ENCEPHALARTOS

JOURNAL OF THE CYCAD SOCIETY OF SOUTH AFRICA

TYDSKRIF VAN DIE BROODBOOM VERENIGING VAN SUID-AFRIKA

NO. 66 JUNE / JUNIE 2001 ISSN 1012-9987

Encephalartos longifolius Go

The Cycad Society of South Africa

The journal is available for members

JOIN THE SOCIETY NOW!

Welcome to the homepage of the Cycad Society of South Africa. Our credo is to promote all aspects of knowledge of cycads, and to foster a lively interest in these plants.

These objects are worthy of pursuit. The cycads have been with us for perhaps 100 million years, but in recent times their numbers and perhaps diversity in nature have dwindled due to competition with flowering plants. Perhaps the single most serious threat to their continuing existence is man, collecting wild plants for ornamental applications. On the scientific front we have lately learnt that these plants have very specialised pollinators, and that re-establishment in nature is unlikely to be successful without profound knowledge of the biology of these plants. Against this background, we firstly promote interest in, and appreciation of, these plants by propagating and growing them as horticultural subjects, and secondly we actively encourage scientific research and the documentation thereof so that we can keep the captive and remaining wild plants alive in years to come.

We invite you to participate in this process.

Piet Vorster
PRESIDENT

The Cycad Society of South Africa, P.O. Box 1790, 0027 Groenkloof

CYCAD SOCIETY OF SOUTH AFRICA
BROODBOOM VERENIGING VAN SUID-AFRIKA

Council members / Raadslede

President
Dr Piet Vorster
Botany Department / Departement Plantkunde
University of / Universiteit van Stellenbosch
Private Bag / Privaatsak X1, 7602 Matieland
Tel.: 021-808 3056; Fax/Faks: 021- 808 3607
E-mail/E-pos: **pjvor@land.sun.ac.za** or/of **pjvor@maties.sun.ac.za**

Secretary-treasurer / Sekretaris-tesourier
Back copies officer / Beampte vir vorige uitgawes
Prof. Guillaume Theron
P.O. Box / Posbus 1790
0027 Groenkloof (Pretoria)
Tel.: 012- 343 3929 (only available between/ slegs beskikbaar tussen 17h00 and/en 19h00)
Fax/Faks: 012 347 7807
E-mail / E-pos: **GTheron@nsnper1.up.ac.za**

Accountant &Auditor
Rekenmeester & Ouditeur
Werner Diedericks
P.O. Box/Posbus 17081
0027 Groenkloof (Pretoria)
Tel. 012- 460 6123

Electronic Services
Elektroniese Dienste
Wynand van Eeden
P.O. Box / Posbus 3489
7536 Tygerpark
E-mail/E-pos:
wvaneeden@eurologic.com
or/of
wynand@ananzi.co.za

Editor of "*Encephalartos*"
Redakteur van "*Encephalartos*"
Isabella Claassen
P.O. Box / Posbus 25688
0105 Monumentpark (Pretoria)
Tel. & Fax/Faks: 012-347 7807
(between / tussen 06h00 and/en 18h00)

Regional officers / Streeksverteenwoordigers

Lowveld / Laeveld

Leon van Rooy
P.O. Box / Posbus 1019
1240 White River / Witrivier
Tel.: 013-751 2419

Natal

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

Northern Province Cycad Working Group / Noordelike Provinsie Broodboom Werkgroep

Gerrie de Haas
Private Bag / Privaatsak X9474
0700 Pietersburg
Tel.: 015-297 2180 (w); 015-295 4021 (h)
Fax/Faks: 015-297 3947

Transvaal

Derik Minnaar
P.O. Box / Posbus 95597
0145 Waterkloof (Pretoria)
Cell/Sel: 082-4131025 (after hours / na-ure)

Pollen- and seedbank officers / Stuifmeel- en saadbankbeamptes

Eastern Cape / Oos-Kaap

Vacant / Vakant

Northern Province / Noordelike Provinsie

Diekie de Klerk
Private Bag / Privaatsak X9474
0700 Pietersbug
Tel.: 015-297 3947
Fax/Faks: 015-297 3947

Transvaal

Manie Maritz
P.O. Box / Posbus 39156
0060 Garsfontein East / -Oos (Pretoria)
Tel.: 012-998 9667

Overseas correspondents / Buitelandse skakelbeamptes

Australia

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

U.S.A. and Canada

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

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COVER / VOORBLAD : Opening page of the Society's web page, www.cycadsociety.org see anouncement on page 16 / Inleidende bladsy van die Vereniging se webwerf, www.cycadsociety.org - kyk aankondiging op bl. 16.

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Please see "INSTRUCTIONS TO AUTHORS" with regard to sending Illustrations in electronic format.

Kyk asseblief "VOORSKRIFTE AAN OUTEURS" in verband met die stuur van illustrasies in elektroniese formaat.

FROM THE PRESIDENT

VAN DIE PRESIDENT

An un-informed person may get the impression that this issue of ***ENCEPHALARTOS*** is not a particularly good reason to join the Society. Closer scrutiny will, however, reveal that it reflects a very active Society.

Recently we entered the 21st Century by establishing our own web site. This was made possible by the far-sightedness and an appreciated cash donation by John Kloppers; and the inventiveness, hard work, and a further cash injection by Wynand van Eeden. For those of you having access to the internet, we invite you to visit our site and to let us know how you like it, and also how we can improve it. It is not at all going to replace ***ENCEPHALARTOS***, but will provide easy access to a variety of relevant and useful information. We believe that it will also recruit many new members.

Also in this edition is an announcement of the **Fifth International Conference on Cycad Biology (CYCAD 2002)**, to be held in July/August next year in Thailand. Please read the announcement attentively, as we hope to see many of you there.

At the end of this year the current Council's terms of office will expire. All members agreed to serve for another term. However, we are disappointed that so few of our members were interested in nominating Council members, or to make themselves available to help running our Society. Unless we all do our bit, the Society cannot function.

In the previous issue's FROM THE PRESIDENT I told about Isabella Claassen's *Dioon edule* which spontaneously got pollinated after she merely leaned a male cone against the female cone, and I speculated about what could have *happened*. Read in this issue about circumstantial clues to this matter.

Piet Vorster

'n Oningeligte persoon mag die indruk kry dat hierdie uitgawe van ***ENCEPHALARTOS*** nie juis 'n goeie rede is om by die Vereniging aan te sluit nie. Nadere ondersoek sal egter openbaar dat dit 'n baie aktiewe Vereniging reflekteer.

Onlangs het ons die 21ste Eeu betree deur 'n eie webwerf op die been te bring. Dit is moontlik gemaak deur die versiendheid en 'n gewaardeerde kontantskenking deur John Kloppers; en die vaardigheid, harde werk, en 'n verdere kontant-inspuiting deur Wynand van Eeden. Vir die van u wat toegang het tot die internet, wil ons graag nooi om die werf te besoek en vir ons te laat weet hoe u daarvan hou, en ook hoe ons dit kan verbeter. Dit gaan gladnie vir ***ENCEPHALARTOS*** vervang nie, maar gaan maklike toegang verleen tot 'n verskeidenheid tersaaklike en bruikbare inligting. Ons glo dat ons daardeur ook baie nuwe lede gaan kry.

Ook in hierdie uitgawe is daar 'n aankondiging van die **Vyfde Internasionale Konferensie oor Broodboom-biologie (CYCAD 2002)**, wat in Julie/Augustus volgende jaar in Thailand gehou gaan word. Lees asseblief hierdie aankondiging aandagtig, omdat ons hoop dat baie van u die geleentheid sal kan bywoon.

Aan die einde van hierdie jaar verval die huidige Raad se dienstermyne. Almal het ingewillig om vir nog 'n termyn te dien. Ons is egter teleurgesteld dat so min van ons lede belanggestel het om Raadslede te nomineer, of hulself beskikbaar te stel om die Vereniging te help bestuur. As ons nie elkeen ons deel doen nie, kan die Vereniging nie werk nie.

In die vorige uitgawe se VAN DIE PRESIDENT het ek vertel van Isabella Claassen se *Dioon edule* wat spontaan bestuif geraak het nadat sy bloot 'n manlike keël teen die vroulike keël laat leun het, en spekuleer oor die oorsaak daarvan. In hierdie uitgawe kan u lees van omstandigheids-getuienis oor wat daar kon gebeur het.

Piet Vorster

FROM COUNCIL / VAN DIE RAAD

NEW HONORARY MEMBERS / NUWE ERELEDE

We welcome two new honorary members. Honorary membership is not something which is bestowed lightly, but these two cases are special. These members have not only provided an enormous service to the Society over a long period, but also made important contributions to our knowledge of cycads.

The first is *Paul Kennedy*. Since 1988 Paul has been our Australian representative, collecting Australian members' membership fees and forwarding it to us. This is a responsible and important job, freeing individual members from the tiresome task of transferring money to South Africa every year, and also saving them bank commission. Paul also discovered the first insects in Australia suspected of being cycad pollinators, on *Lepidozamia peroffskyana*, and several of the recently described new species of *Macrozamia* were first suspected of being new by Paul, and pointed out to me when he and Craig Thompson showed Cynthia Giddy, Elsa, and myself (Piet Vorster) wild Macrozamias in 1990.

The second is *Willie Tang*. He discovered insect pollination of *Zamia integrifolia* in 1987, a year after Knut Norstog (with Stevenson & Niklas) first demonstrated insect pollination in cycads, in *Zamia furfuracea*. Willie therefore discovered the second documented case of insect pollination in cycads. Like Paul Kennedy, Willie has been our agent for many years, in the U.S.A., and to this day he actively promotes the Society. Willie is not a practicing botanists, but is actively involved in botanical research in association with the Fairchild Tropical Garden. He has published a number of high-profile scientific articles on subjects like insect pollination, life histories, and heat and odour production in cycad cones; as well as booklets on the cycads of Thailand and on growing cycads.

Graag verwelkom ons twee nuwe erelede. Erelidmaatskap is nie iets wat ligtelik toegeken word nie, maar hierdie twee gevalle is spesiaal. Die betrokke lede het nie alleen oor 'n lang tyd 'n enorme diens aan die Vereniging gelewer nie, maar het ook belangrike bydraes gelewer tot ons kennis van broodbome.

Die eerste is *Paul Kennedy*. Paul is sedert 1988 ons Australiese verteenwoordiger, en het hy die ledegeld van Australiese lede ingesamel en aan ons gestuur. Dit is 'n verantwoordelike en belangrike taak, wat lede vrygestel het van die lastigheid om elke jaar geld na Suid-Afrika oor te plaas. Paul het ook die eerste Australiese insekte ontdek wat vermoedelik betrokke is by die bestuiwing van broodbome, op *Lepidozamia peroffskyana*. Verskeie van die nuwe *Macrozamia*-soorte wat onlangs beskryf is, is eerste deur Paul raakgesien, en aan my gewys toe hy en Craig Thompson vir Cynthia Giddy, vir Elsa, en vir my (Piet Vorster) wilde Macrozamias gewys het in 1990.

Die tweede is *Willie Tang*. Hy was die persoon wat eerste insekbestuiwing ontdek het by *Zamia integrifolia* in 1987, 'n jaar nadat Knut Norstog (saam met Stevenson & Niklas) vir die eerste keer insekbestuiwing by broodbome demonstreer het op *Zamia furfuracea*. Willie het dus die tweede gedokumenteerde geval van insekbestuiwing by broodbome ontdek. Soos Paul Kennedy, is Willie reeds vir baie jare ons buitelandse agent in die V.S.A., en nog steeds bevorder hy ons Vereniging aktief. Willie is nie 'n praktiserende plantkundige nie, maar is aktief betrokke by plantkundige navorsing in samewerking met die Fairchild Tropical Garden. Hy het 'n aantal hoë-profiel publikasies geskryf oor onderwerpe soos insekbestuiwing, lewensgeskiedenisse, en temperatuurverhogings en geurmiddels in broodboomkeëls; sowel as boekies oor die broodbome van Thailand en oor die kweek van broodbome.

Paul Kennedy

Willie Tang

Wynand van Eeden

NEW MEMBER OF COUNCIL / NUWE RAADSLID

We welcome **Wynand van Eeden** (photo on p. 4) as a new co-opted member of the Council, with the portfolio *Electronic Services*. Wynand established our web page and is keeping it up to date. He has several exciting plans up his sleeve, but we won't steal his thunder. His E-mail address is
wvaneeden@eurlogic.com or **wynand@ananzi.co.za**

Ons verwelkom vir **Wynand van Eeden** (foto op bl. 4) as 'n nuwe gekoöpteerde Raadslid, met die portefeulje Elektroniese Dienste. Wynand het ons webwerf op die been gebring en hou dit op datum. Hy het verskeie opwindende planne in die mou, maar ons wil dit nie nou vooruitloop nie. Sy E-pos adres is
wvaneeden@eurologie.com of **wynand@ananzi.co.za**

ERRATUM

Re: "Focus on *Lepidozamia hopei* (W. Hill) Regel" by Roy Osborne in *Encephalartos* **64**: 12–15 (December 2000).

The following note was received from Roy Osborne: "It was stated on p. 14 that the seeds are borne on the lower surface of the megasporophylls when in fact they are borne on the upper (adaxial) surface of the megasporophylls."

CYCAD 2002

THE SIXTH INTERNATIONAL CONFERENCE ON CYCAD BIOLOGY
DIE SESDE INTERNASIONALE KONGRES OOR BROODBOOMBIOLOGIE

The first circular concerning this conference has recently appeared.. The conference will be held at the splendid Nong Nooch Tropical Garden at Sattahip, Chonburi which is only 20 km from the well-known seaside town of Pattaya, some 190 km south-east of Bangkok in Thailand. The conference is scheduled for 29 July to 3 August 2002. As usual, the language used at the conference will be English and the proceedings will be published. The deadline for expression of interest in the conference is 31 July 2001 and the address to which correspondence should be sent is: **Anders J. Lindstrom, Organizing Secretary Cycad 2002, Nong Nooch Tropical Garden, Sattahip, Chonburi 20250, Thailand. Telephone: 66-38-709358-59; Fax: 66-38-238160; E-mail: kampon@loxinfo.co.th**

A tour will be organized for the registered delegates and accompanying persons to Kanchanaburi as part of the conference. Tours of the gardens will also be arranged during the conference. A post-conference tour to Vietnam will be separately organized if sufficient interest is shown by July 2001.

At this stage the organizers are still unable to provide any indication of costs, but we will report this in ENCEPHALARTOS as soon as it is known.

The purpose of this meeting is primarily to broadcast and exchange new information on all aspects of cycads. Perhaps because of this, many of our members think that it is only a bunch of scientists talking in a language which is incomprehensible to enthusiasts. Nothing can be further from the truth. Botanical reporting is simple, and at these congresses it is specifically presented in such a way that it is understandable and useful to everyone. We realise that it is the enthusiast who sustain interest in this plant group, and we in particular encourage these people to make observations and report on them. These meetings are also wonderful opportunities to meet other enthusiasts from all over the world. The host institution is one of the most remarkable tropical botanical gardens in the world, and there will also be opportunities to see some of the Thai cycad species in nature. We wish to encourage all of you to attend this wonderful occasion.

.....

Die eerste omsendbrief aangaande hierdie kongres het onlangs verskyn. Die kongres sal plaasvind in die pragtige "Nong Nooch Tropical Garden" by Sattahip, Chonburi wat net 20 km van die bekende strandoord Pattaya geleë is, ongeveer 190 km suidoos van Bangkok in Thailand. Die kongres is geskeduleer vir 29 Julie tot 3 Augustus 2002. Soos gewoonlik sal die voertaal van die kongres Engels wees en die voordragte sal gepubliseer word. Die sperdatum vir kennisgewing van u belangstelling om die kongres by te woon is 31 Julie 2001 en die adres waarheen korrespondensie gestuur moet word, is: **Anders J. Lindstrom, Organizing Secretary CYCAD 2002, Sattahip, Chonburi 20250, Thailand, Tel: 66-38-709358-59; Faks: 66-38-238160; E-pos: kampon@loxinfo.co.th**

'n Toer na Kanchanaburi sal vir die geregistreerde afgevaardiges en persone wat hulle vergesel as deel van die kongres gereël word. Gedurende die kongres sal toere van die tuine ook gereël word. 'n Na-kongres toer na Vietnam sal afsonderlik gereël word indien voldoende belangstelling teen Julie 2001 aangedui word.

Op hierdie tydstip is die organiseerdes nog nie by magte om enige aanduiding van kostes te voorsien nie, maar ons sal dit in ENCEPHALARTOS aankondig sodra dit bekend is.

Die doel van die byeenkoms is in die eerste plek om nuwe inligting oor alle aspekte van broodbome bekend te maak en uit te ruil. Miskien om hierdie rede dink soveel van ons lede dat dit net 'n klomp wetenskaplikes is wat praat in 'n taal wat vir liefhebbers onverstaanbaar is. Niks kan verder van die waarheid af wees nie. Plantkundige beriggewing is eenvoudig, en by hierdie kongresse word dit spesifiek so aangebied dat dit vir almal verstaanbaar en nuttig is. Ons besef dat dit die liefhebbers is wat belangstelling in hierdie plantgroep lewendig hou, en ons wil graag juis sulke mense aanmoedig om waarnemings te maak en bekend te stel. Hierdie byeenkomste is ook wonderlike geleenthede om entoesiaste van oor die hele wêreld te ontmoet. Die gasheer-inrigting is een van die merkwaardigste tropiese botaniese tuine ter wêreld, en daar sal ook geleentheid wees om van die Thailandse broodbome in die natuur te sien. Graag wil ons u almal aanmoedig om hierdie wonderlike geleentheid by te woon.

LITERATURE WHICH YOU MAY HAVE MISSED

LISOWSKI, S. 1992. **Note floristique de l'Ituri (Haut-Zaïre).** *Fragmenta Floristica et Geobotanica* **37**: 215–220.

This publication contains a photograph of *Encephalartos ituriensis* in habitat.

More interesting, *Encephalartos septentrionalis*, "previously known only from the Ubangi-Uele Province", is reported from Mt. Mukonza in the Ituri region. The Ubangi-Uele confluence is some 900 km from the Ituri forest. In the absence of more information, the identity of this species remains uncertain. *E. septentrionalis* was originally described from Sudan, hundreds of kilometres from the Ituri region. Material from Didinga in south-eastern Sudan, and from Moyo in Uganda (the latter about 400 km from the Ituri forest), recently distributed under the name of *E. septentrionalis*, probably are not that species, taking into account the normally very restricted distribution ranges of *Encephalartos* species. In the *Memoirs of the New York Botanical Garden* **57**: 157 (1990) (Proceedings of CYCAD 87), Stevenson, Moretti, & de Luca provided a distribution map of *Encephalartos* in tropical Africa, showing this improbably wide distribution of *E. septentrionalis*. It was in this same publication that *E. ituriensis* was first described.

What makes this report unusual, is that Mt. Mukonza from where *E. septentrionalis* is reported, is also the type locality of *E. ituriensis*, in other words, this place harbours two species of *Encephalartos*. It is remarkable that during the fieldwork leading to the description of *E. ituriensis, E. septentrionalis* was not noticed; and also that none of the admittedly few subsequent visitors to the site noticed the second species.

This is a challenge to our intrepid explorers to re-locate these plants, and to critically assess its relationship to the plants at Moyo, Didinga, and the type locality of *E. septentrionalis*.

NEW CYCAD PUBLICATIONS

COETZER, M.E. 2000. **A molecular systematic study of the genus *Encephalartos*.** M.Sc. thesis, University of the Orange Free State.

[58 specimens representing 35 species of the genus *Encephalartos*, and one specimen from the genus *Stangeria* were used in the study which involved the use of both the RAPD and DAF molecular techniques applied to DNA extracted from leaf samples. The PAUP computer software was used to determine the phylogenetic relationships between the species and the genetic distances between them. The results of the study culminated in the attached strict consensus cladogram (see p. 17) of 18 equally parsimonious cladograms of 1034 steps, with a consistency Index of 0.17 and a Retention Index of 0.52. This cladogram represents a heuristic search of the combined analysis, with bootstrap values and jackknife values (in brackets) indicated on the relevant cladogram branches.]

Contact address: Professor J.J. Spies, Department of Botany and Genetics, University of the Orange Free State, 9301 Bloemfontein, South Africa.

FARRERA, M. A. P., QUINTANA-ASCENCIO, P. F., IZABA, B. S. & VOVIDES, A. P. **Population dynamics of *Ceratozamia matudai* Lundell (Zamiaceae) in el Triunfo Biosphere Reserve, Chiapas, Mexico.** *Journal of the Torrey Botanical Club* 127(4): 291–299.

[The geographic distribution, basic demographic parameters and the association of these parameters with environmental factors are described for *Ceratozamia matudai*. A special survey and a review of herbarium collections indicate that *C. matudai* occurs only on the pacific slopes of the Sierra Madre of Chiapas, Mexico. Two censuses (1998–1999) were performed in a pine-cupressus forest in the core zone of the Triunfo Biosphere Reserve, and a montane rain forest in its buffer zone. Neighbouring floristic composition, soil depth, and slope around marked and mapped *C. matudai* individuals in each site were described. This species showed a clumped local distribution on shallow soils and steep slopes. Individuals showed differences in amount of leaf production, trunk diameter, and height between sites. Neighbouring species composition affected seedling mortality. Because of its low numbers and limited range we recommend a status change in its IUCN category to endangered. As with the other cycads, *C. matudai* can reach high market values. *Ex situ* propagation of this and other species may provide incentives among local peasants for conservation of the natural populations and its habitat.]

First author's address: El Colegio de la Frontera Sur, San Christobal de la Casas, Chiapas, 29200 Mexico.

HOWARD, F.W., HAMON, A., MCLAUGHLIN, M. WEISSLING, T. & YANG, S-L. 1999. ***Aulacaspis yasumatsui* (Hemiptera: Sternorrhyncha: Diaspididae), a scale insect pest of cycads recently introduced into Florida.** *Florida Entomologist* 82(1): 14–27.

[Observations were conducted in southern Florida on *Aulacaspis yasumatsui* Tagaki (Hemiptera: Sternorrhyncha: Diaspididae), a recently introduced armoured scale insect native to Southeast Asia. The insect's host plants, exclusively cycads, were identified in the following genera: *Cycas* (Cycadaceae); *Dioon, Encephalartos, Microcycas* (Zamiaceae), and *Stangeria* (Stangeriaceae); *Cycas* species seem to be preferred over other cycad genera by this insect. *Aulacaspis yasumatsui* infested pinnae, rachises, strobili, stems, and roots of various species of cycads. It generally infested all above-ground plant parts of *Cycas* species and sometimes the primary and secondary roots to a soil depth of 60 cm. No morphological differences in the leaf- and root-infesting forms were noted. At an ambient temperature of about 24.5°C, eggs hatched in 8–12 days. In the field, some individuals developed to second instars in 16 days and third instars in 28 days. Third instars (mature females) laid more than 100 eggs. Most of the females of a generation did not live longer than 75 days. No natural enemies were observed. The scale insect populations became extremely dense and killed 100% of 15 *Cycas revoluta* Thunberg within a year of infestation. Between 1996 and June 1998 the insect spread from a limited area in southern Miami to various sites as far as 120 km north, probably by movement of plants.]

First author's address: Fort Lauderdale Research and Education Center, University of Florida, 3205 College Avenue, Fort Lauderdale, FL, 33314, U.S.A..

KVACEK, Z. & VELITZELOS, E. 2000. **The cycadalean foliage "Encephalartos" gorceixianus SAPORTA (Zamiaceae) from the Lower Miocene of Greece (Kymi, Island of Evia) revisited.** *Feddes Repertorium* 111(3–4): 151–163.

[The holotype and additional specimens of cycadalean foliage known as *Encephalartos gorceixianus* Saporta from the lower Miocene of Greece show strong gross morphological similarities to the extant genus *Dioon* Lindl. (Mexico, Honduras, Nicaragua) as well as the fossil *Dioonopsis* Horiuchi & Kimura (Palaeocene of Japan, and Alaska), rather than to the African genus *Encephalartos* Lehm.. Because of the lack of the epidermis structure, its generic assignment must remain open. The occurrence of this relict in the Lower Miocene of southern Europe suggests palaeofloristic connections with other parts of the Northern Hemisfere, rather than with Africa.]

First author's address: Faculty of Science, Charles University, Albertov 6, CZ-12843, Praha, Czech Republic.

MOSTERT, C. 2000. **Aspekte van die kiemingsgedrag en fynstruktuur van *Encephalartos*-stuifmeel.** M.Sc. Thesis, University of Pretoria.

[The objective of the study was to determine the optimal storage conditions for *Encephalartos* pollen. The pollen of *E. caffer, E. eugene-maraisii, E. ferox* and *E. lehmannii* were used in most trials. The effect of three pollen germination media, various storage temperatures and relative humidities during storage on the germination of the pollen, measured at monthly intervals for 7 to 19 months were compared. Some pollen still germinated after storage for 19 months at 5°C under the prevailing relative humidity. The best results came from pollen that was stored in liquid nitrogen or that was freeze dried. A considerable percentage of the pollen thus treated germinated after a trial period of 8 months.]

Contact person: Professor P.J. Robbertse, Botany Department, University of Pretoria, 0002 Pretoria, South Africa.

MOUNDL, A. & TERRY, I. 2001. **Thrips pollination of the central Australian cycad, *Macrozamia macdonnellii* (Cycadales).** *International Journal of Plant Sciences* 162(1): 147–154.

[*Macrozamia macdonnellii* (Zamiaceae) grows at a few isolated sites in central Australia. Male cones support large populations of host-specific thrips, *Cycadothrips albrechtii* n. sp. (Thysanoptera, Aeolothripidae). This insect breeds only in these male cones, from which the adults swarm in late afternoon as the temperature falls and humidity rises. A small sticky trap at one female cone caught 3844 adults on a single afternoon; large numbers of thrips were observed entering this cone. Each thrips carried an average of 15 pollen grains, and pollen delivery into the cone was thus estimated to average more than 5500 grains per ovule. No other potential pollinators were found on these cycads, and it is concluded that *C. albrechtii* is the sole pollinator of *M. macdonnellii*. Since *Cycadothrips* constitues a basal clade within the Thysanoptera, the possibility is considered that thrips were involved in pollen transfer before the radiation of flowering plants.]

First author's address: Commonwealth Scientific and Industrial Research Organization Entomology, P.O. Box 1700, Canberra, ACT 2601, Australia.

SIMPSON, R.J., KHABAZIAN, I., BAINS, J.S., WILLIAMS, D.E., ANDERSEN, R.J., CRAIG, U.K. & SHAW, C.A. 2000. **Necrotic and apoptotic cell death due to neurotoxic actions of MSO and cycad.** *Society for Neuroscience Abstracts* 26(1–2): Abstract No 934.

[To investigate the hypothesis that novel environmental neurotoxins contribute to the etiology of neurodegenerative diseases, we compared the forms of cell death initiated by the following: (i) methionine sulfoximine (MSO); (ii) an extract of cycad flour; and (iii) the putative neurotoxic component of cycad, beta-sitosterol beta-D-glucoside (BSSG). To measure acute necrosis, experimental compounds were applied to adult rat cortical slices in vitro and the amount of lactate dehydrogenase (LDH) release was measured as a direct indication of the levels of cell death. In a second series of experiments, apoptosis was assessed by immunocytochemical staining using an adapted TUNEL method on sections of frontal cortex, hippocampus, spinal cord and retina of rats fed MSO (3, 6, 9 mg/rat/day) or cycad flour (2g/rat/day) for two weeks and compared with controls. Both MSO, cycad flour extract and MSSG induce rapid LDH releases in cortical sections. Neither MSO nor cycad gave significant neuronal apoptosis, but the latter gave apoptosis in the pigment epithelium.]

First author's address: University of British Columbia, Vancouver, British Columbia, Canada.

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

FOCUS ON ...

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:

FOKUS OP ...

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 LONGISPINA P.I. Forst. & D.L. Jones

Paul I. Forster[1] and Roy Osborne[2]

[1]Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia

[2]P.O. Box 244, Burpengary, Queensland 4505, Australia

INTRODUCTION

The greatest number of the 40 *Macrozamia* species, in both the Section *Macrozamia* and the Section *Parazamia*, occur along and near the eastern seaboard of Australia, in south-eastern Queensland and northern New South Wales (Hill 1998). Several complexes of closely-related taxa occur, mainly characterised by geographic replacement of species. This situation is well-illustrated in the *Macrozamia miquelii* complex, a group of closely-related Section *Macrozamia* taxa which extend discontinuously in Queensland over a wide north-to-south band from near Marlborough in the north to near Brisbane in the south. Recent investigations by David Jones and Paul Forster have resolved this complex into 7 species, viz. *Macrozamia miquelii* itself, together with *M. cardiacensis, M. douglasii, M. macleayi, M. longispina, M. mountperriensis* and an undescribed species on serpentine landscapes north of Rockhampton. Both *M .cardiacensis* and *M. longispina* gained "official" status only in 1998 with the publication of Volume 48 of the *Flora of Australia*, while *M. macleayi* was recently resolved by Forster (1999). We take this opportunity to introduce readers of "*Encephalartos*" to *Macrozamia longispina*, a species that has been previously unillustrated (Hill 1998).

DISCOVERY

In late 1964, specimens of a cycad collected on a pastoral property south of Glastonbury (a small forestry township west of Gympie) were sent to the Queensland Herbarium by D.C. Clifford of the Department of Agriculture (now Department of Primary Industries). The specimens were identified at the time as *Macrozamia miquelii*. The specimens had been sent in for identification because they were directly implicated in poisoning of domestic livestock. This population was subsequently eradicated by destroying

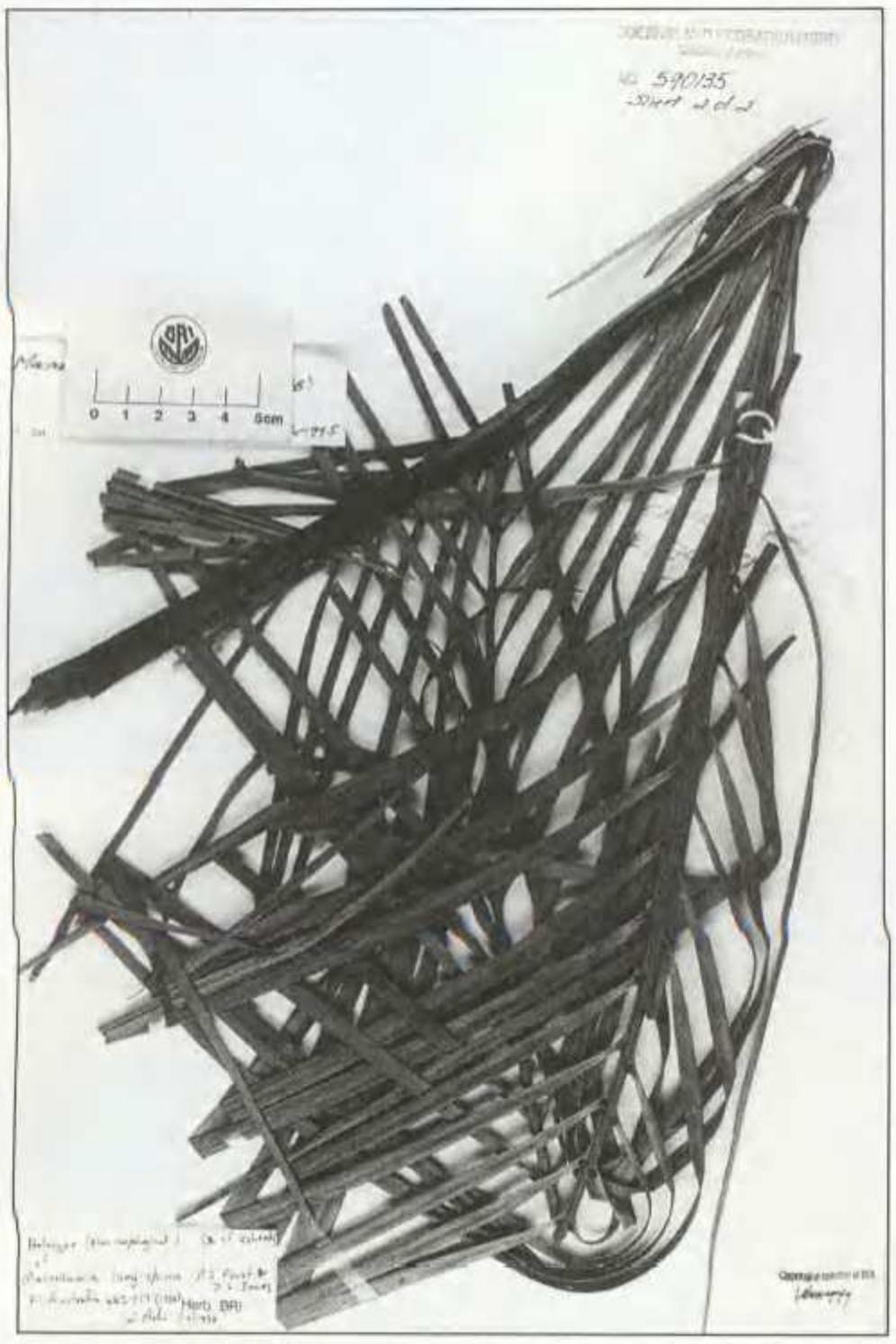


Figure 1a ***Macrozamia longispina*****. One of the two holotype herbarium sheets filed at the Queensland Herbarium (BRI). The specimens were collected by Paul Forster and Peter Machin in October 1992. Photo: Terry Boyle.**

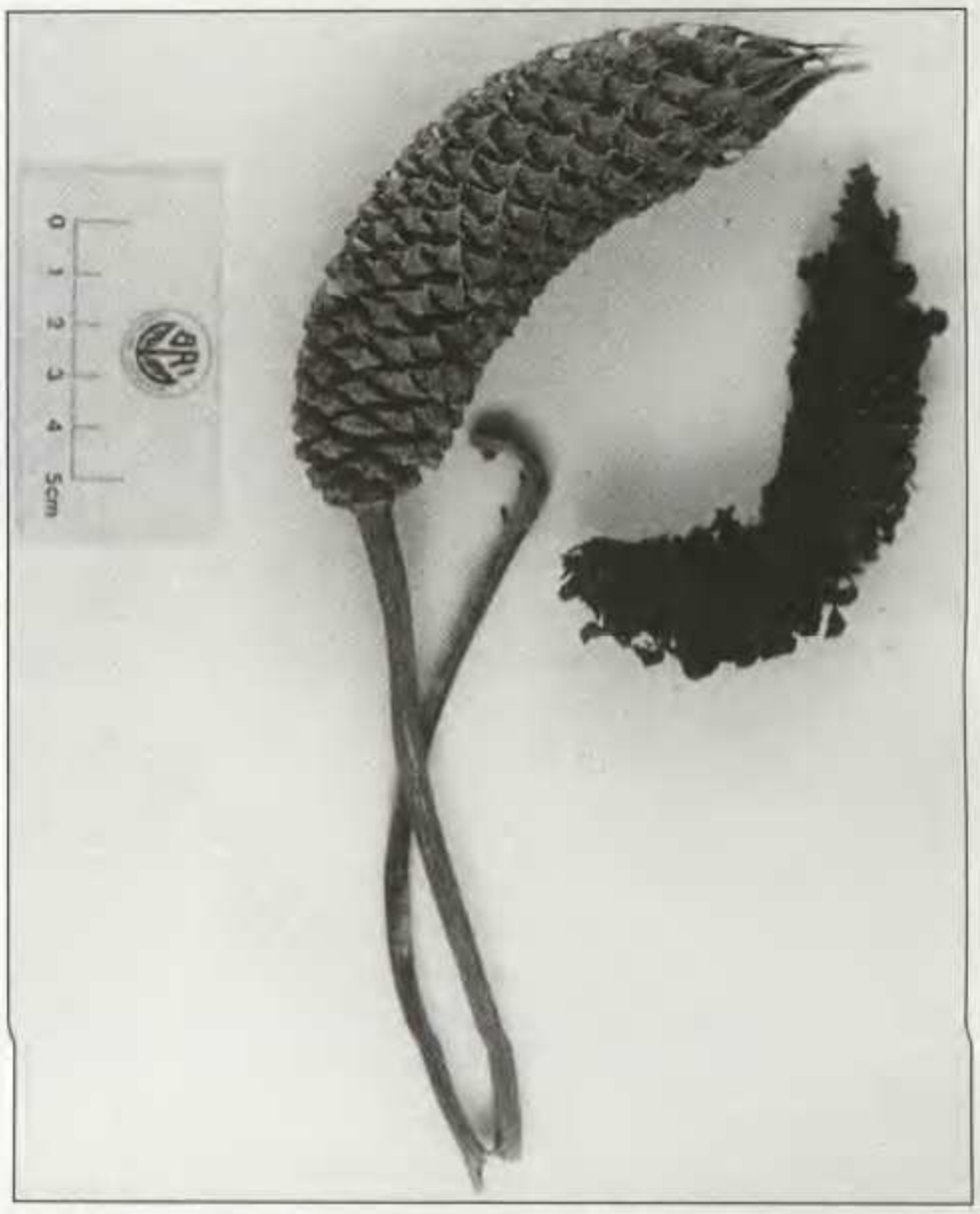


Figure 1b ***Macrozamia longispina*****. One of the carpological specimens filed at the Queensland Herbarium (BRI), collected by Paul Forster and Peter Machin in October 1992. Photo: Peter Machin.**

the plants with power kerosene - as strongly recommen-ded by the Department of Agriculture at the time (Kelly 1967) Botanical investigation in the early 1990's in the surrounding area led to the collection of further material; this too was sent to the Queensland Herbarium where it was then recognised as an undescribed cycad species (Figures 1a, 1b). Although a revision of *Macrozamia miquelii* complex was being undertaken by Forster and Jones, the 1998 treatment of the cycads in the *Flora of Australia* required early publication to allow the name to be used.

DISTRIBUTION AND ECOLOGY

Macrozamia longispina exists in fairly extensive colonies in hilly country supporting open forest or low woodland dominated by *Eucalyptus acmenoides, E. tereticornis, Lophostemon confertus* and *Corymbia intermedia*. The soil type is skeletal and derived from serpentinite. A detailed description of this vegetation is found in Batianoff *et al.* (1991). The type locality for *M. longispina* falls within State Forest # 639, but colonies extend from Widgee Mountain and southeast near Glastonbury (Figures 2, 3). Recent visits to the area show the plants to be in good vegetative condition with the fairly large numbers of seedlings indicating effective regeneration. Not much is known

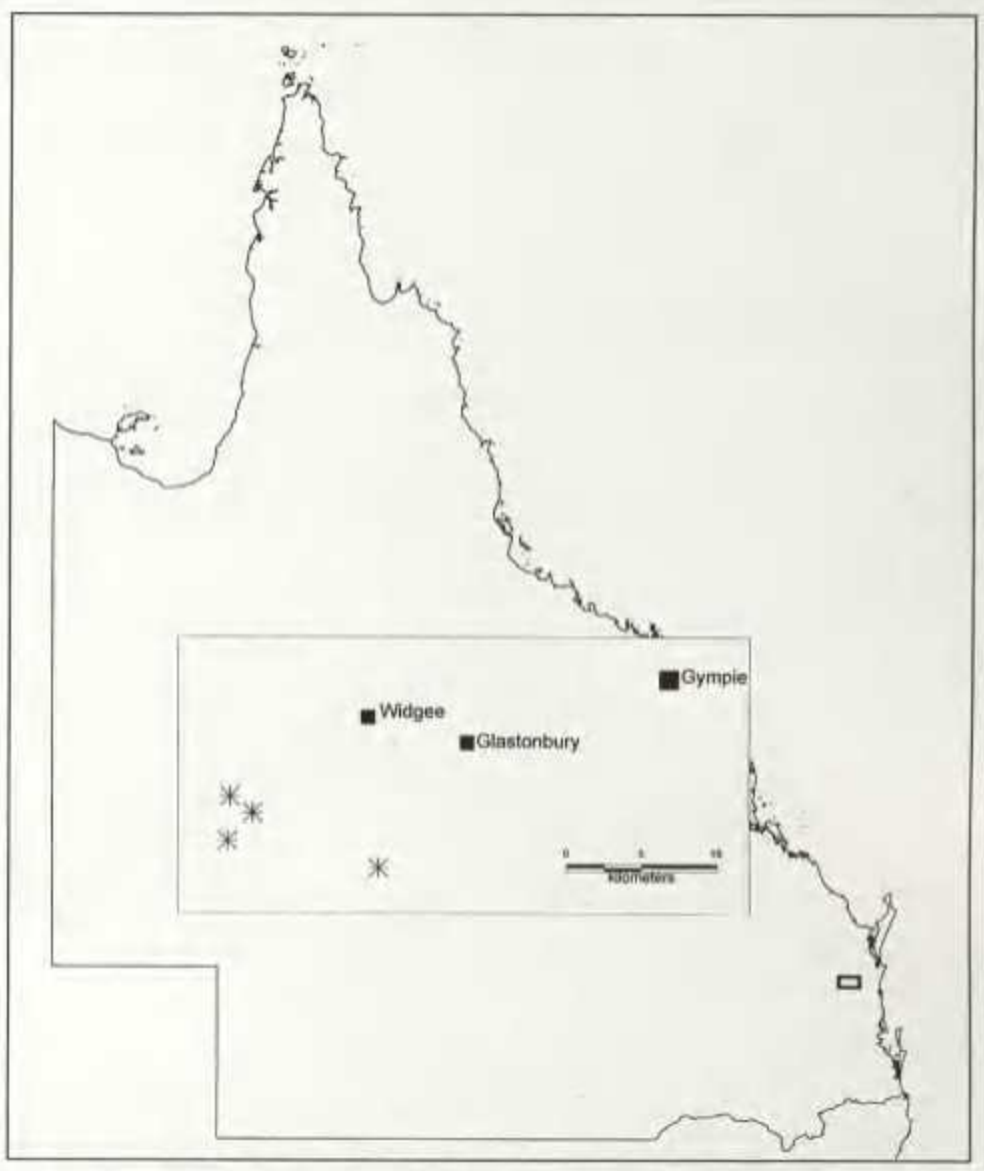


Figure 2 Distribution map of ***Macrozamia longispina*****. The inset map relates to the area within the small rectangle in the map of Queensland. Courtesy of P.D. Bock.**

Figure 3 Widgee Mountain (alt. 688 m), the local landmark for the occurrence of *Macrozamia longispina*. Photo: Roy Osborne.

of the ecology of this species itself, but in common with its relatives in the *M. miquelii* complex, one would anticipate an association with and possible dependence on fire cycles. Certainly, particularly abundant coning has been observed after habitat burning. The insect *Cycadothrips chadwickii* (Thysanoptera) has been found in the male cones of *M. longispina* and may be implicated in pollen transfer (Forster *et al.* 1994).

DESCRIPTION

1. STEM

Macrozamia longispina has a large underground caudex which may become exposed in plants on eroded steep slopes.

LEAVES AND LEAFLETS

Leaves of *M. longispina* are 1.0–1.5 m long with 48–66 (usually around 52–58) widely-spaced, glossy, mid-green leaflets inserted at about 45° to the leaf axis but lying in a flat plane (Colour Figures 1–2 on p. 11). Median leaflets are typically 230–320 mm long by 4.5–6 mm wide and have stomata on the lower surface only. Each leaflet has a pale-cream swollen callus at the point of insertion onto the rachis and these give an attractive overall appearance to the foliage (Colour Figure 1 on p. 11). Petioles are rounded in cross section and 4–5 mm wide with a long clear base.

2. REPRODUCTIVE STRUCTURES

Male plants of *M. longispina* bear green cones about 150 mm long hy 40 mm wide on an extended peduncle (Colour Figure 3 on p. 11). The tightly-packed sporophylls of the male cones have delicate and relatively long (15–20 mm) spines at their tips, particularly towards the apex of the cone, which prompted the name "longispina" for the species.

Female plants of *M. longispina* bear cones (Colour Figures 4–5 on p. 12) which are covered with a waxy bloom at the time of emergence, giving an almost powdery-blue appearance to the structure. Mature cones are comparatively small, at 130–180 mm by 60–80 mm, and are borne on extended peduncles. Each megasporophyll terminates in a stiff sharp spine, these being particularly prominent towards the cone apex.

Seeds of this species have a light orange-red sarcotesta, and measure about 20–23 mm by 14–16 mm.

AFFINITIES

Clearly, the affinities of this species lie with the other members of this closely-related group, but especially with *Macrozamia mountperriensis*.

Macrozamia longispina differs most noticeable from *M. mountperriensis* in three aspects: *viz.* in having leaves with fewer leaflets (usually about 52–58 *vs.* usually about 70–86); in the narrower median leaflets (4.5–6 mm *vs.* 6.5–9 mm) and in the apical sporophylls of the male cones having much longer spines (15–20 mm *vs.* 3–13 mm). A systematic analysis and key to the species in the complex will appear in the forthcoming revision by Jones and Forster. Limited experience with the seedlings of these various taxa indicates that the individual species are recog-nisably different in juvenile leaf and leaflet characters soon after germination.

CONSERVATION AND CULTIVATION

Although *Macrozamia longispina* is not particularly well conserved, the species is not considered to be at risk. It has been assigned an IUCN Red List category of LR, 1c (IUCN Red Data List, 1994). In terms of the Queensland Nature Conservation Act, *M. longispina* falls under the category "common protected wildlife". Harvesting of plants and seeds from habitat is possible under permit issued by the Queensland Environmental Protection Agency.

As this species has only recently been named, there are not many specimen plants in cultivation; the authors know only of one example - a small number of plants which have been established at the Rockhampton Botanic Gardens. It is reasonable to assume that *Macrozamia longispina* would respond to cultivation in much the same way as other species in the *Macrozamia miquelii* complex, i.e. it would make an attractive garden or container plant requiring minimum maintenance and probably be reasonably cold-hardy.

ACKNOWLEDGEMENTS

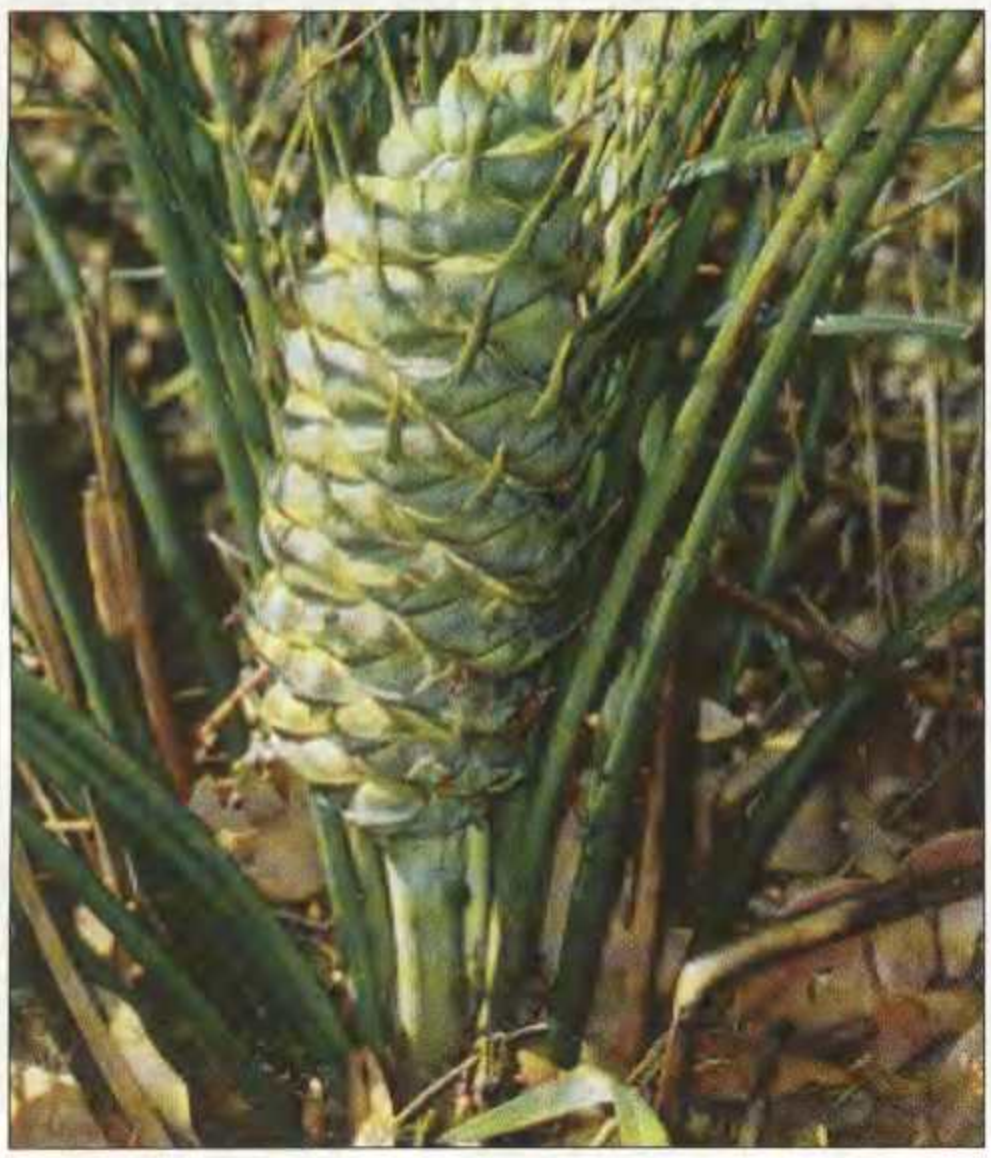
We thank Lou Randall for his kind help in the preparation of this text. Peter Bostock and Terry Boyle of the Queensland Herbarium respectively provided the map and photograph of the type specimen.

Colour Figure 1 *Macrozamia longispina*. **Viewed from directly above, the foliage presents a symmetrical pattern accentuated by the light-coloured swellings at the base of each leaflet. Photo: Roy Osborne.**

Colour Figure 2 *Macrozamia longispina*. **A mature plant at the type locality. Photo: Roy Osborne.**

Right: Colour Figure 3 *Macrozamia longispina*. **Plant bearing a male cone just prior to pollen shedding. A spent male cone is present at the rear. Photo: Roy Osborne.**

Colour Figure 4 *Macrozamia longispina*. **Plant bearing a female cone in the stage prior to pollination. Photo: Roy Osborne.**



Colour Figure 5 *Macrozamia longispina*. **Plant bearing a female cone with fertile seeds. Photo: Vic Wilkins.**

Colour Figure 6 *Encephalartos lebomboensis*. **Photo: Nat Grobbelaar.**

Colour Figure 7 *Encephalartos relictus*. **Photo: Nat Grobbelaar.**

Colour Figure 8 *Stangeria eriopus*, **male cones. Photo: Nat Grobbelaar.**

Colour Figure 9 *Encephalartos ferox*, **too much exposure to sunlight. Photo: Nat Grobbelaar.**

Colour Figure 10 *Ceratozamia latifolia*. **Photo: Nat Grobbelaar.**

Colour Figure 11 *Encephalartos transvenosus*. **Photo: Nat Grobbelaar.**

Colour Figure 12 *Encephalartos natalensis*. **Photo: Nat Grobbelaar.**

Colour Figure 13 *Encephalartos horridus* **Photo: Nat Grobbelaar.**

Colour Figure 14 **Left**: *Zamia roezlii*; **Centre**: *Zamia chigua*; **Right**: *Zamia amplifolia*. **Photos: Alvaro Calonje Daly.**

Colour Figure 15 *Zamia obliqua*. **Photo: A.C. Daly.**

Colour Figure 16 *Zamia wallisii*. **Photo: A.C. Daly.**

Colour Figure 17 *Zamia manicata*. **Photo: A.C. Daly.**

Colour Figure 18 *Zamia encephalartoides*. **Photo: A.C.Daly.**

Colour Figure 19 *Encephalartos hirsutus*. **Photo: Nat Grobbelaar.**

REFERENCES

BATIANOFF, G.N., SPECHT, R.L. & REEVES, R.D. 1991. The serpentine flora of the humid subtropics of eastern Australia. *Proceedings of the Royal Society of Queensland* 101: 137–157.

FORSTER, P .I. 1999. Typification and application of the name *Macrozamia macleayi* (Zamiaceae). *Austrobaileya* 5: 577.

FORSTER, P.I. & JONES, D.L. 1998. *Macrozamia longispina* P.I. Forst. & D.L. Jones, sp. nov. In: *Flora of Australia* 48:717.

FORSTER, P.I., MACHIN, P.J., MOUND,L. & WILSON, G.W. 1994. Insects associated with reproductive structures of cycads in Queensland and northeast New South Wales. *Biotropica* 26: 217–222.

HILL, K.D. 1998. Cycadophyta. In: *Flora of Australia* 48: 597–661.

IUCN, 1994. Red Data List Categories. Gland, Switzerland.

KELLY, T.K. 1967. Killing Zamias with power kerosene. *Queensland Agricultural Journal* 93: 184–185.

SHORT COMMUNICATIONS / KORT MEDEDELINGE

BITS AND PIECES

Nat Grobbelaar
P.O. Box 15357, 0039 Lynn East, R.S.A.

Received 5 April 2001

An ***Encephalartos lebomboensis*** from Mananga produced a male cone on the side of its stem about 20 cm below the lowermost leaves in the Pretoria garden of Arnold Prozesky (Colour Figure 6 on p. 12).

Encephalartos relictus was described as a new species at the 5th International Conference that was held in Miami, U.S.A. during 1999. A specimen of *E. relictus* is doing fine in a Pretoria garden (Colour Figure 7 on p. 12).

Professor Pant recently reported several *Zamia* cones with multiple apices. A ***Stangeria eriopus*** male cone with three apices was recently discovered in a Pretoria garden (Colour Figure 8 on p. 13).

The yellow yellow apices on the pinnae of an ***Encephalartos ferox*** (Colour Figure 9 on p. 13) are not due to a mineral deficiency but is the result of too much exposure to sunlight. More often yellow blotches appear on the middle of the pinnae when the plant are overexposed to strong sunlight.

The pinnae of some cycad species, like the ***Ceratozamia latifolia*** depicted in Colour Figure 10 on p. 13, initially have a deep bronze colour which later changes to green as can be seen in the older leaf of the same plant in the photograph. This phenomenon appears to be more common amongst the *Ceratozamia* and *Zamia* species than is the case for the species of the other cycad genera although some species of *Macrozamia* and *Encephalartos* are known to exhibit the same behaviour.

A male specimen of ***Encephalartos transvenosus*** produced three male cones as well as a flush of new leaves almost simultaneously (Colour Figure 11 on p. 13).

An abnormal male cone on an ***Encephalartos natalensis*** (Colour Figure 12 on p. 13, cone at the right) appeared shortly after a normal cone made its debute. Eventually they took on a fairly similar appearance.

The plant depicted in Colour Figure 13 on p. 13) appears to be a genuine green form of ***Encephalartos horridus*** although one will have to wait for it to cone to be sure. A friend claims to have observed a green form of *E. horridus* within a colony of blue plants in the wild. Its is conceivable that green mutants exists. Has any of our readers evidence for the existence of green *E. horridus*?

The ***Encephalartos hirsutus***, of which part of a leaf is depicted in Colour Figure 19 on p. 14, developed from a leafless and rootless sucker that was dusted at its stem apex with flowers of sulphur and a commercial insecticide containing a mixture of carbamate and chlorpyrifos. When the sucker produced a flush of leaves, some of the pinnae were normal, some did not develop at all whilst many were abnormal in that they were two-lipped with a longitudinal incision that went down the whole length of the pinnae in some cases. Has anybody information as to whether these leaf abnormalities are due to the carbamate or chlorpyrifos?

WEB SITE FOR THE CYCAD SOCIETY OF SOUTH AFRICA

Wynand van Eeden
P.O. Box 3489, 7536 Tyger Park, R.S.A.

Received 23 January 2001

After a few requests from members and a R500.00 donation by John Kloppers, I was asked by the president, Dr. Piet Vorster, to investigate possible ways of getting the Society onto the web. It is starting to happen now and **www.cycadsociety.org** is now the registered domain of the Cycad Society of South Africa.

The site will initially be small but it will grow as we add to it. The Home Page has links to all the other pages and also explains what the Society is about. Other pages include an "About Us" page, a page with links to other useful pages, a short overview of the "*Encephalartos*" magazine and a Forum page. This page is for members to talk to each other and ask for or offer advice, post advertisements or supply information of benefit to all. We shall also add a "Frequently Ask Questions" at a later stage to help members to get information easily. Members can also advertise on the "Information Forum" but to make up some of the cost to maintain the site, a small fee may be charged.

The greatest effort will go into the Species Pages and we want to create a page on all the SA species. These will be based on the "Focus on ..." articles as they appeared in "*Encephalartos*". Members and authors of articles will be asked for photographic material for these pages and all contributions will be recognised.

Our site should complement our excellent magazine and will not replace it. The services of a professional web designer was therefore used to keep to the high standards set by "*Encephalartos*" magazine. Because we are a non-profit organisation, the designer offered us a reduced rate for the design and after this once off cost is covered, it will be relatively cheap to maintain the site. Can I please ask members to make a donation towards the cost of the web site. All donations can be sent to Prof. Guillaume Theron.

Lastly, anybody that wants to contribute in any way can contact me at **wynand@ananzi.co.za**

CYCAD-ASSOCIATED INSECTS MOVE TO NEW HOSTS

Piet Vorster
Botany Department, University of Stellenbosch, Private Bag X1, 7602 Matieland, R.S.A.

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In the previous issue's FROM THE PRESIDENT I reported about Isabella Claassen's *Dioon edule* which spontaneously got pollinated after she merely leaned a male cone against the female cone, and I speculated about what may have happened. Isabella has now told me that she indeed found in male cones of *Dioon* some of the *Porthetes* beetles which occur only in Africa, are found only in association with specific species of *Encephalartos*, and are suspected of affecting pollination in *Encephalartos*. The deduction is that these beetles are able to read the chemical attractant signal of Mexican *Dioon* and are able to react successfully to it, in spite thereof that this signal is different from that of *Encephalartos*, and the cones are structurally quite different. This is a very important observation, and an example of the kind of discovery which you as enthusiast can make.

This phenomenon has huge implications for conservation. In nature, many of these cycad-associated insect species are restricted to specific species or species groups of cycads. There is strong circumstantial evidence that these beetle species, and no others, are responsible for pollination. This means that, should the pollinating insect species of any cycad species for any reason become extinct in nature, no more pollination and reproduction will take place. Examples of where this may have happened, are *Encephalartos equatorialis, E. latifrons,* and certain populations of *E. eugene-maraisii* and *E. laevifolius*. It also means that attempts to re-introduce cycads in nature after they have become extinct there, will be unsuccessful unless the pollinating insect species are known and available, and can be re-introduced into nature together with the cycads. Unfortunately our knowledge of these insects and their life histories is woefully inadequate. However, there is now increasing reason to believe that different pollinating insect species can, under artificial conditions, be "taught" to visit cycad species to which they normally won't be attracted, and even to cycad species in other genera, and that they can there successfully affect pollination.

[Twenty-five of the "seeds" in the *Dioon edule* female cone developed fully in that they had hard sclerotestas, the others remained soft and were also smaller. Fifteen of the twenty-five "seeds" germinated eventually. I have also observed that at the pollen shedding stage the male *Dioon edule*

cones emitted the same overwhelming unpleasant odour as *Encephalartos villosus* male cones at that stage. – **Editor.**]

PHYLOGENY OF *ENCEPHALARTOS* SPECIES

Nat Grobbelaar
P.O. Box 15357, 0039 Lynn East, R.S.A.

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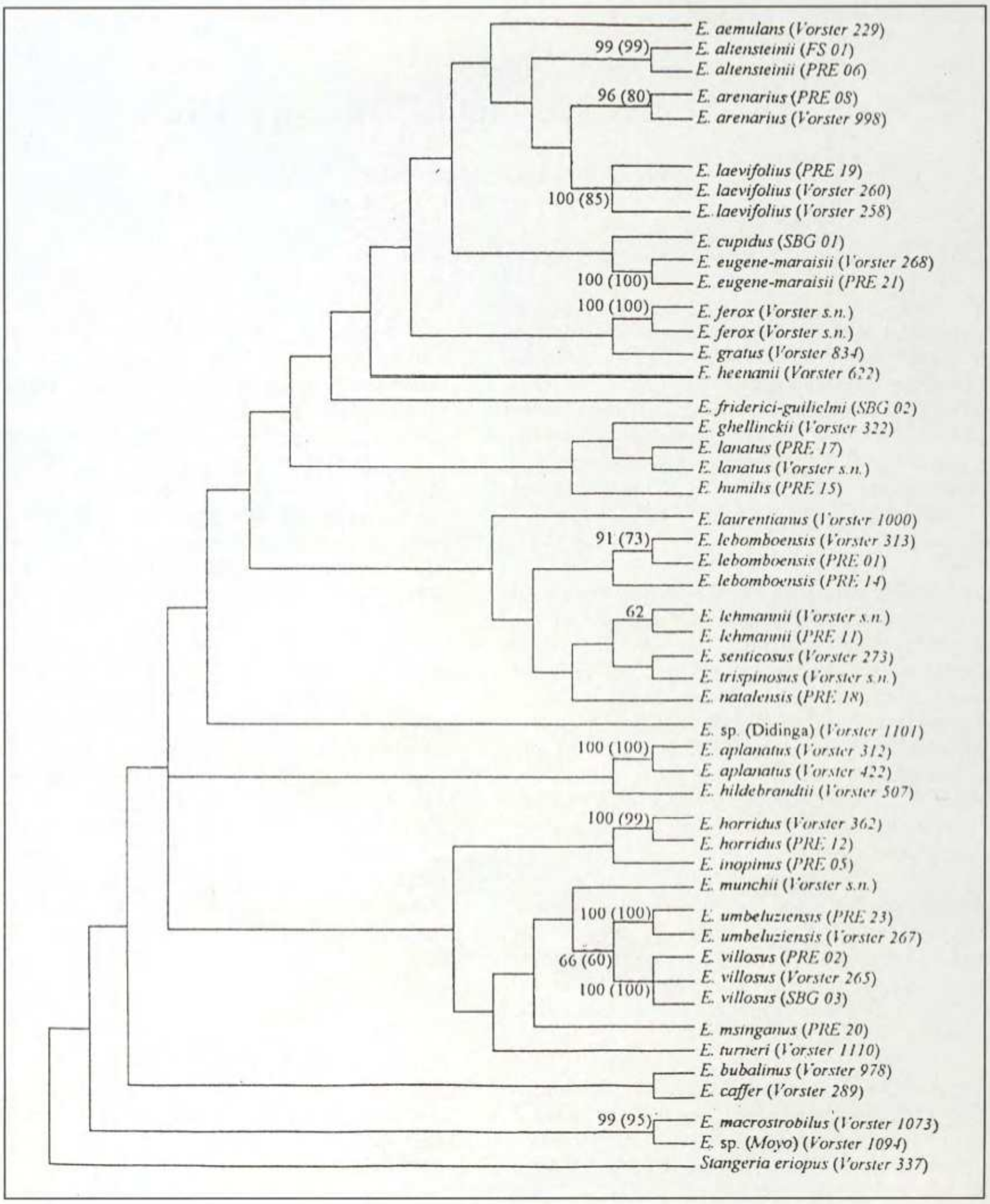
Cladogram of the cycad species of which leaflets were used in the study.



Amongst the abstracts of "New Cycad Publications" in this issue of "*Encephalartos*" the abstract of the M.Sc. thesis of Miss M.E.Coetzer should interest many readers. Although leaf material of *E. woodii* and *E. chimanimaniensis* were included in the study it unfortunately does not feature in the final cladogram (Figure 1) for some obscure reason.

Some of the weird conclusions that were derived at in the study are that *E. villosus* is more closely related phylogenetically to *E. umbeluziensis, E. munchii,E.inopinus* and *E. horridus* than it is to *E. aplanatus* which was found to be closely related to *E. hildebrandtii*.

Hopefully these results will stimulate additional, more comprehensive and intensive research into the phylogeny of the *Encephalartos* species. In the meantime the results of the study can only be accepted with some reservation.

ARTICLES / ARTIKELS

THE ZAMIAS AND CHIGUAS OF COLOMBIA

Alvaro Calonje Daly
Carrera 28 # 5B. 102, Cali, Colombia

Received 3 April 2001

Colombia is best known as the producer of the world's finest coffee, but it is also infamous for cocaine and heroin production and the violent warfare it has helped engender. The violence and widespread corruption which have plagued Colombia for over 30 years have mainly been the result of conflicts of interest in among drug dealers, weapons merchants, rich landowners, rebel Marxist guerrillas, paramilitary groups, and the Colombian government.

It is hard to believe that such an ugly conflict could be staged in such an incredibly beautiful and diverse country. Colombia enjoys both Atlantic and Pacific Ocean coastlines, and one-third of the country is covered by the Amazon jungle. In addition to this, the Andes mountain range splits into three distinct ranges in southern Colombia, thus having wide valleys with big rivers, allowing for many different ecosystems which house an astonishing biodiversity. With over 55,000 plant species, Colombia contains 10% of the world's biodiversity, second only to Brazil, a much larger country.

Ten percent of Colombia's land mass is part of the National Park System, and some of these parks are occupied by guerrilla units or paramilitary groups, thus impeding access to these areas and the opportunity for research. This has contributed to the mystery surrounding the Colombian Zamias.

Colombia has about 18 species of Zamias and Chiguas occurring in different habitats that range from tropical rainforest to high elevation cloud forest. Colombian Zamias are somewhat mythical because some species were discovered last century by Wallis and Braun and only rediscovered by Bernal, Restrepo and Stevenson this century. Some species have hardly ever been seen, others occur only in small areas that are of difficult and dangerous access, while others grew in areas which have been flooded for the construction of large hydroelectric projects.

The different habitats where Zamias and Chiguas occur are savanna in the Northern coast, which has well-defined rainy and dry seasons; rainforest in both the Amazon and the Choco areas; high tropical dry forest in the east of the country; and cloud forest formation in the northwest.

ZAMIA WALLISII

The cloud forests of Antioquia contain two of the rarest and most endangered species of any Zamias in the world. *Zamia montana* and *Zamia wallisii* (Colour Figure 16 on p. 14) *Zamia montana* is the highest elevation cycad in the world, found at 2700 m above sea level and *Z. wallisii* is the *Zamia* with the largest leaflets. Both are endangered because of heavy logging in the area. The Urrao cloud forest, one of the most beautiful cloud forests in the world, has been decimated. Many of the prime cloud forests of Colombia have been cut for poppy growing for the manufacturing of heroin.

ZAMIA ENCEPHALARTOIDES

The high elevation tropical dry forest of Santander contains one species of rare beauty. *Zamia encephalartoides* (Colour Figure 18 on p. 14) is a trunked *Zamia* which grows up to six metres tall, has a black female cone, and

thrives in dry areas of two distinct localities in the Chicamocha canyon. These plants are very resistant to salts and drought. They don't like wet tropical conditions. I have seen them growing outdoors in Southern California.

CHIGUA RESTREPOI

The savannas of Cordoba in Northern Colombia house *Chigua bernalii* and *Chigua restrepoi*, two species of a newly described genus that are truly exquisite in their architecture. Their leaflets have a protruding midrib vein. These species are found growing together and further studies may confirm that they are only one species. *Zamia muricata*, which also grows in scrubland, is a smallish *Zamia* with sharp teeth in its leaflets. *Zamia ulei* is found in the eastern savanna of Colombia as an understorey and full sun plant as well.

The Amazon and Choco rainforests hold a bounty in different species of Zamias. *Zamia amazonica* occurs in both areas in disjunct populations, *Zamia roezlii* (Colour Figure 14 on p. 14) is common, while others such as *Zamia disodon* are extremely rare and possibly extinct. It reportedly occurs in Peru as well. Zamias lived in America before the uplifting of the Andes and when this happened many populations were destroyed allowing for disjunct populations to occur. You see many cases of disjunct populations between the Amazin basin and the Choco rainforest.

ZAMIA ROEZLII, Z. CHIGUA AND *Z. AMPLIFOLIA*

Zamia roezlii, which grows to a height of 10 metres, is the largest of all the Zamias and is found near mangrove swamps in the Pacific coast; it tolerates high salts and is quite a beautiful *Zamia*, with high phenotypic variability. In the Calima Valley near Buenaventura one can find *Zamia chigua*, *Z. roezlii* and *Z. amplifolia*, *Z. amplifolia* (Colour Figure 14 on p. 14) being more elusive and rare. *Zamia chigua* is a rather peculiar-looking *Zamia*, with very fine, closely spaced leaflets. I believe that these three species possibly produce natural hybrids because of the different forms to be found. Mr Whitelock has studied the Zamias of Calima Valley extensively and he reports a high degree of phenotypic variations.

ZAMIA MANICATA

In the Choco one can find *Zamia manicata* (Colour Figure 17 on p. 14), which has beautiful bronze emerging leaves and is one of two species of Zamias with collars in their leaflets. The other is a newly found one, *Zamia macrochiera*. *Zamia manicata* makes a wonderful indoor plant. It is a very tough plant and reportedly very common in some areas of the Choco and maybe into the Darien in Panama.

ZAMIA OBLIQUA

Another species is *Zamia obliqua* (Colour Figure 15 on p. 14), a tall *Zamia* that can grow to eight metres and is found as an understorey plant. It has very nice apple-green leaflets and can have up to eight leaves at a time. This species occurs also in Panama.

Zamia amazonica is one of the most attractive Zamias, with its gorgeous red emerging flushes and deep, dark glossy leaves. This one has great horticultural potential because of its beauty. This is a very tough and worthy plant.

There are several smaller Zamias in the Choco and the Amazon and they are *Z. poeppigiana, Z. melanorachis* and *Z. lecontei*.

The state of conservation of Zamias in Colombia shows some promise by the work of the botanical garden in Medellin and a private arboretum near Cali. Unfortunately the Pacific rainforest has been targeted as a prime coca leaf growing area and it is been logged and planted now. The rainforest of Colombia have traditionally been a place where people have always come to take something never to leave anything, be it gold, platinum, hardwood or Zamias. It seems so durable and resilient yet it is very frail. Hopefully the conflict affecting Colombia will de-esculate to negotiations and botanists from all over the world will be able to visit this beautiful and diverse country.

THE FUTURE FOR MEXICAN CYCADS IN THE WILD

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

Received 22 June 2000

Reprinted from *Cycad Newsletter* 23(2): 16–19 with permission of the editor

This discussion is the second half of an article on the present and future status of the Mexican cycads. Last time, I detailed a number of the threats and causes contributing to the decline of many Mexican populations (*Encephalartos* **64**: 27–28). Now I would like to present an outline of what can be done and what is being done currently to preserve

the Mexican cycads from extinction. Although few topics can precipitate a more heated discussion among exotic plant fanciers than the merits and flaws of CITES (the Convention on International Consenservation of Exotic Species), I think that one truth exists. No other agency or legislation has done more to conserve and preserve cycads in Mexico than CITES. Without CITES, nothing would prevent the unrestricted flow of endangered plant materials out of Mexico, including cycads. In spite of its numerous flaws and shortcomings, the CITES listing of all cycads has done an excellent job of slowing and even stopping large scale wild plant collecting, especially in contrast to the pre-CITES volume of plants that were being exported. Though the avarice of collectors on the US side of the border and the frustration they experience trying to import cycads from Mexico turns many cycadophiles into CITES haters, CITES is the principle legislative barrier that prevents the wholesale removal of specimen plants from habitat. For that reason alone, it should be supported. In addition to the protection that CITES affords, Mexico further protects its fauna and flora with a complex set of laws and regulations that are strict and hard to circumvent. Collecting permits are notoriously difficult to obtain, even (unfortunately) for valid scientific purposes. The myriad forms, fees, and red tape present a formidable gauntlet that successfully slows the issuance of collecting permits to a glacier-like crawl which effectively stifles nearly any and all efforts to legally collect cycads. Until such time when collecting permits are more easily obtained, the Mexican bureaucratic labyrinth is successfully delaying government sanctioned collecting. A rather recent development is the creation of *in situ* (habitat) cycad nurseries fostered by Andrew Vovides of Xalapa Institute of Ecolgy in conjunction with local farmers, Mexican cycadologists, and external support from cycad philantropists such as Tim Gregory. The idea is to involve local people in the protection of mature habitat plants while promoting the artificial propagation of cycads for sale from the occasional harvesting of seed. The first such nursery was created nearly 10 years ago near Chavarillo, Veracruz which is the type locality of *Dioon edule*. Thousands of seedlings have been propagated since and are currently growing quite well. They are maintained under nursery-like conditions for sale and occasional reforestation back into habitat. Now that the plants have reached a marketable size, the program is successfully entering the marketing phase according to Vovides. Apparently many plants are being shipped overseas and the demand is growing. This not only provides an incentive to protect the wild plants and the habitat, but helps promote cycad awareness in Mexico and abroad as well. Several similar projects have begun elsewhere in Veracruz and Oaxaca and a number of similar nurseries are being considered for many of the rarer and more endangered cycad species throughout Mexico. Both governmental agencies and non-governmental organizations are hard at work to detail and document all manner of biological resources. Several very competent conservation biology organizations are actively surveying the remaining areas of biogeographical significance. Studies, charts, satellite imaging analyses, and field surveys are used to compile and diagnose the data. Ultimately these organizations make recommendations with respect to conservation and preservation of Mexico's precious plants and animals. One of these groups in particular, SERBO, of Oaxaca, has been instrumental in habitat mapping and conservation in southern Mexico. Silvia Salas Morales and Leo Schibli, a wife and husband team (in charge of approximately 20 scientists within the organization that is SERBO), have spearheaded a number of vitally important studies and discoveries within the state of Oaxaca. Hopefully they will continue to receive the necessary operating support and financing they so richly deserve. Regional and national botanic gardens have flourished in recent years in response to the growing interest both domestically and from abroad in Mexico's native plants. The Mexican endemic plants and cycads in particular have generated considerable attention. Increased awareness of such botanical treasures has resulted from public displays in botanic gardens and local education programs sponsored by various conservation biology groups, botanic gardens, and cycad field researhers all working together to impart the urgent need to preserve and protect the cycads of Mexico.

As a result, many towns and villages proudly protect their local cycad populations from degradation by controlling access, preserving habitat, and prohibiting the collection of plant materials. A very good example is the type locality of *Dioon caputoi* in southwestern Puebla. A visit to the local cycad population is possible only after a lengthy discussion with the town's officials. Part of the discussion includes a statement of purpose and an agreement not to collect plant materials. Finally, an obligatory guide is sent along to lead the way and monitor the visit. Unfortunately, the system can be subverted by bribing the guide. Several recent introductions of quantities of *D. caputoi* seed attest such flaws in the system. Most of the recntly discovered populations of Mexican cycads occur in remote areas with limited access. Fortunately, economic conditions in Mexico are such that access will remain limited for some time and, consequently, those cycad populations will remain intact well into the foreseeable future. Sustainable harvesting of seed from such populations can begin now to stock the *ex situ* coffers of collectors, botanic gardens, universities, and all manner of cycad repositories throughout the world while still permitting healthy recruitment within the population. The consequence is twofold: to enable the distribution of desirable cycad seedlings and reduce the demand for mature, field-collected plants. And of course, the sooner that seedlings from previously unknown or unavailable populations of cycads are made available, the sooner that they will mature into coning-sized plants. One unexpected source of preservation of Mexican cycads is the creation of new suitable habitat for colonization along road cuts as a result of grading. I have seen evidence of colonization by seedlings of all three genera along road cuts that I estimated to be approximately 20 years or older. The principle beneficiary of expansion into road cuts is *Ceratozamia*. The population of *Ceratozamia* near Palma Sola, Veracruz is a wonderful example of active expansion along a road cut where the highway bisects the population. Because many of the Mexican cycads exist in narrow, well-defined ranges of exacting composition, it seems that some species may actually be expanding in range and numbers by this serendipitous collateral consequence of building roads through existing cycad populations.

Ecotourism and field botany are beginning to play a significant role in cycad preservation in Mexico. As the number of people travelling throughout the country to visit cycad populations increases, the money spent by those people increases. And the correlation between the continued existence of the cycads and the continued flow of money into the local economy is obvious. As long as the habitat and the cycads contained therein stay healthy, people will continue to come and visit and spend their pesos. And in a poor economy like rural Mexico, that speaks loudly for the value of cycad preservation. An unexpected factor contributing to the preservation of the Mexican cycads are the various ethnobotanical uses of the plants. Most commonly used are *Dioon* leaves, but one occasionally finds *Ceratozamia* and even *Zamia* in occasional conspicuous public display. Uses include ornamentation around doors and windows of churches and on statues during religious holidays, especially Easter. In fact, travelling in Mexico during Easter is an excellent way to find new populations of Dioons. I have carefully inspected the leaves, which are woven into ornamental wreaths and used as decorations around houses and churches. Once in a while, something new is discovered in this manner. Weddings, funerals, and various local festivals all employ the occasional use of *Dioon* leaves as ornamentation. And so, the nearby populations of cycads that supplies a town or village with the requisite leaves is valuable source indeed. Consequently, the plants are protected to ensure a continued supply. Several years ago, I stumbled into another interesting ethnobotanical use of cycads. While driving far into the mountains of Oaxaca on a newly graded dirt road in search of new species, I was quite surprised to see a colourfully-dressed group of indigenous people walking miles from nowhere along the road clutching small *Dioon* plants like heads of lettuce. I slammed on the brakes and jumped out to converse; quite excited and quite sure that they must be carting around some new species heretofore never seen. Mostly, I wondered why they just happened to be walking around with those cycads in tow. As I approached, my excitement quelled somewhat as I saw that they were not the proud possessors of a new species but rather, several small *Dioon spinulosum*; probably no more than 6 years old. Knowing that we were many miles from the nearest likely habitat of *D. spinulosum*, I asked where they had obtained their plants and just exactly what they were going to do with them. They smile and told me that they had walked for many hours to get to the nearest paved road so that they could catch the bus to ride for several more hours to arrive at the nearest *D. spinulosum* locality so that they could collect the few plants with which they were now returning home. The reason? They were familiar with the cones and seeds and informed me that the seeds were very desirable and much sought after by many indigenous people in the region for use as beads for bracelets, necklaces, and toys for their children. Their plan was to cultivate the plants so that they would have a local source of seed. The group explained further that within the natural range of *D. spinulosum*, mature plants are preserved, even if the surrounding forest is destroyed so that the plants can be routinely harvested for leaves and seeds. I had often seen clusters of huge *D. spinulosum*, standing as towering memorials to the forest that once was; now reduced to pasture, and wondered why the cycads had been spared when all the other vegetation had long since been cleared and burned away. Now I knew. I admired the ambition of the group to try to establish a seed-producing colony in their own area but did not have the heart to tell them of the long wait that lay ahead for their children. It is much more likely that any bracelets or necklaces from the seeds of these cycads would be worn by their grandchildren. Finally, another contributing factor to the preservation of Mexican cycad populations is the spiritual significance of some localities and geological formations that happen to contain populations of cycads; usually Dioons. Much like the protection that *Encephalartos transvenosus* has enjoyed within the Modjadji forest because of sacred regard, so too, have the attribution of divine and/or mystical properties preserved some localities in Mexico and the cycads contained therein. A splendid example of this is a huge massive in central Oaxaca that is festooned with large plants of a putative new species. Local lore has it that the massive is spritual site, endowed with magical properties. Would that all the remaining cycad localities in Mexico be held in the same esteem!

IN SEARCH OF A RARE CYCAD IN ZAMBIA

Angela Gono and P.S.M. Phiri

The Herbarium (UZL), Department of Biological Sciences, School of Natural Sciences, The University of Zambia, P.O. Box 32379, Lusaka, Zambia

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Introduction

In April 1970, Dr Graham Williamson, who was then a resident of Lusaka, donated some preserved material of the female cone and leaflets of a cycad to the Botany Department of the University of Zambia. It was on one of his countrywide collections of orchids that Dr Williamson found this rare plant on a rocky quartzite site near the roadside located about 28.8 km along the Mpika-Chinsali road.

Collection mission

based on field information found on the label attached to our museum specimen, the first attempt to re-locate the natural habitat of this cycad was made at the end of the

rainy season in 1972. The expedition, led by Phiri in his capacity as Senior Technician in the Department of Biology, concentrated around the Bwingimfumu Hills, covering both districts of Mpika and Chinsali. The search was in vain, as the team only found a rich population of *Raphia* sp., a riparian palm that occurs in high rainfall areas of the country. Phiri had just embarked on part-time studies for his B.Sc. degree – hence his limited knowledge on the field features of cycad plants at that time!

A cycad spotted

about 20 years later, Phiri participated in a workshop on the conservation of trees in Africa, held in Harare. When the workshop organisers arranged a visit to the National Botanical Garden, Phiri was amused to find a living collection of a cycad originally collected from Zambia, being cultivated in Zimbabwe. A subsequent chat with Mr Bob Drummond yielded encouraging information on the natural locality of the cycad in the Northern Province of Zambia.

A renewed search

the acquisition of a four-wheel drive vehicle through SABONET has facilitated greater mobility for the SABONET-Zambia staff and has led to an intensification of field trips to areas that have been under-collected in the country. Prior to mounting a second attempt to re-locate the Zambian cycad, two preparatory steps were necessary. First, valuable field experience was gained during the collaborative Nyika Expedition 2000. Second, a photo of *Encephalartos* sp., cultivated at the Government Hostels in Zomba (Figure 1), was taken to stimulate the memory of the folklore taxonomists among the rural residents of Mpika, who were expected to help in the location of the cycad in Northern Province.

Figure 1 A line of *Encephalartos* cultivated at the Government Hostels in Zomba, Malawi. The photo was taken as an aid in the field identification of the cycad reported to occur in Northern Province, Zambia. Photo: P.S.M. Phiri.

The team (Figure 2) that finally set off for Mpika on June 17, 2000, included Mrs Esnart Chupa (Chief Technician in the Division of Forest Research, Miss Angela Gono (Herbarium Research Officer at UZL), Mr A. Shawa (Technical Officer at the National Plant Genetic Resources Centre based at Mount Makulu Herbarium), Mr Annaniah Sakala (Herbarium Technician at UZL) and P.S.M. Phiri (Team Leader). The first night was spent camping at Kanona Basic School in Serenje District. The expedition team arrived in Mpika on June 18 and the Pricipal (Mr Champo) of the Zambia College of Agriculture kindly offered lodging

Figure 2 The SABONET-Zambia team that found a male plant of *Encephalartos* sp. in the Miombo woodland. Standing from left to right are Mr A. Sakala, Mr A. Shawa and Ms Angela Gono. Kneeling on the ground is Mrs Esnart Chupa. Photo: P.S.M. Phiri.

facilities on the campus. This college is situated 17 km outside Mpika Town, along the main road leading to Tanzania.

Success

The search for the cycad was launched on June 19. Previous records indicated that the female plants of the cycad were located a few metres from the Mpika-Chinsali road, but the team did not find the plant on the reported site. After some enquiries were made in nearby villages, along with the display of the photos of the plants obtained in Zomba, Mr James Chiluba agreed to guide the team to other localities where the cycads occur. The local name for the plant is "Kanchindu" and is sometimes also used for palms – it takes a good folklore botanist to distinguish between a palm and a cycad. After a long drive of more than 20 km into the Forest Reserve, the team found a relict stand of the cycad, thanks to the cooperation of Mr Chiluba and his colleague. On the return journey to the College, the vehicle had a punctured wheel – resulting in a return to base about 8 p.m.

The following day (June 20) was spent carrying out a further search for more populations of the cycad in the Forest Reserve: another stand of cycad plants was found within the same area. Specimens were collected, the associated vegetation type was recorded and soil samples were taken for chemical analysis at the University of Zambia. June 21 was devoted to exploring the southern sector of Mpika, embracing areas of Chief Chikwanda and Chief Mukungule. One of the village Headmen named Chendeyende, a renowned hunter, positively confirmed the occurrence of the cycad in the district.

Systematics and status

When Dr Williamson made the first collection, only female plants were recorded in the area. The cycad was initially identified as *Encephalartos poggei*, which also occurs in

the Democratic Republic of the Congo. However, Peter Heibloem reports on the Internet (see web site **www.pacsoa.org.au./cycads/Encephalartos/cycads** that the female plant found in Zambia is *Encephalartos schmitzii*. The plant that was found by the SABONET-Zambia team had old male cones, suggesting that this was the first discovery of a male plant. The plants occur in a gazetted Forest Reserve covered by the miombo woodland.

Phiri and Mrs. Chupa will soon be preparing a joint report for submission to the Forest Department and the Ministry of Environment and Natural Resources. The second phase will entail conducting a thorough inventory of the Bwingimfumu Forest Reserve as a form of a pilot scheme to provide data on the best approach to effect sustainable conservation measures on all forest and botanical reserves in Zambia.

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Dear Editor

RE LETTERS TO THE EDITOR IN *ENCEPHALARTOS* 64 AND 63

I would like to refer to André Kirsten's Questions to the Editor in *Encephalartos* **64**: 11, December 2000, concerning "Soil mixture and probable disease". I have often introduced my opinion on soil analyses to our readers and have, again and again, emphasized the importance of finding the right soil mixtures for the plants. This time I want to tell you about a special soil mixture. The mixture consists of a special geranium soil produced by Messrs. Stender from Germany. I use 2/3 of this soil and 1/3 of peat moss plus some quartz sand and 1–2 spoonfuls of Seramis per plant. As stated on the label, this geranium soil consists of:

peat, clay
N Nitrogen 200–300 ml/l
P_2O_5 Phosphate 200–500 ml/l
K_2O_5 Potassium oxide 300–600 ml/l
pH ($CaCl_2$) 5,5–6,5
Minors "Radigen", coconut fibre and rice spelts

Seramis is a product consisting of grains (5–7 mm in diameter) made from smashed clay pots. As I add pure peat to it, my soil mixture will have a pH-value of about 5. Further, I would like to mention that I use only plastic pots for *Encephalartos* specimens. I use Styrofoam pieces of about 3 to 4 cm as a drainage. They cover the bottom of my pots up to a height of 5 to 6 cm and help to keep the pH-value at a constant level. In summer the soil should be kept very moist. Every forthnight I use *Rhododendron* fertilizer (acid!), to which I add 20% of Ammonium Sulphate $(NH_4)_2SO_4$.

As soon as the new leaves are mature, I stop fertilizing the plants to avoid damage to the roots. Generally, I provide only those plants with fertilizer which show first signs of new leaves developing, because according to my experien-ce a plant develops the more leaves the fewer nutrients it gets. Richly fed after a period of "hunger" the plants produce wonderful leaves.

However, as mentioned before, I am telling you about my experience and I wonder if other *Encephalartos* enthusiasts have had similar experience.

There is yet another point I would like to make. Referring to "Letters to the Editor" on page 24 of *Encephalartos* **63**, September 2000, I would like to mention that Mr. R.M. Rudy is likely to be wrong when considering his *Cycas revoluta* a "plant of the future or mutations". The damage done to leaves and plants seems to have been caused by the synthetic auxin 2,4-D (2, 4 Dichlorophenoxyacetic Acid $C_8H_6Cl_2O_3$). Auxin is a substance contained in many her-bicides. In extremely small quantities it is sometimes ad-ded to tissue culture. Used in quantities of 1/10 mg to 1 mg it causes "cristata"-growth, and that is exactly what the plants on the photographs seem to have developed. Of course, this mutation may also have been caused by other herbicides or selective herbicides (e.g. Round-up, Gesaprem for maize cultivation, etc.)

Julius Brunner, *Postfach 4, A-2326 Maria Lazendorf, Austria.*

Received 23 January 2001

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Dear Prof. Theron

NEW WEBSITE

Congratulations on the new website, it looks great. I have already added a link on my web page to the site:
http://home.earthlink.net/~decho/

Doug Eckel, *2119 Victoria Drive, Fullerton, California 9263, U.S.A..*

Received 27 February 2001

DAILEY NEWS March 27, 2001

Cycads recovered: four held

BY GRAEME HOSKEN

SEVENTY-FOUR endangered plants were recovered and four men were arrested on Friday in an undercover operation by the Richards Bay Organised Crime Unit.

The men who were arrested for allegedly attempting to sell 74 Ferox Cycads appeared in court on Friday. Police spokesman Captain Vish Naidoo said that the Ferox Cycads were extremely rare and grew naturally only in the Manguzi and Kosi Bay areas.

"Mr Siphiwe Mahlangu (32), Mr Zwelibanzi Manzini (34), Mr Msawenkosi Sithole (38) and Mr Sipho Dlamini (57) were arrested after they allegedly tried to sell the cycads to undercover policemen.

"After questioning the men, it was established that most of the plants were going to be sold to tourists from Gauteng and other parts of South Africa," said Naidoo.

He said that if anybody was caught buying or in possession of the plants they would face criminal prosecution with a penalty of a severe fine or a prison sentence.

THE MERCURY Wednesday, March 28, 2001

Cycad arrests

EMPANGENI – Four men have appeared in court at Emanguzi in Maputaland after allegedly trying to sell 74 endangered Ferox cycads to the police.

The men, who were originally planning to sell the plants valued at R60 000 to buyers from Gauteng, were arrested by members of the organised crime unit in Richards Bay. – Empangeni Bureau

PLANNING TO GO TO CYCAD 2002?

If you are planning to attend, and to travel there from South Africa, you could consider calling **Ita van der Walt (tel: (012) 548 0216 evenings, (012) 548 0223 daytime, fax: (012) 548 4944)**. She is co-ordinating the travels from South Africa. Of course you can make your own arrangement, but there may be advantages in travelling as a group.

GAAN U NA CYCAD 2002?

As u beplan om te gaan, en vanuit Suid-Afrika te reis, kan u oorweeg om te skakel met **Ita van der Walt, (tel: (012) 548 0216 saans, (012) 548 0223 bedags, faks: (012) 548 4944)**. Sy koördineer die reise vanuit Suid-Afrika. Natuurlik kan u u eie reëlings tref, maar daar mag voordele aan verbonde wees om in 'n groep te reis.