streektak wat die Ooskaap toer meegemaak het neem 'n blaaskans langs 'n windpomp.

Figuur 6.—Hierdie ossewa kon net tot by die watergat kom en het daar vergaan. Dit het weer 'n goeie skuiling gebied vir die doringboom wat langs die agteras kon deurgroei.

Figuur 7.—*Encephalartos lehmannii* in natuurlike habitat.

I would, once again, like to thank all the participants at the event who were prepared to make their time available. Some more photos are included here (Figure 1–4).

## Ooskaap Broodboomtoer—April 2009

Na 'n beplanning van meer as 12 maande het die tyd uiteindelik aangebreek vir die toer na die Ooskaap. Al die magtigings is verkry en hier het Nollie Bosman, veldwagter van Addo vir ons 'n reuse taak vervul. Aanvoorwerk is gedoen deur Louis Olivier van Kirkwood. Almal het van hul onderskeie bestemmings vertrek op Donderdag, 16 April, om by Sitrusoewer Rivierkamp van Paling Swart op Kirkwood bymekaar te kom. Christo en Neil Page het spesiaal van Gauteng af gery om by die toer aan te sluit. So ook Alan Huntley van Kirkwood en sy vriend van Johannesburg.

Vrydagoggend moes almal vroeg opstaan om reeds teen 6:00 te vertrek na die noordekant van die Addo Nasionale Park. Dit was omtrent 'n konvooi van voertuie! By die Darlingtondam is van die motors agtergelaat en almal het 'n sit- of staanplek op een van die bakkies gekry.

Die dag het bewolk begin, maar uiteindelik met goeie weer uitgedraai. Ons eerste stop was by die windpomp op pad na die 4×4 roete in die suide deur die Suurberge (Figuur 5). Na drie uur op die pad was 'n koffetjie en toebroodjie meer as welkom.

Met die opry na die stop by die watergat, kon ons alreeds die eerste groot broodbome (*E. longifolius*) teen die berghange sien. Die eerste mooi plante direk langs die pad was egter *E. lehmannii*. Die plante het langs die noordelike hange gegroei (Figuur 6 & 7).

Die pad het stadig hoër begin kronkel en van die draaie was redelik skerp en vol los klippe (Figuur 8).

Die uitsig vanaf die kruin was asemrowend en ons het die geleentheid gehad om daar tussen die groot reuse te gaan rondklouter, aan hulle te vat en foto's te neem van enige moontlike hoek en draai. Ten spyte daarvan dat dit baie droog is, was die plante hier in 'n besonders goeie toestand (Figuur 9–15).

Van die bakkies was bo-op die kruin agtergelaat, sodat die roete verder met twee 4×4 voertuie aangepak kon word. Almal het 'n sitplekkie gekry ten einde die suidelike hange van die berge te verken. Die hange is heelwat koeler en natter. Die plante hier was ongelooflik mooi en verkeie plante met keëls, beide manlik en vroulik, is opgemerk. Die meeste keëls is egter deur die bobbejane van die omgewing beskadig.

In hierdie area groei verskeie plante van reusagtige proporsie en daar is wyd gespekuleer oor die ouderdom van 'n spesifieke plant waarvan die stam byna 10 meter is. Party van die toerlede het gereken so plant kan ongeveer 1500 jaar oud wees. By die murasie van die ou Bedrogfonteinopstal het ons middagete geniet en met 'n redelike mate van ongeloof na die legende van Generaal Jan Smuts se vergiftiging met broodboomsade geluister. Die terugtog is daarna aangepak en verskeie van die *E. lehmannii* plante is weer vir oulaas besigtig. Na 'n opwindende, lang dag is almal met skemerlig terug na Kirkwood om die moegheid met 'n goeie stort effens af te was en saam te braai.


Figuur 8.—Sommige van die steil draaie het heelwat los klippe gehad!

Figuur 9.—Wes-Kaap streektaklede tussen broodboomreuse.

Figure 10.—Uitsig oor Darlingtondam vanaf die kruin.

Figuur 11.—Neil en Christo tussen die groot plante.

Figuur 12.—Een van die reuse.

Figure 13.—Elma in haar element besig om foto's te neem.

Figuur 14.—'n Klompie van die toerlede geniet die vars lug.

Figuur 15.—*Encephalartos longifolius* langs die pad. Schalk het hom baie mooi genooi om saam te ry, maar hy wou ongelukkig nie in die bakkie klim nie.

Figuur 16.—Andy en Maria wonder hoeveel plantjies hulle nog kan koop.

Figuur 17.—'n Pragtige voorbeeld van *Encephalartos longifolius* met die hakie op die blaar.

Figuur 18.—'n Keëldraende *Encephalartos woodii* plant.

Figuur 19.—'n Keëldraende *Encephalartos latifrons* plant.

Daar was geleentheid om aan te kondig dat die Tak goedkeuring verkry het om 'n skenking van R2000 te maak aan SANParke se Addo Nasionale Park, met die oog op 'n broodboombewarings- en navorsingsfonds. Die lede het ook hul bereidwilligheid te kenne gegee om as broodboom veldwagters vrywillig te help met wetenskaplike veldopnames op 'n jaarlikse basis.

Die Saterdagoggend is besoek gebring aan die tuin van Louis en Queen Olivier in Kirkwood. Daar was baie mooi plante en heerlike skons en tee. Almal het ook die geleentheid gehad om plantjies te koop (Figuur 16).

Na die Oliviers se tuinbesoek is almal na die tuin van Dr. Jacques du Plessis in Port Elizabeth. Ons eerste reaksie was een van verstomming aangesien hier ongelooflike mooi plante was met verskeie in keël. 'n Besoek aan die kwekery met heelwat unieke plante wat welig groei het verder bygedra tot die lede se bewondering (Figuur 17–19).

Die uitstappie na die Ooskaap is een waaroor nog lank gepraat sal word. Daar is baie foto's geneem en daar is reeds 'n versoek dat 'n spesiale skyfievertoning aangebied word oor die uitstappie. Almal was dit eens dat die volgende toerreëlings solank aan die gang moet kom...

## Aksies vir die res van die jaar

Augustus—Byeenkoms by Brackenfel Hoërskool om 14:00.

Aanbieding en skyfievertoning deur Piet Vorster getiteld: Op reis na donker ... Op soek na seldsame en interessante broodbome.

Verkiesing van nuwe bestuur.

September—Broodboom identifikasie kursus by Kirstenbosch.

November—Afsluitingsfunksie.

Ons hou piekniek in Kirstenbosch.

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## REVISED ADVERTISEMENT COSTS

Since September 2006 publication costs have increased by 34.71% even though the cost of advertising stayed the same for this period of time. After careful consideration the costs have been revised and advertisers should make a note of the new costs involved.

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In accordance with the Society's Constitution, after two years, the current editor's term comes to an end and the position will be vacant from January 2010. A suitably qualified person is required to continue this service to members. Interested persons should contact the secretary-treasurer or president of the Society, whose contact details appear on the inside cover of this journal.

# NEW PUBLICATIONS

In recent issues of *ENCEPHALARTOS* a number of new publications were announced. Some of these are summarised below, plus some new titles of which we received reprints. We report on an unusual number of new species.

SCHUTZMAN, B., ADAMS, R., HAYNES, J.L., & WHITELOCK, L.M. 2008. **A new endemic *Zamia* from Honduras (Cycadales: Zamiaceae).** *The Cycad Newsletter* 31(2/3): 22–26.

This is a very neat description of a new species, *Zamia busellii*, from Honduras. These plants have erect stems up to 2 m tall and up to 160 mm thick. There are as many as 44 leaves, each 70 to 150 mm long. The leaflets are up to 360 mm long and 40 mm wide, and glossy green. The male cone is up to 280 mm long and almost 40 mm across, while the female cone is up to 250 mm long and 110 mm across. It occurs in rather wet evergreen forest on a steep mountain slope, in dense shade, 700 to 1399 mm above sea level.

The article is liberally illustrated with coloured photographs, and includes a photograph of a new beetle species which is suspected of being a pollinator.

I was lucky to see and photograph this *Zamia* when visiting Honduras in 2005, and can attest that it would be a worthy addition to any living collection should seed become available, and I see no reason why it won't grow well if protected from frost and drought.

Unfortunately this publication was preceded by Nelson Sutherland & Sandoval (2008); see below, so the correct name for this species is *Z. onan-reyesii*.

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NELSON SUTHERLAND, C.H., & SANDOVAL GONZÁLEZ, G.G. 2008. **Una especie nueva de *Zamia* (Zamiaceae) de Honduras.** *Ceiba* 49: 135–136.

This description of a new species, *Zamia onan-reyesii*, from Honduras refers to the same new species as Schutzman *et al.* (above), and as it was published before Schutzman *et al.* this is the correct name. The description is briefer and readers may have difficulty with the Spanish text. The salient features are illustrated with photographs and what looks like drawings.

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SANGIN, P., FORSTYER, P.I., MINGMUANG, M., & KOKUBUGATA, G. 2008. **A phylogeny for two cycad families (Stangeriaceae and Zamiaceae) based on chloroplast DNA sequences.** *Bulletin of the National Museum of Nature and Science* [Japan] Ser. B, 34: 75–82.

This article attempts to determine the evolutionary relationship between the cycad families Stangeriaceae and Zamiaceae by means of DNA analysis. It is based on 43 species namely the single *Stangeria*, two *Bowenia*, two *Dioon*, 13 *Encephalartos* from throughout the geographical range, 11 *Macrozamia*, two *Lepidozamia*, six *Ceratozamia*, *Microcycas*, two *Zamia*, and 3 *Cycas*.

The results suggest that *Encephalartos* is more closely related to *Lepidozamia* than to *Macrozamia*. *Encephalartos*, *Lepidozamia*, and *Macrozamia* clustered together, while the results suggested a more distant relationship to *Dioon*. Unsurprisingly *Ceratozamia* forms a group on its own, while *Microcycas* is grouped very close to the two *Zamia* species examined. Interestingly the results suggest a quite distant relationship between *Stangeria* and *Bowenia*, thus supporting the growing notion that these two genera should not be grouped together in the same family Stangeriaceae.

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HAYNES, J.L., WHITELOCK, L.M., SCHUTZMAN, B., & ADAMS, R. 2008. **A new endemic *Ceratozamia* from Honduras (Cycadales: Zamiaceae).** *The Cycad Newsletter* 31(2/3): 16–21.

This article describes a new species, *Ceratozamia hondurensis*, from the tropical lowlands of Honduras. This striking species reminds one of *C. euryphyllidia* with its very broad leaflets (240–300 mm long and 90–130 mm wide), but it carries 20 or more leaves which are 1.4 to 2.8 m long. I have seen this species in nature, and to me this is one of the most unusual cycad species and easily the most beautiful *Ceratozamia*.

It grows in several places in humid evergreen tropical lowland forest, in dense shade, between 20 and 600 m above sea level.

The article is well illustrated with colour photographs.

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KEPPEL, G., HODGKISS, P.D., & PLUNKETT, G.M. 2008. **Cycads in the insular south-west Pacific: dispersal or vicariance?** *Journal of Biogeography* 35: 1004–1015.

Anyone who has collected the host of *Cycas thouarsii*-like species described from the east coast of Africa to the western Pacific would know how difficult it is to

distinguish these species from each other. This is thought to mean that they are closely related and have dispersed relatively recently over their current wide range by means of their unique buoyant seeds. This article presents the results of an analysis of some morphological characteristics as well as allozymes.

Although two groups could be distinguished, the allozyme data suggest that the currently recognised species are closely related to each other. To me the most interesting result is that *Cycas silvestris* from the York Peninsula in north-eastern Australia and having bright green broad leaflets like *C. rumphii* groups with *C. rumphii*. I have always suspected that *C. silvestris* belongs in that group rather than the other Australian species.

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ROEMER, R.B., TERRY, L.I., & WALTER, G.H. 2008. **Unstable, self-limiting thermochemical temperature oscillations in *Macrozamia* cycads.** *Plant, Cell and Environment* 31: 769–782.

It is well-known that both male and female cones of cycads heat up well above ambient temperature when respectively shedding pollen and being receptive for pollination. This study of *Macrozamia lucida* and *M. macleayi* indicated that the onset of temperature increasing is not influenced by light level nor do the events initiate at fixed time intervals. Instead it is triggered by ambient temperature itself: at 20 and 22°C the intervals vary widely, but stabilise at 30°C. A mathematical model to circumscribe the process is presented.

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BINNS, D.L. & MEEK, P. 2008. **Population size, habitat and conservation status of an endangered species, *Macrozamia johnsonii* (Zamiaceae).** *Cunninghamia* 10: 373–380.

The *Threatened Species Conservation Act* of New South Wales lists *Macrozamia johnsonii* as *endangered*. Yet, is this justified? The authors assert that there are between 1.9 and 3.5 million mature plants of which 30% are protected in a formal reserve. At present there are no significant threats. It is concluded that the conservation status should be reduced to *least concern*.

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OSBORNE, R. & VOVIDES, A. 2007. **The Cardboard Plant, the Cardboard Palm, or *Zamia furfuracea*.** *Palms & Cycads* 97: 23–29.

This is an overview of *Zamia furfuracea* under the headings *discovery; distribution, habitat and ecology; description, vegetative structures; description, reproductive structures; distinguishing features; conservation status;* and *cultivation*. There is an extensive bibliography; and photographs of plants in habitat, leaf detail, and male and female cones.

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TAYLOR, A.S. HAYNES, J.L. & HOLZMAN, G. 2009. **Taxonomical, nomenclatural and biogeographical revelations in the *Zamia skinneri* complex of Central America (Cycadales: Zamiaceae).** *Botanical Journal of the Linnean Society* 158: 399–429.

For many years only a single species of arborescent *Zamia* with large corrugated leaflets, *Z. skinneri*, was recognised in Panama, and the validity of *Zamia neurophyllidia* with smaller leaflets was in some doubt. The present study re-defined *Z. skinneri*, distinguished *Z. neurophyllidia*, and described three new species viz. *Z. hamanii*, *Z. imperialis*, and *Z. nesophylla*, all with corrugated leaflets. They are distinguished from each other by the number of leaves (3 or more than 10), colour of the emerging leaves (green or reddish), colour of female cones (brown or green), orientation of female cones (erect or hanging), and leaflet size. They are discussed in detail, and a key to their identification is provided. The article includes reproductions of historical illustrations, a distribution map, plants in habitat, leaves, cones, and seeds.

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WARD, D.B. 2009. ***Zamia floridana* (Zamiaceae), the correct name of the Florida cycad.** *Phytologia* 91: 95–104.

Nomenclatural reasons are provided that the correct name for the *Zamia* of Florida is *Zamia floridana* and not *Z. integrifolia*.

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OSBORNE, R., STEVENSON, D.W., VOVIDES, A.P. 2006, publ. 2008. **What is *Ceratozamia fuscoviridis*?** *Delpinoa* 48: 5–10.

It is shown that a plant known amongst cycadophiles as *Ceratozamia* 'red back' or *C.* 'Molango' is in fact the same as what was tentatively called *C. fusca-viridis* (correctly *fuscoviridis*) in 1878, and the name is legitimised by the present authors who also provide a detailed description. It is characterised by reddish brown emergent fronds and the leaflets are green above but brown underneath once hardened. They not only found the original herbarium specimen in Kew Herbarium in England, but also living plants in botanical gardens in Ireland and Italy which are judged to be from the original collection. The article is well illustrated.

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LINDSTROM, A. 2009. **Typification of some species names in *Zamia* L. (Zamiaceae), with an assessment of the status of *Chigua* D. Stev.** *Taxon* 58: 265–270.

Type specimens of species names are very important because they are meant to tell us exactly what species an author had in mind when he coined a name. In practice type specimens are often poor or ambiguous because of the frequently large size of the plants, the difficulty of finding and preserving cones, and the fact that many collectors are not familiar with cycad taxonomy and thus do not preserve the important parts of the plants.

Lindstrom studied the type specimens of a number of controversial *Zamia* species and came up with results which deserve consideration:

- The names *Zamia amplifolia*, *Z. roezlii*, and *Z. wallisii* were recently neo-typified, but that was unnecessary because original material exists in herbaria.

- *Zamia oligodonta* is considered to be a synonym of *Z. montana*.

- *Zamia poeppigiana* has in recent times been considered to apply to both plants from Peru (east of the Andes) and from Ecuador and Colombia west of the Andes. Evidence is here presented that two species are involved, with the name *Z. lindenii* applying to the plants west of the Andes.

- *Chigua* is considered to be synonymous with *Zamia*. Furthermore, *Chigua bernalii* is said to be based on poor material, and identical to *C. restrepoi* (now *Zamia restrepoi*).

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NICOLALDE-MOREJÓN, F., VERGARA-SILVA, F., GONZÁLEZ-ASTORGA, J., VOVIDES A.P., ESPINOSA DE LOS MONTEROS, A. 2009. **Reciprocal illumination of morphological characters upon a molecular hypothesis supports the proposal of a new species of cycad from Mexico.** *Systematics and Biodiversity* 7: 73–79.

Whereas most of our readers may read this article chiefly for the description of the new species, *Dioon stevensonii*, there is considerably more to it. The authors give an overview of the discovery of *Dioon* species, including this new species. For at least 10 years we were aware of these plants, and field botanists who really know their *Dioon* plants were unable to match the plants to any described species, though some likened them to *D. tomasellii*. Then in 2007 a paper was published which included the results of a molecular investigation, showing that these plants do, molecularly, not at all match *D. tomasellii*. The authors then went back to the field, had another good look at the plants, and (*voila!*) realised that these plants differ so profoundly from *D. tomasellii* that they described it as a new species.

*D. tomasellii* is a medium-sized *Dioon* with stem up to 1.2 m tall. The leaves are covered in golden yellow to yellow hairs when emerging. At least some of the leaflets are imbricate; they are up to 11 mm wide, straight, with only one or two teeth on the upper margin. The apices of the female cone scales are not reflexed, unlike those in *D. caputoi*.

There are several colour photographs, as well as an identification key to all the described species of *Dioon*.

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HURTER, J. 2009. **What has become of *Encephalartos heenanii*?** *The Cycad Newsletter* 32(1): 3.

The virtual eradication of *Encephalartos heenanii* between 1984 and 2007 is related and ascribed to the apathy, ignorance, and incompetence of those appointed to safeguard the plants. There is a particularly nice photograph of a clump in habitat.

*Author's address: not provided.*

SANEESH, C.S. 2009. **Bread from the wild: *Cycas circinalis* L. Endemic, endangered, and edible.** *The Cycad Newsletter* 32(1): 4–5.

In rural India flour is routinely prepared from the seeds of *Cycas circinalis*. From a conservation point of view this is no trivial matter: in one village alone, it amounts to 1500 kg of seeds annually, while a buyer stated that his annual procurement of seeds amount to 10 000 kg.

Methods are outlined to leach the seeds (essential as they are otherwise poisonous), and to prepare the flour. No recipes for particular dishes are provided, but photographs of *Pidy* and *steamed noodles* look pretty apetising.

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HAYNES, J. 2009. ***Encephalartos kanga* Pócs & Q.Luke—A newly described 'red cone cycad' from Tanzania.** *The Cycad Newsletter* 32(1): 6–14.

The discovery and history of the recently described *Encephalartos kanga* are related, and the supposed distinguishing characteristics are discussed, quoting liberally from the original publication as well as people who saw the plants in habitat. There are also photographs of herbarium specimens and cultivated plants in various parts of the world, and a distribution map of the east African species.

It is concluded that *E. kanga* was described from insufficient material, but that all the available information suggests that it is synonymous with *E. kisambo*. A noteworthy point is not the reddish, rather than yellow, cones of *E. kanga*, but the fact that it occurs some 300 km from the only other locality for *E. kisambo*.

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HAYNES, J. 2009. ***Encephalartos kisambo.*** *The Cycad Newsletter* 32(1): 15–17.

This is a mini-monograph of *Encephalartos kisambo*. Aspects treated are history of its discovery, diagnosis (but no description), conservation status, and relationships. Of some use is a key to east African species which also treats *Encephalartos laurentianus* but not *E. ituriensis* nor the north-eastern group of *E. mackenziei*, *E. macrostrobilis*, *E. septentrionalis*, and *E. tegulaneus* subsp. *powysii*. There is a good bibliography but only one small indistinct photo of a cultivated plant (though there are several useful photographs elsewhere in this issue of *The Cycad Newsletter*).

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CAMERON, A. 2009. ***Encephalartos kisambo* in cultivation – Athi River, Kenya.** *The Cycad Newsletter* 32(1): 17–18.

The article concerns growing seedling plants of *Encephalartos kisambo* some 30 km south of Nairobi, Kenya, at 1450 m above sea level.

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HOLZMAN, G. 2009. **Growing kisambos in Hawaii.** *The Cycad Newsletter* 32(1): 19–20.

The author waxes lyrically about growing *Encephalartos kisambo* in Hawaii. *Inter alia* he states "I have experienced no … adverse problems that have caused me to consider *Encephalartos kisambo* anything but the perfect feature cycad for just about any condition or soil type". Even allowing for the fact that Hawaii has a wonderful climate for cycads, your reviewer must agree that *E. kisambo* (together with *E. transvenosus*) must be the easiest and most beautiful *Encephalartos* which one can grow, as long as one has sufficient space for these monsters.

There are nice photographs of male and female cones.

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We do not as a rule report on advertisements, but could not resist the temptation on this one:

Member Greg Holzman in *The Cycad Newsletter* 32 advertised for sale *Encephalartos kisambo* plants with 25+ cm stems for U.S. $300 (about R2400), plus shipping from Hawaii. Enquire from **Greg Holzman, Pacific Cycad Nursery, P.O. Box 764, Kekaha, Hawaii 96752, U.S.A. E-mail: cycads@hawaii.rr.com, or see www.cycadshawaii.com**

**Piet Vorster**
**pjvor@sun.ac.za**

# *DIOON MEROLAE* DE LUCA, SABATO & VÁZQ. TORRES

Roy Osborne[1] & Tim Gregory[2]

Figure 1.—The Italian botanist Professor Aldo Merola, for whom *Dioon merolae* was named in 1981. Reproduced by permission from the University of Naples Federico II, Italy.

## Introduction

*Dioon* is the genus that most South African cycad enthusiasts would see as being related to *Encephalartos*. Certainly there are many similarities in gross vegetative morphology. At the present time the genus has 16 extant species, all of which are endemic to Mexico, except for *Dioon mejiae* from Honduras. So far in this magazine, we have featured 'Focus on…' articles on *D. argenteum* (Gregory & Salas-Morales 2008), *D. caputoi* (Osborne 2005) and *D. spinulosum* (Tang 1987). In this issue we focus on *D. merolae*.

## Discovery

In 1909, California plant collector Edward Howard found a cycad population near Cerro Tres Picos, to the northeast of Tonalá, and more or less equidistant between Arriaga and Villa Flores in the northwestern reaches of the Sierra Madre, Chiapas, Mexico. He called this plant 'Dioon dohenyi' to acknowledge the financial help of his expedition sponsor, Edward Doheny of San Diego, although that name was never validly published. Howard arranged for up to 50 plants to be exported to California. Voucher specimens from some of these garden plants later became filed in several US herbaria under the names 'D. tomentosum' and *D. purpusii* Rose. Further, in 1925 Carl Purpus himself collected material from what seemed to be the same taxon near Las Minas in the mountains east of his base at Hacienda Montserrate in the Cintalapa district. His specimen bears an unpublished name, attributed to Joseph Rose, honouring the Del Pino family who owned the land where the plants grew.

Investigations by the Italian cycad research group headed by Paolo De Luca in the 1970s are led to the conclusion that all these specimens referred to a single new species. Subsequent fieldwork revealed an additional population near Villa Flores and the species was finally published as *Dioon merolae* in 1981. The epithet recognizes Aldo Merola (1924–1980), former Director of the Botanical Garden of the University of Naples Federico II (Figure 1). The holotype is M. Vázquez Torres 2301, collected near the original Tres Picos site in May 1979, and filed at the herbarium of the University of Naples, Italy. At the time, it was thought that the species was confined to Chiapas and was geographically isolated from other *Dioon* populations in Oaxaca and Puebla by the low-lying Isthmus of Tehuantepec.

Fieldwork during the mid-1990s by Silvia Salas-Morales and Leo Schibli of the research institute Sociedad para el Estudio de los Recursos Bióticos de Oaxaca (SERBO) led to the discovery of three significant populations of *D. merolae* in Oaxaca; two in the southeastern foothills of the Sierra de Juárez and one in the northern foothills of the Sierra Madre del Sur (Chemnick *et al*. 1997). These stands are approximately 160 km to the west of the nearest Chiapas populations but only about 30 km east of a stand of a new species of *Dioon* (as yet unnamed), and they match the morphological characteristics of the Chiapas populations. In addition, Salas-Morales and Schibli observed by helicopter what appears to be another large *D. merolae* population in the southern mountains of the Chimalapas region of Oaxaca. This broad distribution demonstrates that the Isthmus of Tehuantepec is not necessarily a barrier to the distribution of *Dioon* species in southern Mexico.

## Distribution, habitat and ecology

*Dioon merolae* is the southernmost of all the Mexican dioons; only *D. mejiae* from Honduras occurs at a lower latitude.

Because of its extensive distribution, involving 10 separate populations on the Pacific slope of two adjacent states, the habitats for *Dioon merolae* are somewhat variable. Populations occur at 700–1200 m in the lowest reaches of the pine/oak forest (bosque de pino y encino) at Villa Flores in Chiapas (Figure 2 and 3) and in the Sierra Sur of Oaxaca, under *Pinus oocarpa* forest near Las Minas in the Sepultura Biosphere Reserve, Chiapas, and in tropical semi-deciduous forest (bosque tropical caducifolio) at the type locality near Tonalá in Chiapas and in the other Oaxacan localities (Figure 4). Temperatures

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Figure 2.—*Pinus oocarpa* occurs on steep slopes in the Sepultura Biosphere Reserve, Chiapas and affords shelter to some very large *Dioon merolae* specimens. Photo: Roy Osborne.

range from 30–40°C in summer and can drop briefly to freezing in mid-winter. Annual rainfall is 500–800 mm and occurs between June and September.

Associated plants at the Sierra de Juárez locality in Oaxaca include *Agave potatorum*, *Beaucarnea recurvata*, *Billbergia mexicana*, *Chamaedorea elegans*, *Hechtia* spp., *Plumeria rubra* and *Tillandsia brachycaulos*. Soils in these various localities are derived from sedimentary rock or karst limestone. Due to the cultivation of certain illegal crops in southern Mexico, there is some danger associated with visiting isolated *Dioon* populations. For this reason it is imperative to obtain permission from the local authority and to employ the services of a local guide.

As with other *Dioon* species, circumstantial evidence points to insect pollination in *D. merolae*. The factors include thermogenesis in both male and female cones at the time of pollen dehiscence in the male cones and pollen receptivity of the female cones, and that the female cone scales remain tightly adpressed except for a row at the cone base that opens briefly at pollination time. A weevil found in both male and female cones of *Dioon merolae* has been identified by Rolf Oberprieler (1995) as being in the genus *Rhopalotria* (parallocorynus group, Belidae), and is the candidate pollinator for this cycad and related species in the same general range.

The dioons of central and southern Mexico produce large seeds with a bright yellow sarcotesta. The white-throated magpie-jay (*Calocitta formosa*), implicated in seed dispersal of *D. holmgrenii*, may also be a dispersal agent for *D. merolae*. Rodents such as the nocturnal deer mouse (*Peromyscus* sp.) are known to eat the sarcotesta and to leave caches of 'cleaned' seeds up to 25 m from the mother plant. In Oaxaca, domestic pigs are known to eat *D. merolae* seeds but they defecate the 'cleaned' seeds with sclerotestae intact, possibly facilitating germination in the process.

## Description, vegetative structures

*Stems* of *Dioon merolae* are erect to 300 cm in length, 20–40 cm in diameter, but become procumbent with increasing length and age, up to 800 cm having been measured. Mature plants can produce basal suckers leading ultimately to impressive multi-trunked specimens (Figure 3). *Leaves* are stiff, neither keeled nor flat but with leaflets deflexed and curved (so that their tips are below the plane of the rachis), dark shiny green to glaucous green, densely tomentose on emergence becoming glabrous later, 80–140 cm long, 13–17 cm wide with a

Figure 3.—*Dioon merolae*. An enormous female specimen with numerous reclining trunks, known to many as 'Loran's plant', at 700 m on a steep east-facing slope in *Pinus oocarpa* forest near Las Minas. Photo: Jeff Chemnick.

Figure 4.—*Dioon merolae*. A plant in seasonally dry tropical forest on a west-facing slope at 1100 m, near Santiago Lachiguiri, Oaxaca, with *Agave kerchovei* in the foreground. Photo: Roy Osborne.

Figure 5.—Roy Osborne (left) and Nat Grobbelaar (right), both past Presidents of the Society, inspecting a male *Dioon merolae* specimen at a nursery in Brisbane, Australia, May 2009. Photo: Stan Walkley.

petiole 7–15 cm long, 10–20 mm in diameter and semi-circular in cross section. *Leaflets* are arranged in 120 or more pairs that are angled forward (pinna-to-rachis angle 60–80º), closely imbricate, linear to lanceolate, with sharply pointed tips curving both down and towards the leaf apex, and with revolute margins, the upper margin entire or with up to four teeth 1 mm long, the lower margin with none to two teeth. *Median leaflets* are 7–12 cm long by 10–13 mm wide. *Cataphylls* are woolly, about 10 cm long by 2 cm wide at the base. *Eophylls* are similar to those of other dioons being grey-green with multiple teeth on both leaflet edges (Figure 5 and 6).

## Description, reproductive structures

*Male cones* of *Dioon merolae* are solitary per stem, erect, elongate/cylindrical, densely tomentose, 20–40 cm long excluding the peduncle, 8–10 cm in diameter, with a much reduced peduncle so that the cone appears sessile. *Microsporophylls* present a triangular face, 10–14 mm high and 15–20 mm wide. *Microsporangia* occur over two lobes that meet basally, covering the entire undersurface of the microsporophyll (Figure 7).

*Female cones* are solitary per stem, erect, ovoid, densely grey-tomentose except for the lowermost rows of scales that are very lightly tomentose to glabrous and green, 40–45 cm long excluding the peduncle, 20–25 cm in diameter, with a much reduced peduncle so that the cone appears sessile. *Megasporophylls* present a triangular face 105–115 mm high by 75–80 mm wide. *Seeds* have a yellow sarcotesta when ripe, the sclerotesta smooth with some longitudinal grooves, 33–41 mm long and 24–32 mm in diameter, the chalaza with a pit 5–8 mm in diameter (Figure 8).

The diploid chromosome number is consistent with the regular pattern for the genus, i.e. 2n = 18 with the karyotype 8 metacentric + 8 submetacentric + 2 telocentric (Moretti 1990).

## Distinguishing features

*Dioon merolae* is distinguished from other dioons of southern Mexico by its leaves with closely overlapping leathery leaflets that arise from the rachis at an acute angle and are arched above and deflexed below the rachis, so that in cross section the leaf profile resembles a gull in flight with wings in the downstroke (Figure 6). Detached leaflets will not lie flat.

The closest relatives of *D. merolae* are probably *D. holmgrenii* and *D. oaxacensis*, with *D. argenteum*, *D. califanoi*, *D. caputoi* and *D. purpusii* being somewhat less closely related. Attempts have been made to devise cladistic trees showing relationships in the genus, variously using morphological, molecular and biogeographical data (e.g. Vovides *et al*. 2007). Some degree of commonality suggests that the cycads of Oaxaca, Chiapas and Puebla represent a monophyletic group of fairly recent origin and illustrating speciation in progress.

Figure 6.—*Dioon merolae*. Leaf detail, from a plant in greenhouse cultivation at the Orto Botanico, Naples, Italy. Photo: Roy Osborne.

## Ethnobotany

The details that follow have been abstracted from the CYCAD 2005 presentation by Mark Bonta and Roy Osborne (2007). *Dioon merolae* is known in Chiapanec, a near-extinct native language of Chiapas, as nimalari, or less often nimbalari ('nima' leaf + 'lari' feather). The Chontal people use the names la-fane-tejua, lan-zi-le or lan-zi-li. In Spanish, the species has been referred to as comida antigua (old-time food), comida de gentil (people's food), espadaña (swordlike, relating to the leaf), morrito (small tree gourd with spherical fruit, *Crescentia alata*), maíz viejo (old-time maize), palma espinuda (prickly palm), and palmilla (little palm).

In common with other dioons from southern Mexico, leaves of this species are used ornamentally in religious events. For example, the men (espadañeros) from Suchiapa and Terán villages in the central depression of Chiapas walk nearly 70 km each way to collect over 20 000 espadaña leaves from a cycad population near Villa Flores; this effort in preparation for the annual Santa Cruz Festival on 3 May (Pérez-Farrera & Vovides 2006). The practice appears to be a long-standing Chiapanec tradition that has become syncreted into the local Catholic religion. *Dioon* leaves are also used during Easter and other religious holidays, weddings and similar events. Churches prepare wreaths using cycad leaves, sometimes from plants that they have cultivated specifically for that purpose.

Some communities (e.g. the Chontal) eat the raw sarcotesta (Mark Bonta pers. comm.) while others consider the fried material a delicacy. The starch-rich megagametophyte has been used as an emergency foodstuff in the absence of corn supplies (Chemnick *et al*. 1997), while the hollowed-out sclerotesta is used for children's games, bracelets and necklaces.

Figure 7.—*Dioon merolae*. A male cone at the time of pollen shedding, on a plant in cultivation in Brisbane, Australia. Photo: Roy Osborne.

## Conservation status

No other *Dioon* species from southern Mexico has been illegally collected and exported to the extent of *D. merolae*. As recently as the 1990s, hundreds of wild-collected stems of this species were smuggled into the USA for sale in California and Florida. Nurseries in towns to the west of Tuxtla Gutiérrez continue to collect plants from the local wild populations. Another major threat to the *D. merolae* populations is habitat destruction to make way for field crops and for pasture for domestic animals (Figure 9). One population in Chiapas was irreversibly damaged in April 2007 when many of the mature plants, and all the younger specimens, were burned. Road construction projects result in plant losses and also make populations more accessible to illegal collecting.

As mentioned above, the use of espadaña leaves during religious events is extensive. However, only old-

Figure 8.—*Dioon merolae*. A female cone on 'Loran's plant' near Las Minas in Chiapas. Photo: Jody Haynes.

Figure 9.—A large *Dioon merolae* specimen burned during habitat clearance for agriculture in Chiapas. Photo: Miguel Angel Pérez-Farerra.

er leaves are taken and the practice does not seem to have any significant impact on the cycad population. Of greater concern is the fact that factions hostile to the Catholic religion have apparently set fire to plants so as to sabotage the leaf collection and subsequent festivities (Pérez-Farrera & Vovides 2006). Attack by the larvae of the *Eumaeus* butterfly appears to be a problem in some years. Recruitment into existing populations is threatened by goats that graze on seedlings and by seed harvesting for sale to growers.

A positive development has been the establishment of two community nurseries, the first at La Sombra de la Selva, where both *Ceratozamia mirandae* and *Dioon merolae* are being propagated and managed, and the second at San Andrés Quintana Roo, where *D. merolae* is grown (Vovides *et al*. 2002). Pérez-Farrera & Vovides (2006) report that the espadañeros at the campesino nursery near Villa Flores introduced about 2000 *D. merolae* seedlings to augment the local population. The 2003 Cycad Action Plan gave a conservative total population size of 3000–5000 mature individuals for *D. merolae* (Stevenson *et al*. 2003). The plants in La Sepultura Biosphere Reserve in Chiapas fall within a designated conservation zone but most populations are in unprotected areas. All Mexican cycads are protected by the national law NOM-059-ECOL (1994 and later revisions), and this species is listed as vulnerable on the IUCN Red List of Threatened Species (2008).

*Dioon merolae* has recently become the subject of fairly extensive research, with publications on its ethnobotany (Pérez Farrera & Vovides 2006 and in preparation), investigations into population ecology (Flores-Vázquez *et al*. in preparation) and population dynamics (Pérez Ferrera *et al*. in preparation).

## Cultivation

*Dioon merolae* is a handsome cycad, suitable for container or landscape applications in warm temperate and tropical climates. Similar to the case with most other dioons, seeds of *D. merolae* take as long as two years after pollination to mature fully. Seed germination is enhanced by removal of the sacrotesta and by scarification of the sclerotesta (Pérez Farrera *et al*. 1999). The species is relatively fast growing in its juvenile stage but older plants grow only slowly, benefiting slightly from good soil and occasional fertiliser treatments. This cycad is somewhat cold sensitive.

## Acknowledgements

We thank Jeff Chemnick, Jody Haynes, Aldo Moretti, Miguel Angel Pérez-Farrera and Stan Walkley for photographic contributions. Miguel Angel Pérez-Farrera also assisted with proof-reading the text.

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# The rare thrill of observing wild-growing cycads in nature

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Figure 1.—It is always exciting to see cycads in nature, like this *Encephalartos middelburgensis*, on the Highveld.

Despite our rich heritage of indigenous cycads, few South Africans have enjoyed the thrill of seeing these jewels in their natural state. Jaco van Wyk has experienced this pleasure and relates some of his cycad adventures to readers.

I have always had a love affair with cycads, especially our own African genus *Encephalartos*. But strangely, since the bug bit me more than a decade ago, I have only seen four different species at three localities in nature. This is quite sad. I have seen thousands of plants in private collections all over the country or well-run botanical gardens like Kirstenbosch, Pretoria or the Lowveld National Botanical Gardens. To me, seeing these plants in gardens is the equivalent of seeing elephants in a zoo. Nothing compares to seeing these 'living fossils' in nature. I know many people will not disclose sites where wild cycads grow because of unscrupulous illegal collecting and dealing in these rare plants. Still, nothing comes close to the sight of wild-growing *Encephalartos* plants in their natural habitat (Figure 1).

The first time when I saw these amazing plants in nature was when some of the owners of a private game reserve near Bronkhorstspruit invited me to their property. It was quite exciting to see cycads growing in the Gauteng Province. Beautiful specimens of *Encephalartos middelburgensis* took my breath away (Figure 1). Seeing these plants, which are not pruned by skilled horticulturists, made me realise how these plants survive and that conditions are not always exactly favourable for cycads to survive in nature. This was evident from, amongst other things, damage from veld fires and porcupines chewing at their stems. The much smaller specimens of *E. lanatus* which grow in the same area are just as interesting as their larger family members.

The second time I saw a wild cycad was totally unexpected. My wife and I were visiting the Oribi gorge area near Port Shepstone. We bought our permit from the Oribi Gorge Hotel to visit the different viewpoints of the gorge. At one of the numerous viewpoints, aptly named Baboon Castle, I saw two plants. They grow in rather impossible places and we could not come close to the specimens of *E. natalensis* (Figure 2).

The third place where I saw wild cycads is arguably South Africa's best-known cycad area, if not one of the best areas in the world. One of the best-kept secrets of the Limpopo Province is the Modjadji Nature Reserve, about 52 km from Tzaneen and 31 km from Modjadjikloof, previously known as Duiwelskloof. The Reserve is famous for its *E. transvenosus* plants, one of the 38 species of *Encephalartos* in South Africa. This species

Figure 2.—A Natal cycad, *Encephalartos natalensis*, growing in the Baboon Castle section of the beautiful Oribi Gorge. The plant is in the foreground on the left-hand side of the photograph.

has the most northerly distribution within South Africa for indigenous cycads.

The Nature Reserve comprises of a huge natural amphitheatre that is virtually bound on the upper slopes by slabs of granite outcrops. Taller cycads can be observed on the south-easterly ridge (Figure 3). Looking east from the reserve, one has a bird's eye view of the flat landscape of the Kruger National Park and the numerous semi-tribal settlements. The reserve covers an area of 308 ha and is reminiscent of an ancient forest (Figure 4). Experts often refer to cycads as 'living fossils' because they date back to the Mesozoic Age, some 50–60 million years ago when they were particularly prolific all over the earth and probably formed a substantial part of the dinosaurian diet.

The reserve is strongly associated with the cultural heritage of the Lobedu people and the Modjadji cycad (*E. transvenosus*). The Reserve takes its name from the highly respected and influential reigning Rain Queen of the Lobedu people of Modjadji from this region. The Rain Queen, Modjadji VI, is part of a dynasty of female rulers. Her subjects believe that she has the ability to call up rain. The Reserve lies adjacent to the kraal area of the royal family. To a large extent, *E. transvenosus* plants have enjoyed protection bestowed upon them by the former Rain Queens and it was chiefly through their vigilance which led to the area being declared a National Monument in 1936 and proclaimed a Nature Reserve in the early 1980s.

There are several features which make the Modjadji cycad particularly special. Firstly, its height of often more than eight metres is certainly worth mentioning, espe-

Figure 3.—The taller Modjadi cycads that grow in the Modjadi Nature Reserve are found on the south-eastern ridge of the upper slopes of the slabs of granite outcrops.

Figure 4.—Some of the *Encephalartos transvenosus* cycads that form part of the cycad forest.

cially when compared to other indigenous South African species. Some individual plants even exceed the 13 m mark, rendering it the second tallest cycad in Africa, after the Kwango giant cycad (*E. laurentianus*) from the south-western parts of the Democratic Republic of Congo (Figure 5). Secondly, the montane environment of the Modjadji Nature Reserve has an incredibly high density of *E. transvenosus* plants. An estimated 15 000 adult plants grow in the Reserve. Although this is an impressive phenomenon, the Reserve is by no means the most extensive cycad forest in the world. It would appear that one population of the Chinese Panzihua cycad (*Cycas panzhihuaensis*) in the Sichuan Province numbers 250 000 individuals. The population of another *Cycas* sp. from Australia's Northern Territory numbers over 1 million individuals (Golding & Witt 1998).

Entry to the Reserve is reasonably priced at R10 per person and R20 per vehicle. I also purchased a permit for R20 at the Reserve for a one year old plant from the nearby nursery. The nursery is situated on the main road; approximately 5 km from the Reserve.

I will definitely make an effort to see more wild cycads and would like to encourage fellow cycad-lovers who have visited other places in South Africa where one may still see these magnificent plants in their natural environment, to write down their accounts and have it published in *ENCEPHALARTOS*.

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Figure 5.—Some of the larger Modjadi cycads. The tallest specimens in the Modjadi Nature Reserve can grow up to 13 m!

# Current threat status of *Cycas beddomei* Dyer, an endemic species of the Tirupati-Kadapa hills, Andhra Pradesh, India.

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## Abstract

*Cycas beddomei* Dyer, an endemic species of the Tirupati-Kadapa hills, Andhra Pradesh, India is listed as being critically endangered by the IUCN. Furthermore, it is the only Indian cycad listed on CITES. To document its current population size and to re-evaluate its threatened status we monitored the species populations in the Tirupati-Kadapa hills for longer than the past decade. We re-established the 'critically endangered status' of the species on par with the IUCN 2008 Red List, however, some additional sub-criteria were added.

## Introduction

The worldwide destruction of the natural environment by human population explosion, urbanisation, industrialisation and habitat fragmentation has led to a tremendous loss of biological diversity over the past few decades. The International Union for the Conservation of Nature and Natural Resources (IUCN) is the world's main authority on the conservation status of species (Mrosovsky 1997). The IUCN Red List is set upon precise criteria to evaluate the extinction risk of taxa as well as to help the international community to try to reduce species extinction. The IUCN Red List is widely considered to be the most objective and authoritative system for classifying species in terms of the risk of extinction. The 2008 update of the IUCN Red List includes 44 838 species, of which 869 (2%) are Extinct or Extinct in the Wild; 16 928 (38%) are threatened with extinction (IUCN 2009). Of these, 8 457 are plant species classified under different threats. India accounts for 246 of these species with 9 species already extinct. The major causes of species extinction are habitat loss and degradation. Habitat loss and fragmentation led to the formation of small, isolated and scattered populations which are increasingly vulnerable to inbreeding depression, high infant mortality and susceptible to environmental stochastic and consequently, possible extinction (Caro, 1998). Of all the vascular plants, gymnosperms are some of the most vulnerable group representing 980 species as opposed to 270 000 angiosperms. Many of them are considered to be living fossils and 35% of them are threatened with extinction including 150 species of cycads (IUCN 2009). In the 2008 IUCN Red List, 45 species of cycads are listed under the critically endangered category. Seven of these species belong to the family Cycadaceae, including *Cycas beddomei*.

There is a general lack of scientific information on cycad population dynamics and the impact of harvesting and management practices on cycad populations. It is of concern that some critically endangered cycads continue to decline in population size due to habitat destruction as well as illegal trade (Donaldson *et al*. 2003) and the role of CITES in cycad conservation needs necessitate a critical evaluation of the different species' populations.

*Cycas beddomei*, an endemic species of the Tirupati-Kadapa hills of Andhra Pradesh state, India, belonging to the family Cycadaceae is recorded as a Critically Endangered species (IUCN 2009). The plant is especially known for its medicinal importance (Bharath Kumar & Murthy 2001). It is the only cycad species of India listed on CITES Appendix I (Inskipp & Gillett 2005). Botanical surveys based on India's Red Data Book (Nayar & Sastry 1987) listed the species as Vulnerable, but was later given the status of Endangered (Rao *et al*. 2003). Jadhav *et al*. (2001) classified the species as Critically Endangered based on secondary data. The species has been assessed in 2003 by Hill and evaluated by Donaldson & Hill (IUCN 2009) as Critically Endangered following Version 3.1 categories and criteria of the IUCN Red List (IUCN 2001). They attributed the criteria B1 (Extent of Occurrence—EOO) with an estimated $<100$ km$^2$; B2 (Area of Occupancy—AOO) with an estimated $<10$ km$^2$. The sub-criteria evaluated for both B1 and B2 is ab (i, ii, iv). Sub-criterion (a) refers to severe fragmentation or occurrence in a single location; (b) refers to continuing decline, observed, inferred or projected in (i) extent of occurrence (ii) area of occupancy and (iv) number of locations/subpopulations.

Our research team has been working on various aspects of plant biodiversity of southern Andhra Pradesh (Rao *et al*. 1998, 2007; Rao 2001, 2003; Suresh & Rao 2009) for the past ten years, monitoring threatened tree populations in southern Andhra Pradesh which includes *C. beddomei*. Since earlier studies were based mostly on secondary data, in this paper we attempted to present the current threatened status of the species based on field observations of the species population; specifically those done in the past two years through a random sampling technique.

## Materials and methods

The study was carried out in the hill ranges of Tirupati-Kadapa located in the south eastern Ghats of Andhra Pradesh between 13°37'–15°58'N and 79°15'–79°30'E. The altitude of the study area varies from 200–1150 m above mean sea level and most of the hill peaks are higher than 900 m above mean sea level. The monthly aver-

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Figure 1.—*Cycas beddomei* population on Talakona hilltop.

age minimum temperature varies from 18°C–22.6°C in January and 33.4°C–36.2°C in May. The annual rainfall varies between 570–1230 mm. Forests of the study area are of dry deciduous mixed type with patches of moist deciduous nature with dominant tree species including *Buchanania axillaris, Gardenia gummifera, Ochna obtusata, Pterocarpus santalinus, Shorea tumbuggaia, Syzygium alternifolium, Terminalia alata* and *T. pallida* (Figure 1 & 2).

*Cycas beddomei*, locally known as 'Peritha' or 'Madanakamakshi' appears almost like a small phoenix tree with a distinct trunk of up to 1.5 m. The plants are dioecious. The male and female plants (Figure 3 & 4) can easily be distinguished, the former in clumps and the latter with isolated growth as cited by Whitelock (2002). Leaves are pale green, up to 1 m long; leaflets narrow, linear, 12–18 cm × 2–3.5 mm, with revolute margins. Male cones are oblong-ovoid, 35 × 16 cm, with a short peduncle. Megasporophylls up to 4 × 2 cm. Ovules usually 2–4, occasionally 6–8, inserted above the middle of the stalk, up to 4 cm across.

The field studies were conducted in the Tirupati-Kadapa hills from 2006–2008 covering all possible areas of species distribution based on literature accounts as well as our field observations. The Tirupati-Kadapa hills, conventionally known as 'Seshachalam hills', occupies an area of about 250 km$^2$. The area was stratified into 32 grids of 6.25 × 6.25 km, using remote sensing data (IRS-1C). Explorations in these 32 grids resulted in the identification of a further 15 grids originally containing *C. beddomei*.

All the individuals of the species in reference were counted for each grid. Transects of 1000 × 5 m were laid down in each grid and in the case of terrain heterogeneity, this transect was subdivided into 2–4 transects of 500–250 m each. This amounts to approximately the 0.01% of sampling intensity, which is a standard requirement for such enumerations (Shivaraj *et al*. 2000). A total of 195 geographical locations using a Global Positioning System (GPS) were explored. Records of the current distributions of the species were gathered from ground surveys. In 15 grids all trees with >10 cm girth, including *C. beddomei* trees (>2 cm height), were counted and considered for the analysis.

The recent Version 3.1 of IUCN (2001) is applied for reviewing the threatened status of the species against the existing data.

Figure 2.—*Cycas beddomei* population in the Dongabanda area.

Figure 3.—Female plant of *Cycas beddomei* with multiple shoots.

## Result and discussion

A record of 2 237 tree individuals of *C. beddomei* was counted in the sampled 15 grids (Table 1). This area lies between 13°37'–13°58'N and 79°2'–79°22'E accounting for about 87.5 km$^2$. In all grids, female trees are more abundant (71–65%) than male trees (19–35%). An attempt has been made to estimate the whole population of the species considering the field data samples. The density distribution of *C. beddomei* indicated that 53% of the grids (eight grids) have more than 150 individuals; 27% of the grids (four grids) have 100–145 individuals and the remaining 20% of the grids (three grids) with less than 100 individuals. The total number of trees, of all species encountered, is between a minimum of 372 and a maximum of 804 individuals. The component of *C. beddomei* with respect to all arborescent species in the grids accounts for a minimum of 6.97% to a maximum of 36.59% of the total tree individuals. Based on the current population records on all 15 grids, a minimum of 20 000 to a maximum of 30 000 mature individuals are estimated to occur in their natural habitat.

This is the first ever critical study based exclusively on field observations of *C. beddomei* populations. The species is currently evaluated for its threat status following Version 3.1 of IUCN (IUCN 2001). Of the five criteria (A–E) pertaining to threatened categories; the species is classified under the Critically Endangered category with respect to criterion B1 (Extent of Occurrence) and B2 (Area of Occupancy). This is on par with the recent IUCN Red List (IUCN 2009). In the current study, sub-criteria (a) and (b) both under B1 and B2 are suited for the taxon. Sub-criterion (a) refers to severely fragmented population or found in a single location and (b) with reference to continuing decline, observed, inferred or projected pertaining to different threat factors numbering (i–v). In addition to IUCN Red List evaluation, we observed and noted all the threats (i–v): (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and or quality of habitat; (iv) number of locations/subpopulations; (v) number of mature individual ascribed to the taxon.

Based on the field observations, *Cycas beddomei* is currently re-evaluated and categorised as Critically Endangered based on Version 3.1 of IUCN with the following criteria: **CR B1 a, b (i–v) + B2 a, b (i–v).**

Figure 4.—Male plants of *Cycas beddomei*.

Table 1.—Grid-wise population information of *Cycas beddomei*. The component of *C. beddomei* plants as a percentage of the total number of trees; as well as the ratio of male and female plants are indicated.

| Grid number | Location | Altitude | Total number of trees | Number of *C. beddomei* plants | Component of *C. beddomei* (%) | ♀ plants | ♂ plants |
|---|---|---|---|---|---|---|---|
| 57O/1NW1 | 13° 57' 30"N 79° 2' 45.4"E | 800 | 692 | 167 | 24.13 | 117 | 50 |
| 57O/1NW3 | 13° 56'45.2"N 79° 4' 6.3"E | 790 | 597 | 145 | 24.28 | 109 | 36 |
| 57O/1NW4 | 13° 54' 6.9"N 79° 6' 41.3"E | 860 | 625 | 168 | 26.88 | 123 | 45 |
| 57O/1NE1 | 13° 57' 2.3"N 79° 7' 39.4"E | 750 | 516 | 36 | 6.97 | 29 | 8 |
| 57O/1NE2 | 13° 55' 2.5"N 79⁰ 10' 36.4"E | 650 | 421 | 114 | 27.07 | 86 | 28 |
| 57O/1NE4 | 13° 33' 9.2"N 79° 12' 25.4"E | 792 | 506 | 76 | 15.01 | 57 | 19 |
| 57O/1SE1 | 13° 50' 32"N 79° 10' 51.3"E | 980 | 647 | 165 | 25.50 | 123 | 42 |
| 57O/1SE3 | 13° 49' 25"N 79° 13' 26.7"E | 1010 | 804 | 210 | 26.11 | 157 | 53 |
| 57O/1SE4 | 13° 47' 30"N 79° 12' 15.2"E | 960 | 715 | 236 | 33.00 | 170 | 66 |
| 57O/5SW1 | 13° 50' 2.8"N 79° 15' 48.4"E | 920 | 700 | 182 | 26.00 | 135 | 47 |
| 57O/5SW2 | 13° 46' 6.8"N 79° 16' 2.01"E | 950 | 468 | 156 | 33.33 | 124 | 32 |
| 57O/5SW4 | 13° 45' 19"N 79° 20' 24.3"E | 850 | 372 | 86 | 23.11 | 65 | 21 |
| 57O/6NW1 | 13° 43' 8.9"N 79° 18' 32.4"E | 1150 | 515 | 137 | 26.60 | 103 | 34 |
| 57O/6NW3 | 13° 43' 1.2"N 79° 21' 12.4"E | 820 | 496 | 142 | 28.62 | 101 | 41 |
| 57O/6NW4 | 13° 40' 46"N 79° 19' 59.2"E | 1108 | 593 | 217 | 36.59 | 163 | 54 |


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# Eienskappe van verskillende *Encephalartos eugene-maraisii* plante

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Figuur 1.—'n Besoek aan 'n *Encephalartos eugene-maraisii* lokaliteit by Itabeni.

*The author shortly explains the taxonomic and nomenclatural history of* Encephalartos eugene-maraisii *and describes some of the characteristics of the different forms of the species as found at the different localities.*

Die eerste Suid-Afrikaanse broodboom is in 1775 deur Carl Pehr (Peter) Thunberg ontdek. Hierdie Sweedse mediese dokter het vir drie jaar (1772–1775) plante in Suid-Afrika versamel en word dikwels as die vader van die Suid-Afrikaanse broodbome beskou.

Die bekende Afrikaanse digter en natuurwetenskaplike, Eugène N. Marais, het in sy latere lewe in die bosveld, noordwes van Naboomspruit, in die Palala hooglande gewoon. In 1927 is eksemplare van broodbome wat hy daar ondek het na dr. Rudolf Marloth in Kaapstad geneem vir identifikasie. Laasgenoemde wou nie aanvaar dat broodbome van die Waterberg afkomstig was nie. Hy het geskryf dat die plante van Nelspruit se omgewing afkomstig is en dit as *Encephalartos paucidentatus* benaam.

Marais het sy susterskind, Inez Verdoorn, by die Nasionale Herbarium in Pretoria besoek waar hy haar vertel het van die broodbome in die Waterberge. Sy het die lokaliteitinligting op etikette van die eksemplare in die herbarium van Nelspruit na Waterberge verander.

Marias is in 1936 oorlede. Jare later het Inez 'n plaaslike landbouvoorligtingsbeamte, mnr. Toerien, gevra om hierdie broodbome te ondersoek en op te spoor. Hy het toe wel broodbome gevind by Vlakfontein op die Palala hoogland.

In 1945 het Verdoorn die bome beskryf en die naam *E. eugene-maraisii* daaraan toegeken.

In haar verhandeling in 1976 beveel Suzelle van der Westhuiszen onder leiding van prof. P.J. Robbertse aan dat *E. eugene-maraisii* op grond van morfologiese verskille in drie tot vier goed omgrensende taksons verdeel kan word.

Lavranos en Goode het op grond van Van der Westhuizen se navorsing in 1998 die plante van die 4 lokaliteite waar *E. eugene-maraisii* oorspronklik gevind is as volg verdeel: *E. eugene-maraisii* subsp. *eugene-maraisii* (Waterberg), *E. eugene-maraisii* subsp. *middelburgensis* (Middelburg), *E. dolomiticus* (Wolkberg) en *E. dyerianus* (Mica). In 1995 het P.J.H. Hurter *E. nubimontanus* (Wolkberg) beskryf wat ook deel was van die *E. eugene-maraisii* groep wat ook bekend was as die doringagtige *E. eugene-maraisii*.

'n Groep het 'n besoek gebring aan 'n *E. eugene-maraisii* lokaliteit by Itabeni om eienskappe van hierdie spesie in die natuur te sien (Figuur 1 & 2).

Figuur 2.—'n *Encephalartos eugene-maraisii* plant in habitat.

Figuur 3.—Eienskappe van die Potgietersrus, ook bekend as die Waterberg of gewone vorm, van *Encephalartos eugene-maraisii*.

**Die volgende eienskappe is kenmerkend van *E. eugene-maraisii*:**

**Stam**

- Regopgroeiende bogrondse stam, soms leunend as dit baie lank is.
- Bogronds is dit onvertak, heelwat suiers en is dikwels meerstammig.
- Stamkroon besit dik, sagte, witterige skutblare, ouer deel van die stam word deur eenvormige blaarbasisse beskerm.

**Loofblare**

- Krom geleidelik afwaarts, maar die blaarpunt krom dikwels effens opwaarts. Albei kante is n ligte blougroen kleur. Blare is 'styf', 0.7–1.5 m lank; pp-hoek is 20–40°.
- Basis is 90–120°; pr-hoek 45–70°, s-hoek verklein basipetaal +85° tot +100°, en na blaarpunt +45° tot 65°.
- Pinnas oordek mekaar nie-dakpansgewys.
- Blaarsteel 120–160 mm met 'n klein blaarvoet wat 'n grys haarkleed het.
- Basale pinnas basipetaal verklein tot hoogstens een of twee stekels.
- Middelste pinnas 150–200 × 13–18 mm; leeragtig en sonder knobbels; gaafrandig of soms met 'n enkele

Figuur 4.—Eienskappe van die Palala vorm van *Encephalartos eugene-maraisii*.

Figuur 5.—Eienskappe van die Kransberg, ook bekend as die Matlapasrivier vorm, van *Encephalartos eugene-maraisii*.

tand aan die proksimale rand; pinnapunte is doringagtig.

**Keëls**

- In Desember sigbaar.
- Manlike keëls: 1–8 per keer per stam gevorm; 200–450 mm lank; 60–100 mm in deursneë; steel 25–110 mm lank; stuifmeelstorting Februarie–Maart gepaardgaande met 'n sterk reuk; keëls disintegreer nie spontaan nie, en verdroog Mei–Augustus.
- Vroulike keëls: 1–6 per keer per stam gevorm; 300–500 mm lank, 16–200 mm in deursneë; hoofsaaklik donkerbruin met keëls by die Kransberg-lokaliteit bruin met groenkleurige skubblaarpunte wat aan beide manlike en vroulike keëls 'n gespikkelde voorkoms verleen.

**Habitat**

- Groei op rotsagtige en steil hellings met goeie dreinering.
- Gemiddelde hoogte bo 1450 m; Kransberg 2085 m bo seevlak.
- Somerreënvalgebiede, 600–700 mm per jaar.
- Stadig groeiend in vol son en bestand teen ryp.

**Die volgende eienskappe is van die *E. eugene-maraisii* plante by die verskillende lokaliteite opgemerk:**

**Potgietersrus (Waterberg—gewone vorm; Figuur 3)**

- Sterk rivier-omgewing.
- Pinna is korter en breër.
- Kleur van pinna is 'n ligte blougroen.

**Palala (Figuur 4)**

- Soortgelyk aan dié van Potgietersrus.
- Pinnas is donkerder groen van kleur.
- Loofblare is korter met 'n kleiner pp-hoek.

**Nylstroom (Nyl se oog, Alma-omgewing)**

Hoewel dit 'n mite is dat broodbome hier voorkom is die volgende notas van hierdie lokaliteit bekend:

- Blare is langer en meer gedraai; blouer van kleur.
- Langer en smaller pinnas.
- Petiole is langer.

**Kransberg (Matlapasrivier; Figuur 5)**

- Blare is langer en ragis is reguit, blouer van kleur.
- Netjiese voorkoms
- Pinnas korter, meer verspreid en breër; pp-hoek wyer.
- Kan maklik verwar word met die bloukleurige *E. nubimontanus*.

# Some observations on *Encephalartos transvenosus*

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## Introduction

The foliage leaves of *Encephalartos transvenosus* from their separate localities in its wide distributional and altitudinal range and even within the same populations appear to differ morphologically. The leaflets differ in length, width, shape and the ways of shielding. Cycad enthusiasts use locality or trading names to distinguish between the leaf variations in *E. transvenosus* especially from the better known localities. A certain *Encephalartos* species is sometimes confused with *E. transvenosus*. The cones of *E. transvenosus* and its cultivation requirements are briefly discussed.

## Name derivation

The specific epithet of *E. transvenosus* is derived from the Latin words 'trans' which means through or over, and 'venosus' meaning full of veins. The name probably refers to the veins which can be seen on both sides of the leaflets when it is held against sunlight.

## Distribution and habitat

*Encephalartos transvenosus* has a widespread distribution north and south of the Tropic of Capricorn in the Limpopo Province of South Africa. This species occurs at widely separated localities over an extensive area in the northern Drakensberg and the foothills thereof. It is also known from a remote western locality and with numerous populations in the Soutpansberg area (Figure 1A).

Within its distributional range, *E. transvenosus* can be found in mixed bushveld, (Figure 1D) humid forests (Figure 1E) and, at higher altitudes, in grassland (Figure 1F). *Encephalartos transvenosus* usually occurs in rocky environments or on cliffs in direct sunlight to deep shade, between altitudes of 600–1200 m with frequent mist and rainfall in excess of 1500 mm per year.

Although it is assumed that *E. transvenosus* is not endangered, it has become, or is nearly extinct at some localities, especially in the areas formerly known as of Lebowa and Venda (Figure 1B & 1G). This species benefits from official protection in several nature reserves, forestry areas and on private land.

## Leaf variation

The leaflets of *E. transvenosus* from the different localities shield one another in various ways along the leaf. The shielding can be incubous to an extensive degree, but on most of the locality leaf forms, the direction of shielding changes along the length of the leaf. The age of the


Figure 1.—A, distribution map of the cycads. Red triangles resemble known localities of *Encephalartos transvenosus*; the green square represents the known locality of an unknown *Encephalartos* species, most closely related to *E. paucidentatus*. B, a form of *Encephalartos transvenosus* from south of the Soutpansberg which seems to have become extinct in its natural habitat. Photo: Mike Hurter. C, *Encephalartos transvenosus* specimen with erect and flat leaves with pronounced incubous shielding of the leaflets almost along the entire length of the leaves. Photo: Mike Hurter. D, *Encephalartos transvenosus* at the eastern extremity of its natural distribution. Photo: Mike Hurter. E, *Encephalartos transvenosus* growing in deep shade at a nature reserve in the Soutpansberg. Photo: Mike Hurter. F, *Encephalartos transvenosus* in the northern Drakensberg. Photo: Mike Hurter. G, leaf detail of the plant in Figure 1B. Photo: Mike Hurter.


Figure 2.—A, lower (abaxial) side of *Encephalartos transvenosus* with pungent teeth, slightly thickened margins and curved leaflets near the rachis. Photo: Mike Hurter. B, upper (adaxial) side of *Encephalartos transvenosus* from the western Soutpansberg. Photo: Exclusive Cycads. C, abaxial (lower) leaf of *Encephalartos transvenosus* from the western Soutpansberg. Note the absence of the rows of pungent teeth. Photo: Mike Hurter. D, *Encephalartos transvenosus* from the Wolkberg area at a high altitude. Photo: Mike Hurter. E, apical part of the 'fishtail' *Encephalartos transvenosus* leaf. Photo: Exclusive Cycads. F, *Encephalartos transvenosus* from its most southernmost locality. Photo: Mike Hurter. G, *Encephalartos transvenosus* from the eastern Soutpansberg with leaflets orientated succubously in the proximal part of the leaf.

cycad may have an influence on the direction of shielding of the leaflets, since *E. transvenosus* in its juvenile phase usually display different leaf characteristics than plants of greater age. Light and climatic conditions may also play a role in this phenomenon.

At some localities in the Soutpansberg the leaflets of *E. transvenosus* appear to shield one another exceptionally incubously almost along the whole length of the leaf (Figure 1C). When these leaf forms are viewed from the lower (abaxial) side, the pungent teeth on the lower (phylloproximal) margins of the leaflets can be lined up to form rows down the length of the leaf (Figure 2A) with the lower margins slightly thickened and the leaflets curved near the rachis. A specific leaf form of *E. transvenosus* from this area became known as the 'Visgraat' *E. transvenosus* by some cycad collectors. With a bit of imagination this leaf form gives the impression of the backbone of a fish ('visgraat') when the entire length of the abaxial side of the leaf is viewed, or could the reasoning behind this name refer to a herringbone pattern? It is interesting to note that the toothed appearance does not occur on all specimens from this locality and that on some very old specimens the leaflet margins may become entire (Figure 2B & 2C).

Initially a few clones from the same general area appeared in cultivation of which the apical leaflets are 'fused' together to form a large, united pinna resembling a fish's tail. This is probably the result of a mutation and this leaf form became known as the 'Fishtail' *E. transvenosus* (Figure 2E).

From certain localities the leaflets of some *E. transvenosus* leaves may be incubously orientated almost along the entire length of the leaf (Figure 2G), whilst they shield one another only slightly incubously (Figure 2F) from other localities. Usually, however, the distal leaflets shield one another conspicuously incubously.

Some forms of *E. transvenosus*, such as those occurring at a locality near Thohoyandou and the Wolkberg area, may displays a leaf form which is more tapered towards the leaf apex (Figure 3A) whilst the shape of the leaflets may be quite different (Figure 2D).

*Encephalartos transvenosus* is sometimes referred to as the Modjadji cycad or Modjadji palm. This is in reference to the world-renowned locality where a unique forest of *E. transvenosus* plants occurs at the village of the succeeding generations of Modjadji Rain Queens northeast of the town of Tzaneen (Figure 3B & 3C).

The leaflets of *E. transvenosus* at the Modjadji site are usually succubously orientated in the proximal part of the leaf (Figure 4A) and shield one another incubously in the distal half of the leaf (Figure3D & 3E).

When the Modjadji leaf form is viewed from the lower (abaxial) side, the pungent teeth on the lower (phylloproximal) margin may form rows but only on the distal (incubous) overlapping leaflets. It also displays the slightly thickened margins and curved leaflets near the rachis on the distal part of the leaf (Figure 3D). *Encephalartos transvenosus* plants from this site also display a multitude and variety of marginal types on the leaflets ranging from toothed to completely entire (Figure 3E, 3F, 3G & 4C).

There also exists a species of *Encephalartos* that appears to be related to *E. paucidentatus* and which is possibly now extinct in its natural habitat due to over-harvesting of the stems by traditional healers in the southern parts of the Limpopo Province. This species used to occur


Figure 3.—A, *Encephalartos transvenosus* from near Thohoyandou. B, *Encephalartos transvenosus* occurring in their thousands on granite at the Modjadji Nature Reserve. Photo: Mike Hurter. C, inside the cycad forest at Modjadji. Photo: Mike Hurter. D, *Encephalartos transvenosus* from Modjadji viewed from the abaxial (lower) side showing the incubous shielding and slightly thickened and curved lower margins near the rachis. Photo: Mike Hurter. E, *Encephalartos transvenosus* with leaflets that are noticeably convex longitudinally, and incubously shielding. Photo: Mike Hurter. F, *Encephalartos transvenosus* with narrow leaflets. Photo: Mike Hurter. G, *Encephalartos transvenosus* with a somewhat flatter leaf. Photo: Mike Hurter.


Figure 4.—A, succubous leaflet orientation in the proximal part of the leaf. Photo: Mike Hurter. B, *Encephalartos transvenosus* male cones that developed between and below a set of leaves and cones. Photo: Mike Hurter. C, *Encephalartos transvenosus* showing leaflets with entire margins. Photo: Mike Hurter. D, Species of *Encephalartos* probably related to *E. paucidentatus* with prominent longitudinal ridges and robust teeth on the abaxial (lower) side of the leaflets in the distal part of the leaf. Photo: Mike Hurter. E, succubously orientated leaflet shielding in the proximal part of the leaf. Photo: Mike Hurter. F, leaflets decrease in size basipetally. Photo: Exclusive Cycads. G, unusual female cone. Photo: Mike Hurter.

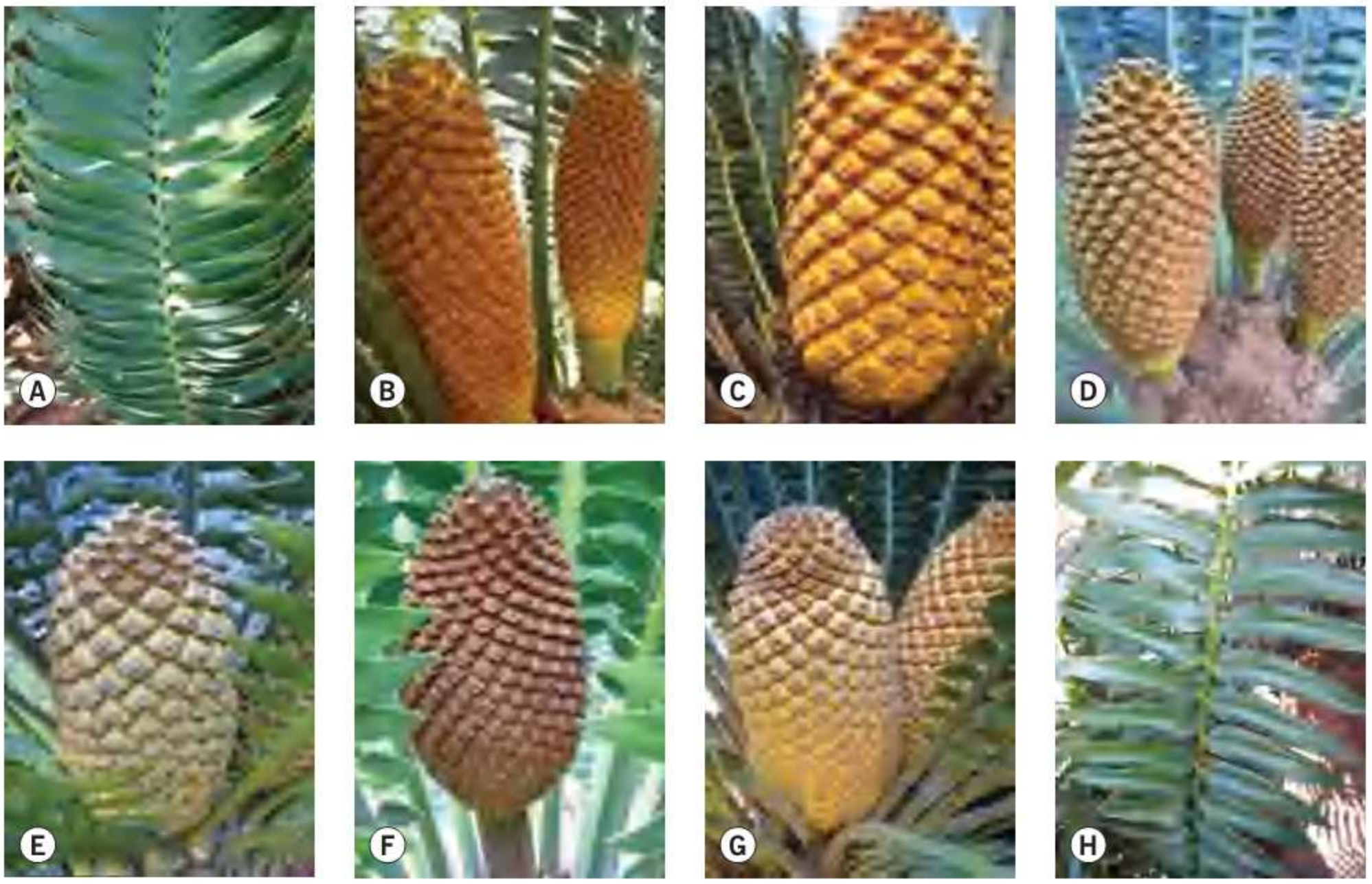


Figure 5.—A, incubous shielding of leaflets in the distal half of the '*Encephalartos paucidentatus*' species from Limpopo Province. Photo: Mike Hurter. B, *Encephalartos transvenosus* male cones from Modjadji before pollen shedding. Photo: Mike Hurter. C, female cone of *Encephalartos transvenosus* from Modjadji. Photo: Mike Hurter. D, male cones of *Encephalartos transvenosus* from the Wolkberg area. Photo: Mike Hurter. E, female cones of *Encephalartos transvenosus* from the Wolkberg area. Photo: Mike Hurter. F, male cone of *Encephalartos transvenosus* from the western Soutpansberg before pollen shedding. Photo: Mike Hurter. G, female cones from the western Soutpansberg. Photo: Mike Hurter. H, detail of *Encephalartos transvenosus* × *woodii* hybrid seedling cultivated at Exclusive cycads displaying a strong influence of *E. woodii* with flexible leaflets.

slightly south of the natural distribution of *E. transvenosus* and is sometimes confused with the latter species. Although this species superficially resembles *E. transvenosus* it differs in having very distinct and prominent longitudinal ridges on the abaxial (lower) side of the leaflets with thickened and recurved margins (Figure 4D). The leaflets shield one another succubously in the proximal part (Figure 4E) and very incubously in the distal part of the leaf (Figure 4D & 5A). The upper side of the leaflets is very concave transversely and convex longitudinally (Figure 5A) and decrease in size basipetally (Figure 4F).

## Cones

*Encephalartos transvenosus* of both genders can produce between one to five cones per stem (Figure 5D, 5E & 5G). Although the peduncle of the male cone is usually visible, the peduncle of the female cone is obscured by cataphylls (Figure 5B & 5C).

When the cones emerge they are usually covered in a layer of hairs but as the cone age some hairs are lost, especially on the female cones. The cones from different localities also display colour variation which is more evident on the male cones (Figure 5B & 5F). The cone scales of some male cones tend to become hairless and may display a light green colour towards the flat terminal facet in the apical part of the cone as it nears the pollen shedding stage.

*Encephalartos transvenosus* can produce cones and leaves simultaneously and occasionally on the side of the crown below or between a set of leaves (Figure 4B & 4G). It is interesting to note that these cones are usually smaller or differently shaped than cones that develop from the apex of the stem of the cycad (Figure 4B & 4G). *Encephalartos transvenosus* can sometimes produce leaves of a reduced scale on the apex of, especially, the female cones. This is, however, seldom observed. An interesting characteristic of the female cones is that after pollination the seeds are retained on the cone for several months and by the time of their release, the embryos usually have developed to the stage where they germinate immediately.

## Cultivation

*Encephalartos transvenosus* can be propagated from seed, basal suckers and aerial branches but it is discouraged to attempt propagation from small aerial buds. This beautiful species is adaptable to different growing conditions and is fast growing but will require ample space to develop. This cycad species is suitable for subtropical to warm temperate regions and can endure light frost.

Care should be taken when large plants are transplanted with their long heavy leaves and it is advisable to either reduce the leaves or removing them completely by cutting, or to keep them tied together for a lengthy time.

Female plants of *E. transvenosus* are sometimes used in hybridisation experiments with *E. woodii* in an attempt to repeat the process until a pure *E. woodii* female is produced (Figure 5H).

# LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Here are photos of an amazing *Encephalartos transvenosus* growing in a garden in Nelspruit which should be of interest to many a reader.

A few months ago I saw a Modjadji cycad with ten cones which I though was amazing. Not long after I came across this male specimen. Could this be a record?

There are five cones typically found in the centre of the plant. Then there are leaves from the previous season. Below these leaves are a ring of another ten cones, and then an older set of leaves! This is all on a single stem on a plant which has not yet branched.

Rob Kunitz
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Several photographs were sent in as a matter of interest for possible inclusion in Encephalartos. Fellow cycad lovers are encouraged to send in images of their own cycads with some notes on the specimen in question. Send your pictures to the editor at one of the following addresses: groblera@sanbi.org or aliciakrige@gmail.com.

Figure 1.—Members of the Western Cape Regional Branch in the Suurberge. The cycads are *Encephalartos longifolius*. Photo: Schalk van der Merwe

Figure 2.—*Encephalartos longifolius* specimens along the northern slopes of the Suurberge. Photo: Schalk van der Merwe

Figure 3.—*Encephalartos longifolius* specimens along the northern slopes of the Suurberge. Photo: Schalk van der Merwe

Figure 4.—This remarkable specimen of *Encephalartos longifolius* grows on the southern slopes of the Suurberge. Photo: Schalk van der Merwe

Figure 5.—Branching specimen of *Encephalartos longifolius*. Photo: Schalk van der Merwe

Figure 6.—Hans Viljoen displaying his affection for cycads. Photo: Schalk van der Merwe

Figure 7.—*Encephalartos transvenosus* thriving despite a massive hole in its trunk. This photograph was taken in the north of Johannesburg. Photo: Richard Potter.

Figure 8.—Mutant leaf apex of *Encephalartos arenarius*. Photo: Mike Hurter.

Figure 9.—Male cones at pollen shedding stage of the 'Mgeniensis' cycad (see Figure 8 in *ENCEPHALARTOS* 96: 27). Photo: Mike Hurter.

Figure 10.—Leaf detail of *Encephalartos inopinus* with the rachis and pinnae becoming very yellow with age. Photo: Mike Hurter.

Figure 11.—Female cone of *Encephalartos latifrons*—a critically endangered species. Photo: Exclusive Cycads.

Figure 12.—Male cones with very long peduncles of an undescribed *Encephalartos* species at pollen shedding stage. Photo: Mike Hurter.

Figure 13.—Male cone of *Encephalartos hirsutus* and leaves with bright yellow rachis after it became glabrous with age. Photo: Exclusive Cycads.

Figure 14.—This photograph of a lovely female *Encephalartos transvenosus* was taken in the south of Johannesburg. Photo: Richard Potter.

Figure 15.—Cycads in the Montecasino Bird Gardens in Johannesburg where the largest private collection of African cycads in the world can be seen. Photo: Richard Potter.