

ENCEPHALARTOS

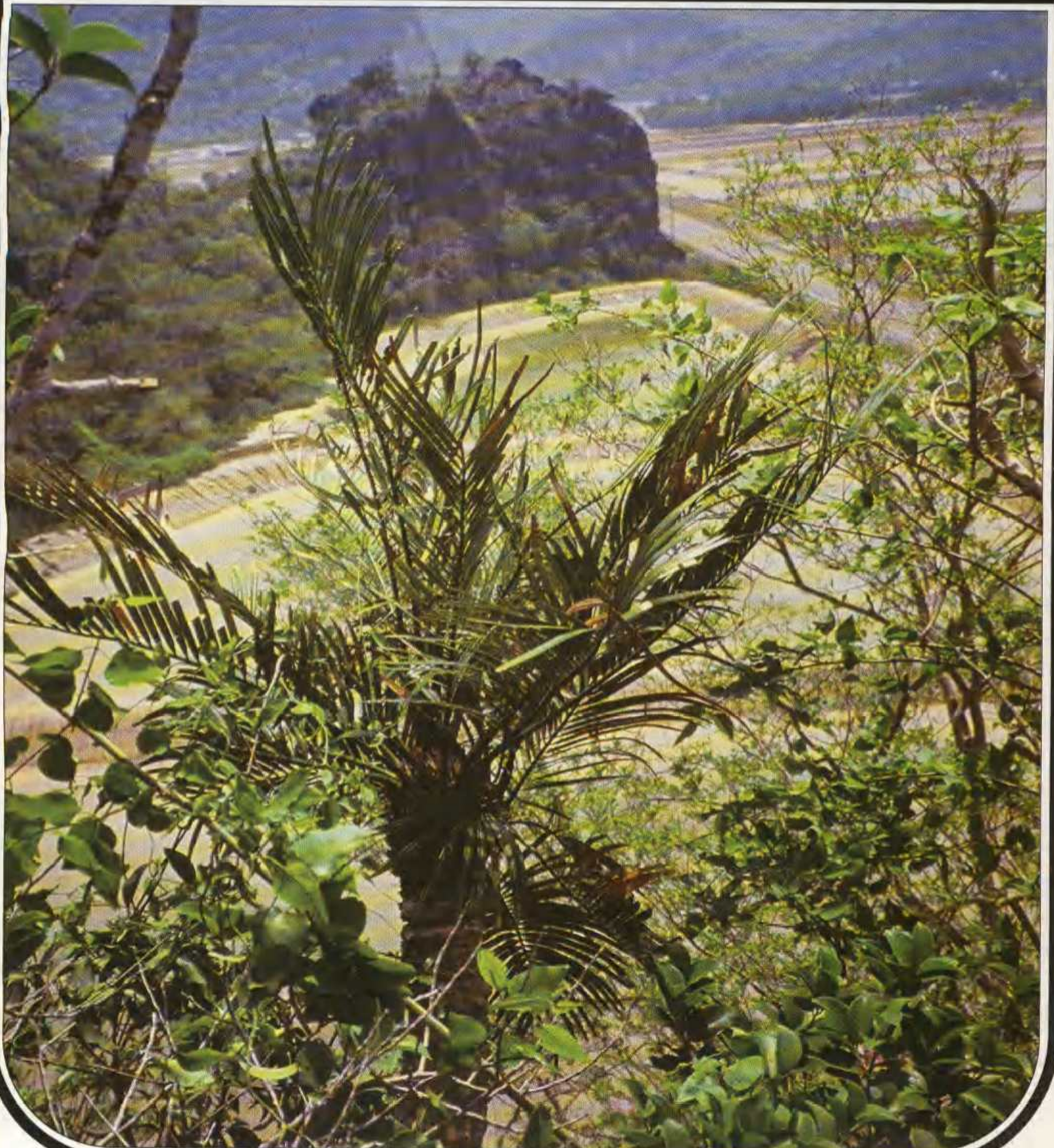
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VAN SUIDELIKE AFRIKA

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BROODBOOM VERENIGING VAN SUID-AFRIKA

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It was reported in the Miami Herald, 09-11-2004 that thieves, using a hurricane evacuation as cover, broke into Fairchild Botanical Garden and stole 33 priceless cycads. Some were as tall as 10 feet and have been at the garden for more than 50 years. Some 20 species are amongst the stolen plants. Plants appear to have

been selected carefully before being uprooted and carted off. [We can do without these negative stories but it is our responsibility to relay the information to our members. Should you have any information that can help track these plants please contact the relevant authorities. Ed.]

Afa News 16/9/04

Cycad species dying out

SAPA

Two more cycad species have gone extinct in the past two years, according to data from the National Biodiversity Institute.

This brings to six the number of the plant species that have been lost to South Africa, said John Donaldson, director of research at the institute.

He said it was sad that the avarice of a few individuals was causing the extinction.

"When there are only 10 to 20 individual plants left in the wild, just one or two selfish collectors can exterminate an entire species," he said.

"Sadly, these people have no qualms about personally causing an extinction, as it makes their private collections even more valuable."

Cycads are highly-prized ornamental plants which take a long time to grow from seed.

A plant 3 to 4m tall could be 400 years old. For this reason, people often resort to harvesting them from the wild, despite the strict laws against this.

Stan Rodgers of Limpopo Nature Conservation told of how an expedition in February to translocate the few last known individuals of the rare *Encephalartos brevifoliolatus* to safety from poachers ended in disaster. They arrived to find the plants had been hacked out of the mountainside, and taken away by helicopter. This species, together with another species from Limpopo, *E. nubimontanus*, is now extinct in the wild.

In the past year, cycad hauls worth R1-million had been confiscated – on their way to being sold on the black market to local and foreign collectors.

Cycads are interesting for their beauty and because they come from an old lineage of plants, which existed before any of the angiosperms (flowering plants) evolved.

"Cycads like the species we see growing today in the forests of Limpopo and KwaZulu-Natal were around when dinosaurs roamed the continent," said Donaldson. But data have shown that 24 of the 37 species in the country were now threatened, many with fewer than 500 individuals left in the wild.

Members of the public with cycads in their gardens should register them with the authorities, said Donaldson. Once a cycad is registered, it can be legally traded.

The Courier-Mail Tuesday, August 17, 2004

Forged papers claim in plant import case

Tony Keim

A SUNSHINE Coast nursery proprietor who specialised in endangered plants used forged documents to take delivery of rare flora illegally imported from South Africa, a court was told yesterday.

The District Court in Brisbane was told Peter Henry Heibloem allegedly used falsified documents in a bid to take delivery of separate shipments of cycads in October 2000 and March 2001.

Heibloem, 50, yesterday pleaded not guilty to two counts each of using a document knowing it was forged and using a document containing false information.

Commonwealth prosecutor Russell Hanson, QC, in his opening to the jury, said Heibloem operated the Eudlo Cycad Gardens, outside Noosa in the Sunshine Coast hinterland.

The jury was told Heibloem's nursery traded in cycads, a rare and ancient species of plant that had not evolved in millions of years.

Mr Hanson said cycads were endangered and protected in Australia under the Convention on International Trade on Endangered Species.

He said regulated trade of cycads in and out of Australia was limited to personal use and



Peter Heibloem

that it was illegal for any person to import and export the plants commercially.

The jury was told Heibloem used forged documents from "persons unknown" which claimed two shipments of plants belonged to South African ex-patriots who had migrated to Australia and who now wanted their personal collections sent to them.

Mr Hanson said Heibloem was also named in the documents as the person authorised to collect a shipment of cycads purported to belong to Stewart Forbes, from Perth.

He said subsequent investigations revealed Stewart Forbes had never owned cycads and that the forged documents incorrectly named him as "Stuart Forbes".

"(Forbes) doesn't know Mr Heibloem. He has never heard of him," Mr Hanson said.

Mr Hanson said the Crown maintained Heibloem was aware the documents were forged when he presented documents to Australian Customs officials.

The trial before Senior Judge Tony Skoien continues.

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COVER / VOORBLAD : *Cycas pranburiensis* in its limestone hill habitat at
Khao Sam Roi Yot, Thailand.

Photo / Foto: William Tan

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FROM THE EDITOR



VAN DIE REDAKTEUR

The last issue of *ENCEPHALARTOS* took only a short time to get into shape before I sent it off to the printer. I am glad to say that my call for articles was enthusiastically responded to and I received interesting articles on various subjects. When you submit an article for *ENCEPHALARTOS*, please first read the instructions for authors as set out on the back cover page. Include a title, your address and the date of the article. Photographs should be at least 200-300dpi resolution for best results.

This issue is packed with information and is going to take a while to get through. I shall continue "The Beginners" series in *ENCEPHALARTOS* 81 in March, including a usefull article from Andrew Fraser, on growing cycads from seeds and how to build your own hotbed for germinating seed. An idea to publish a booklet (and supply it with a new subscription), aimed at beginners, was put forward by the president, Piet Vorster. Let us know what you think of it, especially all our new members who joined since September 2003.

It is summer in the southern hemisphere and even though we have had only a few hot days at 34°S, I am glad to report new life in the form of leaves on *E. trispinosus*, *E. eugene-maraisii*, *E. fridericki-guilielmi* and *E. horridus*. This is the time of year when you see the results of your labour manifest itself in the form of new leaves, cones and new suckers. Hopefully the water restrictions imposed in the Western Cape will not influence our cycads' health. It's a good idea to mulch now and preserve the water left from the winter rains and to make it last as long as possible. You can use bark and even rocks as an effective mulch to stop evaporation from the soil.

Please make a note of paying your membership fees as soon as possible to ensure you receive the next issue without any delay. Cycad 2005 is in early January and I can recommend going after spending a wonderful week in the company of all the experts in 2002. For those of you lucky enough to go to Mexico for Cycad 2005, take lots of photographs and notes and be sure to write an article for the rest of us, not there to experience it ourselves.

If you see mistakes in this issue feel free to bring it to my attention. After looking at a computer monitor for a week I tend not to see some of the obvious ones.

WvE

Wynand van Eeden

FROM THE PRESIDENT



VAN DIE PRESIDENT

Just like the government of a country, or a municipality, the Board of this Society was elected and appointed by you, the members, to manage the Society on your behalf. The Board is not there to regulate your actions, but to serve you. However, sometimes the Board has to make rules in order to protect the broad membership of the Society against the actions of a few. One example of this is the payment of membership fees.

Because we don't want to lose members, we have until recently been very lenient about the payment of membership fees. Members who failed to renew their memberships in time were kept for almost a year on our mailing list in the hope that they would eventually renew, and they still received *ENCEPHALARTOS*. However, this practice cost a surprising amount of money, and the people who paid for it were those members who did renew their memberships in time. It is not true that we just temporarily carried the non-payers because inexplicably every year there were quite a number of people who never renewed their memberships and just vanished from the scene.

When Guillaume Theron took over as Secretary, he was appalled at how much money the Society lost through this practice. He therefore initiated a strict policy by which people who hadn't renewed by the time the new membership list was compiled, had their names deleted from that list. Late renewers also didn't receive *ENCEPHALARTOS*, before renewal, but once they had renewed they received all the issues, which they had missed.

Late renewal does however mean a lot of work for the Secretary. He must fetch those issues, which you missed, from the store, address them, pack them for mailing, and then take them to the post office. Maybe this doesn't sound like a lot of work, but he has to repeat this process every time our members renew one by one. Do keep in mind that the board members are all volunteers who do this work in their limited free time and it is unfair to saddle them with unnecessary extra work.

Accordingly the Board has decided that late renewers will hitherto be charged R25 for every issue which they have missed.

If you think that this is unnecessarily draconian, we remind you that personal renewal notices are sent to you as early as with the September issue of *ENCEPHALARTOS*.

Within the Board there were also proposals about the method of payment.

For the Secretary it is still the easiest if you send a cheque. We know that cheques are sometimes lost in the post, and therefore we also provide the option of paying your membership fee directly into the Society's account.

Net soos die regering van 'n land, of 'n munisipaliteit, is die Raad van hierdie Vereniging deur u, die lede, gekies en aangestel om die Vereniging namens u te bestuur. Die Raad is nie daar om u handeling te reguleer nie, maar om u te dien. Soms moet die Raad egter reëls neerlê om die breë lidmaatskap van die Vereniging te beskerm teen die optrede van enkelinge. Een voorbeeld hiervan is die betaling van ledegelde.

Omdat ons nie graag lede wil verloor nie, was ons tot betreklik onlangs nog baie informeel oor die betaling van ledegeld. Ons het lede wat nie hulle lidmaatskap hernu het nie, vir byna 'n jaar lank op die adreslys gehou in die hoop dat hulle wel mettertyd sou hernu, en hulle het nog steeds *ENCEPHALARTOS* ontvang. Dit het egter verbasend baie geld gekos, en die mense wat daarvoor betaal het was daardie lede wat wel betyds hulle lidmaatskappe hernu het. Dit is nie waar dat ons die nie-betalers net tydelik voorgeskiet het nie, want onverklaarbaar was daar elke jaar 'n hele klomp van hierdie mense wat nooit weer hulle lidmaatskap hernu het nie en net van die toneel af verdwyn het.

Toe Guillaume Theron as Sekretaris oorgeneem het, was hy verstom om te bereken hoeveel geld die Vereniging verloor het deur hierdie praktyk. Hy het gevolglik 'n streng beleid ingestel waardeur mense se name nie op die ledelys verskyn het as hulle nog nie hernu het teen die tyd dat die nuwe ledelys opgestel word nie. Laat-hernuwers het ook nie *ENCEPHALARTOS* ontvang nie, voordat hulle hernu het nie maar hulle het wel al die uitgawes wat hulle gemis het, gekry nadat hulle hernu het.

Laat hernuwing beteken egter 'n klomp werk vir die Sekretaris. Hy moet die eksemplare wat u gemis het, uit die stoor gaan haal, hulle adresseer, verpak vir versending, en dan by die poskantoor gaan pos. Dit klink miskien nie na baie werk nie, maar hy moet dit hoeveel keer herhaal soos lede een vir een hernu. U moet onthou dat die raadslede almal vrywilligers is wat hierdie werk in hulle bietjie vrye tyd doen, en dit is onredelik om onnodige ekstra werk op hulle te pak.

Die Raad het gevolglik besluit dat laat hernuwers voortaan R25 sal moet betaal vir elke uitgawe wat hulle gemis het.

As u dink dat dit onnodig streng is, herinner ons u daaraan dat persoonlike hernuwingskennisgewings reeds saam met die September uitgawe van *ENCEPHALARTOS* aan u gestuur word.

Binne die Raad was daar ook voorstelle oor die manier van betaling.

Vir die Sekretaris is dit steeds die maklikste as u 'n tjek stuur. Ons is bewus daarvan dat tjeks soms in die pos verlore raak, en daarom gee ons ook aan u die opsie om u ledegeld direk in die Vereniging se rekening te deponeer.

However, it is of no avail if you don't fax, or mail a copy of your deposit slip to the Secretary, otherwise it is almost impossible to determine who has made the remittance. There were also proposals that we should create credit card facilities, but this is uneconomical for the volumes which we handle. Lastly, there was a proposal that we should initiate a 2-, 3- or 5-year membership, or even a life membership at about 20x the annual membership fee. Do let us know what you think of this.

By the time you receive this issue, the bags of a few of us will already be packed for the conference in Mexico. As usual we will report to you on the proceedings, as well as on the additional trips which some of us will undertake to see plants in their natural habitats. Therefore, do renew your membership in time so that you can read it all in the March issue.

Piet Vorster

Piet Vorster

Dit help egter niks as u nie aan die sekretaris 'n afskrif van die depositostrokio pos of fax nie, anders is dit byna onmoontlik om vas te stel wie die inbetaling gemaak het. Daar was ook voorstelle dat ons kredietkaartfasiliteite skep, maar dit is on-ekonomies vir die volumes wat ons hanteer. Laastens was daar 'n voorstel dat ons 'n 2-, 3-, of 5 jaar lidmaatskap instel, of selfs 'n lewenslidmaatskap teen ongeveer 20x die jaarlikse ledefoo. Laat weet gerus vir ons wat u hiervan dink.

Wanneer u hierdie uitgawe ontvang, sal 'n paar van ons se tasse reeds gepak wees vir die kongres in Mexico. Soos gewoonlik sal ons aan u verslag doen oor die verrigtinge, en ook oor die bykomstige toere wat party van ons gaan onderneem om plante in hulle natuurlike habitat te sien. Hernu dus betyds u lidmaatskap sodat u dit alles in die Maart-uitgawe kan lees.

Piet Vorster

Piet Vorster

FROM THE COUNCIL / VAN DIE RAAD

CYCAD SOCIETY OF SOUTH AFRICA: MEMBERSHIP FEES FOR 2005 BROODBOOM VERENIGING VAN SUID-ARIKA: LEDEGELD VIR 2005

Our overseas members must please note that due to exchange rates we had to adjust the membership fees for 2005. Local members are not affected. The new fees are listed on the subscription form in the front of the journal. **Please take note of the late renewal penalty in "From the President".**

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2981	STEYN, Mej Rachel	Posbus 23151, GEZINA, 0031
2982	ABREU, Ms Sandra	P O Box 1271, GLENVISTA, 2058
2983	ODENDAAL, Sameul Kenneth	P O Box 912-907, SILVERTON, 0127
2984	FOUCHÉ, Mnr P A P	Posbus 26841, MONUMENTPARK, 0105
2985	GIBSON, Geoff	P O Box 1545, KLOOF, 3640
2986	NEUHOFF, C G J	Posbus 1223, TZANEEN, 0850
2987	STONE, Me L & MAKOVINI, Mnr W F	Posbus 101558, MORELETA PLAZA, 0167
2988	MATTHEWS, Mr grant	P O Box 50537, WIERDAPARK, 0149
2989	VAN DER WESTHUIZEN, Mnr Wiaan	Posbus 6007, ONVERWACHT, 0557
2990	MORTIMER, Mnr Eddie	Posbus 38471, FAERIE GLEN UITBR 6, 0043
2991	DU PREEZ, Brigadier Generaal Nico J	P O Box 12840, CLUBVIEW, 0014
2992	SWANEPOEL, Eben	Lanzerac Singel 33, VREDEKLOOF, 7560
2993	VAN DER WALT, Wally	Posbus 26312, STEILTES, 1213
2994	VENTER, Mnr M A	George du Toitstraat 4, UNIVERSITAS, Bloemfontein, 9301
2995	WILLIAMSON, Mnr C G	Posbus 5025, ONVERWACHT, 0557
2996	KASUYI, Mnr M Louis	P O Box 2936, MONTANAPARK, 0159
2997	HEFER, Mnr Ben J	Smooklaan 630, LES MARAIS, Pretoria, 0084
2998	ROOS, A H	Spiesstraat 16, ANNLIN, Pretoria, 0182
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3003	KRUYSHAAR Mnr Harm	Posbus 1399, WAPADRAND, 0050
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3006	LOURENS, Mnr Deon	Posbus 2043, BRITS, 0250
3007	DE BEER, Dr Gerhard C O	Posbus 3356, PIETERSBURG, 0700
3008	VAN DYK, Mnr Ben M	Posbus 2577, HALFWAY HOUSE, 1685
3009	STRYDOM, Mrs E	P O Box 2377, NELSPRUIT, 1200
3010	VAN ZWEEL, Mev Gerd	Suite 390, Privaatsak X15, SOMERSET-WES, 7129
3011	KLEYNHANS, J W	Posbus 11482, ZWARTKOPS, 0051
3012	BOOYSEN, Willem Kasper	Cape Heritage 5, Hazeldanlaan, Heritage Park, SOMERSET-WES, 7130
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3014	HSU, Mr Yung-Chuang	No 200 Shang-shan, TOUWU, Miaoli County, 36244 Taiwan
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3018	ROSCOE, Mike	Cycad Nursery Co, P O Box 91, RIVERVIEW, 3930
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3020	VAN DEN BERGH, M	Landrosstraat 11, RUSTENBURG, 0299
3021	WEYER, Dr J H	Posbus 1050, FAUNAPARK, 0787
3022	HESLOP, John	15 Radar Drive, DURBAN NORTH, 4051
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3028	ROODT, Lizette	Posbus 20513, PROTEAPARK, 0305
3029	WENHOLD, N R	Posbus 3, MOOINOOL, 0325
3030	LUBBINGE, L Paul	Boneschansstraat 21, ELARDUSPARK X1, 0181
3031	SMIT, Willem	Maroelastraat 51, VAL DE GRACE, 0184
3032	PIETERSE, Val	P O Box 1118, STRUBENSVALLEY, 1735
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3034 VAN ZYL, Mr J M
3035 MUNNIK, Mev Jeanetta P
3036 ROETS, Mr F
3037 SCHOEMAN, Mnr L
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Posbus 4182, TIERVALLEIRAND, 0174
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NEW CYCAD PUBLICATIONS

BROOME, T. & SCHUTZMAN, B. 2004. **Hand-pollination of cycads.** *The Cycad Newsletter*. 27(2): 4-7.
[Practical advice is given for the hand-pollination of various cycad genera.]

First author's address: The Cycad Jungle, P.O.Box 325, Polk City, FL 33868, U.S.A.

CALDERÓN-SÁENZ, E. & STEVENSON, D.W. 2003. **Una nueva especie de *Zamia* L. (Zamiaceae) de los Andes de Colombia y clave actualizada par alas especies del género en Colombia.** (= "A new species of *Zamia* L. (Zamiaceae) from the Andes of Colombia and a current key to the species of the genus in Colombia.") *Revista de*

la Academia Colombia de Ciencias Exacates, Físicas y Naturales. 27 (105): 485-490.

[*Zamia oligodonta* sp. nov. from the Andes of Colombia (department of Risaralda), is described and illustrated. This new species can be distinguished from other species in the genus, through the presence, on the leaflets, of a few coarse subapical teeth, along with an acuminate-falcate apex. A morphological comparison with related species in the genus is established and a revised key for the Colombian species of the genus *Zamia* L. is presented.]

First author's address: Instituto de Investigación de Recursos Biológicos Alexander-von-Humboldt, A.A. 8693, Bogota D.C., Colombia.

COSTA, J-L., PAULSRUD, P. & LINDBLAD, P. 1999. **Cyanobiont diversity within coralloid roots of selected cycad species.** *FEMS Microbiology Ecology* 28: 85-91.

[The diversity and host specificity of the cyanobionts of several cycad species (*Cycas circinalis* L., *C. rumphii* Miq., *Encephalartos leboomboensis* I. Verd., *E. villosus* Lem. and *Zamia pumila* L.) collected in a botanical garden were examined using the tRNA^{Leu} (UAA) intron sequence as a genetic marker. Nested PCR was used to specifically amplify the tRNA^{Leu}(UAA) intron directly from the freshly isolated symbiotic cyanobionts. By direct amplification of the biological material the laborious isolation of the cyanobionts can be avoided. A single DNA fragment, ranging in size from 287 bp to 329 bp, was consistently amplified from the different biological samples. The intron sequences obtained from the cycad cyanobionts show high similarities to the corresponding sequences in the free-living strains *Nostoc* sp. strain PCC 73102 and *N. muscorum* as well as in several lichen cyanobionts. Although different *Nostoc* strains were found in the present study, no sequence variation was observed when analysing a single coralloid root. However, different

coralloid roots from a single cycad individual may harbour different cyanobacteria. Moreover, cyanobionts in coralloid roots of both *Encephalartos leboomboensis* and *E. villosus* were found to possess the same intron sequence.]

First author's address: Department of Physiological Botany, Uppsala University, Villavagen 6, S-752 36 Uppsala, Sweden.

EMSHOUSEN, E. & MANNIOIN, C. 2004. **Taming Asian cycad scale (*Aulacaspis yasumatsui*).** *The Cycad Newsletter*. 27(1): 8-10.

[The control of Asian cycad scale (*Aulacaspis yasumatsui*) by means of various insecticides is discussed.]

First author's address: Montgomery Botanical Center, 11901 Old Cutler Road, Miami, FL 33156, U.S.A.

HIRSH, H. & MARIER, T. 2002. **Damage and recovery of *Cycas micronesica* after typhoon Paka.** *Biotropica* 34 (4): 598-602.

[Typhoon Paka passed over Guam on 16 December 1997, and caused extensive damage to the *Cycas micronesica* population. Defoliation reduced subsequent stem extension and leaf size, and increased synchrony of flushes. Decapitated plants developed numerous adventitious buds on damaged stems during recovery. Toppled plants were selectively browsed by feral deer and pigs. Epiphytes increased susceptibility to decapitation or toppling. Growth reduction was minimal and ephemeral, indicating that this species is highly resilient to tropical cyclone damage.]

First author's address: Headquarters U.S. Marine Corps, 2 Navy Annex, Washington, D.C. 20380, U.S.A.

HUANG, S., CHIANG, Y.C., SCHAAL, B.A., CHOU, C.H. & CHIANGS, T.Y. 2001. **Organelle DNA phylogeography of *Cycas taitungensis*, a relict species in Taiwan.** *Molecular Ecology* 10: 2669-2681.

[The phylogeographic pattern of *Cycas taitungensis*, an endemic species with two remaining populations in Taiwan, was investigated based on genetic variability and phylogeny of the atpB-rbcL noncoding spacer of chloroplast DNA (cpDNA) and the ribosomal DNA (rDNA) internal transcribed spacer (ITS) of mitochondrial DNA (mtDNA). High levels of genetic variation at both organelle loci, due to frequent intramolecular recombination, and low levels of genetic differentiation were detected in the relict gymnosperm. The apportionment of genetic variation within and between populations agreed with a migrant-pool model, which describes a migratory pattern with colonists recruited from a random sample of earlier existing populations. Phylogenies obtained from cpDNA and

mtDNA were discordant according to neighbour-joining analyses. In total four chlorotypes (clades I-IV) and five mitotypes (clades A-E) were identified based on minimum spanning networks of each locus. Significant linkage disequilibrium in mitotype-chlorotype associations excluded the possibility of the recurrent homoplasious mutations as the major force causing phylogenetic inconsistency. The most abundant chlorotype I was associated with all mitotypes and the most abundant mitotype C with all chlorotypes; no combination of rare mitotypes with rare chlorotypes were found. According to nested clade analyses, such non-random associations may be ascribed to relative ages among alleles associated with the geological history through which cycads evolved. Nested in networks as interior nodes coupled with wide geographical distribution, the most dominant cytotypes of CI and EI may represent ancestral haplotypes of *C. taitungensis* with a possible long existence prior to the Pleistocene glacial maximum. In contrast, rare chlorotypes and mitotypes with restricted and patchy distribution may have relatively recent origins. Newly evolved genetic elements of mtDNA, with a low frequency, were likely to be associated with the dominant chlorotype, and vice-versa, resulting in the non-random mitotype-chlorotype associations. Paraphyly of CI and EI cytotypes, leading to the low level of genetic differentiation between cycad populations, indicated a short period for isolation, which allowed low possibilities of the attainment of coalescence at polymorphic ancestral alleles.]

First author's address: Department of Biology, National Taiwan Noemal University, Taipei, Taiwan.

IRONMONGER, B., IRONMONGER, S., HAYNES, J., NAZOR, C. FRASIER, R.L. & BROOME, T. Cycad Focus : *Lepidozamia peroffskyana*. *The Cycad Newsletter*. 27(1): 11-13.

[In this composite article Bruce and Suzi Ironmonger discuss the habitat and cultivation of *L. peroffskyana*, Jody Haynes deals with the morphology and phenology whilst Craig Nazor and R.L.Frazier discuss their experiences of growing the species in Texas. Tom Broome relates his experience with the species in Florida.]

First author's address: P.O.Box 754, Bonsall, CA 92003-0754, U.S.A.

KEPPEL, G. 2002. Low genetic variation in a pacific cycad: Conservation concerns for *Cycas seemannii* (Cycadaceae). *Oryx* 36 (1): 41-49.

[The conservation status of *Cycas seemannii*, native to Vanuatu, New Caledonia, Fiji and Tonga, is assessed based on isozyme analysis, abundance estimates and factors affecting the survival of the species. Genetic variation in the species is low and genetic differentiation between populations is high, as compared to plants in general and to other cycads. Lower genetic variation was detected in a fragmented population as compared to less disturbed populations. Low gene flow was also detected, implying little contact between the various populations. A conservative estimate of 17000 individuals remaining in the wild was obtained, with more than half of these located on the islands of Vanuatu. Accounts of past abundance suggest declining population sizes, most likely the result of repeated burning. Other factors that may be contributing to the decline are decreasing importance to and protection by humans, habitat alteration for agricultural and

developmental purposes, and poor dispersal and recolonisation potential. An assessment based on the present estimated abundance and what is known of recent declines in numbers, indicates that the species should be categorised as Vulnerable on the IUCN Red List. On some of the densely populated islands, such as Viti Levu in Fiji and Nukualofa in Tonga, the species is locally Endangered or Critically Endangered. Possible conservation measures are suggested, and it is emphasised that populations on different islands must be considered separately because of their genetic differentiation.]

Autor's address: Department of Biology, School of Pure and Applied Sciences, The University of the South Pacific, P.O.Box 1168, Suva, Fiji Islands.

McDANIEL, I. 2004. The magic of mycorrhizae. *The Cycad Newsletter*. 27(2): 3.

[Plants of several cycad species that were inoculated with mycorrhizae several years ago are compared with their uninoculated counterparts that were initially quite similar to illustrate the beneficial effect of mycorrhizae on cycad growth.]

Author's address: 4034 Crest Heights, Fallbrook, CA 92028-4908, U.S.A.

OW, M.C., GANTAR, M. & ELHAI, J. 1999. Reconstitution of a cycad-cyanobacterial association. *Symbiosis* 27: 125-134.

[*Zamia furfuracea* and its cyanobiont *Nostoc* FUR 94201 were separated and reunited in the laboratory to reconstitute a functional symbiosis between a cycad and cyanobacterium. Reconstitution was achieved also with *Nostoc* 2S9B, a soil cyanobacterium. The identities of the cyanobacteria were confirmed by amplified fragment length polymorphisms, using the highly polymorphic intergenic region separating the 16S RNA and 23S RNA genes. Scanning electron microscopy indicated the presence of mucilaginous material on the surface of roots present when *Nostoc* 94201 was cocultivated with the plant.]

First author's address: Dept. of Biological Sciences, Florida International University, Miami FL 33199, U.S.A.

SCHUTZMAN, B., WHITELOCK, L., McDANIEL, I., SHAYNES, J. & BROOME, T. 2004. Cycad Focus: *Zamia splendens*. *The Cycad Newsletter*. 27(2): 8-12.

[Bart Schutzman relates the history of *Z. splendens* and also provides some taxonomic considerations. This is followed by a description of the species by Loran Whitelock, Irv McDaniels experience of growing *Z. splendens* in California, the phenology of the species by Jody Haynes and Tom Broome's experience of growing the species in Florida.]

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SRIVASTAVA, P.C. & CHAUHAN, D.K. 2004. A strange branching cycad: *Cycas circinalis* var. *swamyii* Pant. *The Cycad Newsletter*. 27(1): 5-7.

[The branching of the stem of *Cycas circinalis* var. *swamyii* Pant is unusual among the *Cycas* species and is the main character that distinguishes it from the other varieties of *Cycas circinalis*.]

First author's address: Department of Botany, Ewing Christian College, University of Allahabad, 211 003, India.

VOVIDES, A.P., PEREZ-FARRERA, M.A., SCHUTZMAN, B., IGLESIAS, C., HERNANDEZ-SANDOVAL, L. & MARTINEZ, M. 2004. A new species of *Ceratozamia* (Zamiaceae) from Tabasco and Chiapas, Mexico. *Botanical Journal of the Linnean Society* 146: 123-128.

[*Ceratozamia becerrae* sp. nov. is described and illustrated. This species from Tabasco and Chiapas has affinity with *C. miqueliana* H. Wendl. from Veracruz and Chiapas, but differs in morphology and habit of leaves, leaflets, male and female strobili and trunk.

Ceratozamia becerrae is considered part of the *C. miqueliana* species complex that includes *C. miqueliana*, *C. euryphyllida* Vazq. Torres, Sabato & Stevenson and *C. zoquorum* Perez-Farrera, Vovides & Iglesias. The geographical range of this species complex is southern Veracruz, Tabasco and northern Chiapas in tropical rain forests.]

First author's address: Jardín Botánico Fco. J. Clavijero, Instituto de Ecología, A.C., Apartado Postal 63, 91000, Veracruz, Mexico.

XIAO, L-Q, GE, X-J, GONG, X, HAO, G. & ZHENG, X-S-X. 2004. ISSR variation in the endemic and endangered plant *Cycas guizhouensis* (Cycadaceae). *Annals of Botany* 94: 133-138

[*Cycas guizhouensis* (Cycadaceae) is a rare and endangered species endemic to the southwest of China. An investigation was undertaken into the genetic variation of wild populations. ISSR markers were used to determine the genetic variation within and between 12 extant populations of this species. Low genetic diversity (at population level, $P = 14.21\%$ HE = 0.0597; at species level, $P = 35.90\%$, HT = 0.1082) and a high degree of differentiation among populations (GST = 0.4321) were detected. This genetic structure is considered to be due to the combined effects of slow biochemical evolution, genetic drift, inbreeding and limited gene flow between populations. Based on these findings, strategies are proposed for the genetic conservation and management of the species.]

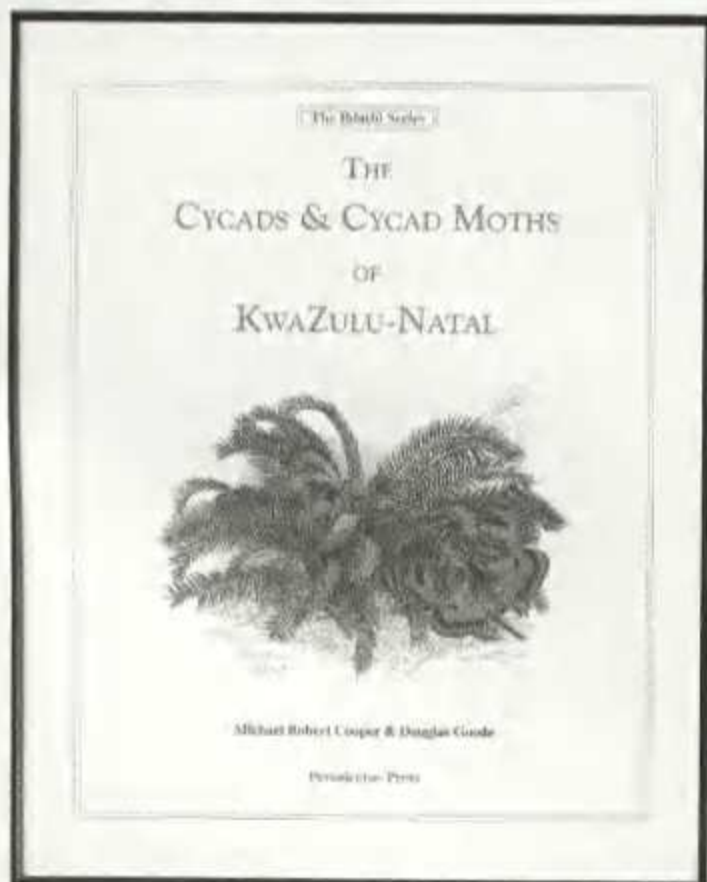
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BOOK REVIEW / BOEKBESPREKING

COOPER, MICHAEL ROBERT; & GOODE, DOUGLAS. *THE CYCADS AND CYCAD MOTHS OF KWAZULU-NATAL*.

NEW GERMANY: Peroniceras Press, 7 Ridge Road, 3610 New Germany. xxii + 98 pages, colour plates from watercolour paintings, maps. Price uncertain: the Botanical Society Bookshop at Kirstenbosch sells it for R450, but agents in Gauteng had copies for R300.



I have always welcomed new books in these pages, perhaps because there were no books when I first became interested in cycads. This latest offering is co-authored by long-time Society member Douglas Goode

well known for his previous books *Cycads of Africa* (1989); *The cycad collection volume 1. Natal Province* (1996); and *Cycads of Africa*, vol. 1 (2002, reviewed in *ENCEPHALARTOS* 69: 35–36, March 2002). However, this time he is neither first author nor, apparently, illustrator, that position being taken by Cooper, "Emeritus Professor of Geology at the University of KwaZulu-Natal and author of numerous scientific publications, particularly in the fields of palaeontology and evolutionary biology". He is not a member of this Society.

KwaZulu-Natal is not a discrete phytogeographical entity, in fact it is phytogeographically very diverse; but its inhabitants have always had a strong sense of provincial identity which is reflected in a number of natural history books covering the region. This is another one.

This book deals with both cycads and with cycad-associated moths of the family Geometridae. Yet this is no comprehensive treatise on cycad-associated insects or even moths. The all-important weevils, several of which are implicated in pollination, are only mentioned in passing, and on page 15 there is a drawing of the larva of *Bunaea alcinoe* which is said to be restricted to east Africa and thus has no bearing on the subject of this book. Apart from a brief mention in the introduction, the moths are treated separately on pages 76–93, some 9 species in all. This section is reviewed further below.

The book commences with a *preface*, reminding the reader about the antiquity and present-day peril of wild cycads. There is a short *explanation of this book*, which explains how to interpret the symbols in the treatments of species. There is a strongly worded section on *the evolution and classification of African cycads*

(about which more below) followed by *description of new genera and species*. These take into account the whole of the former *Encephalartos*, not only the KwaZulu-Natal species. Collectors will be delighted by the five new species to be collected. Of the xvii + 75 pages devoted to the cycads, the first 27 comprise an introduction, dealing with *roots, stem, leaves, cones and seeds, pollination, reproduction, differences between sexes, seed dispersal, variation, hybrids, and age (longevity?)*, in general. There is a quite extensive treatment of the main vegetation types and climatic conditions in which cycads occur, but that has little bearing because cycads tend to grow in local mini-habitats quite atypical of the broad vegetation types in which they may be.

Some 19 species of cycads are treated. For each species there is a full-page watercolour painting of a whole plant with leaf detail. The cones are not illustrated on the plates, but those of some species are scattered through the introduction (pages xv—25), unfortunately without reference in either the main text or index. The treatment of species is somewhat unorthodox, appearing under the headings *size, habitat, cone, habit, general identification, and conservation* (in that order). The page is headed, not by the scientific name but by a vernacular name, which would be unfamiliar to most readers. For each species there is also a distribution map (covering KwaZulu-Natal only) plus a diagram showing the time of pollen- and seed release. Lastly, for each species vernacular names are provided in English, Afrikaans, German, French, Portuguese, Spanish, and Italian; but not in Zulu. *Encephalartos aplanatus* is claimed to occur in KwaZulu-Natal and included. *Xanthostrobus lebomboensis* (*Encephalartos lebomboensis*) is included even though it is not known from KwaZulu-Natal. *Encephalartos caffer*, which occurs in the far south of the area covered, is not included.

The section on cycads is followed by one on the moths. The format is much the same as for the cycads, and the text for each species is under the headings *eggs, larvae, pupa, larval foodplant, habitat, habits, identification, and conservation*, in this order for reasons understood by the authors only. Again vernacular names in 7 languages are supplied. For every species there is a colour plate, which in some cases depict all the stages but in other cases only the adults.

There is a bibliography, not at the end but on page 27. At the end of the book there are no less than 8 separate indices, to scientific, English, Afrikaans, German, French, Spanish, Portuguese, and Italian names of both cycads and moths.

There is no glossary to explain how to distinguish *pinnacanth* and *spine*.

There is a list of subscribers on page vi, including local as well as overseas supporters. Apparently the prospectus was circulated rather selectively, certainly not to our members in general, and I for one have been completely unaware of the compilation of the book.

Goode is a professional artist and synonymous with paintings of cycads. Remarkably most if not all the paintings in this book are not by Goode (whose

contribution is not clear), but by Cooper. They are really very good, but they do not include the all-important cones. They are therefore more decorative than informative. There are four different plates for *Xanthostrobus natalensis* (*Encephalartos natalensis*), each headed by a different fanciful vernacular name and each with its own set of vernacular names in 7 languages. I presume this is to show variation, but the variation in the leaflets could have been shown in a single plate.

The duty of a reviewer is to provide prospective buyers and users of a book with guidelines as to whether they can expect to find the work useful or otherwise. In this case we are confronted with, firstly, a splitting of the genus *Encephalartos* into 11 genera, and secondly five new species.

The authors claim (page ix) that the current classification of *Encephalartos* is not phylogenetic, *i.e.* does not reflect evolutionary relationships. That is quite true, not only for the cycads but for most of our plants. We can group species together on their similarities, but we are aware of the pitfalls and we don't really know how the evolutionary processes took place. Only two modern classifications, if they can be called that, exist: firstly that by Dyer in *Bothalia* 8: 405—515 (1965) which has been followed by subsequent writers of "popular" books without understanding the issue, and secondly that by Vorster in Walters & Osborne's *Cycad classification concepts* pages 69—83 (2004) in which available information but especially spatial information was incorporated. We hope that molecular data will cast more light on this scheme in the not too distant future, but we are not yet there. To rectify this deficiency, Cooper & Goode split *Encephalartos* up into 11 different genera which they suggest are natural groupings and sufficiently distinct. These are enumerated and discussed below.

To justify this act, they claim (page xi) that the Linnean system of classification is flawed because it only shows basal branching, while Darwin's method (which they claim to apply, whatever that may mean) is phylogenetic and shows all the fine branching. They also claim that Linnaeus worked on similarities and Darwin on differences. This is plain nonsense. Taxonomy is about similarities which is why we place all the African cycads (apart from *Stangeria*) together in the genus *Encephalartos*, rather than place every species in a separate genus. Furthermore, the Linnean system of classification has been universally obsolete for a very long time. We don't use any Linnean classification system, but we do use the Linnean system of nomenclature. Darwin has never proposed any classification system. Cooper and Goode dogmatically state (page xi) that the "Toothed cone scales" of the genus *Encephalartos* in the sense of Cooper & Goode is of evolutionary significance, but provide no evidence.

The first question to ask, is whether the authors were successful and persuasive. They grouped species together within new groups, but completely neglected to motivate their groupings. They provided no clue to the perceived evolutionary relationships within or between the genera, and therefore failed in their proclaimed intention.

The second question is whether the subdivision of *Encephalartos* is justified. It is often said that delimitation of genera and species is an arbitrary matter, subject to the personal opinion of the taxonomist involved. It is certainly not so simple, but there is some truth in this perception, within limits. The real question is to what extent the new genera are defined, and whether they demonstrably differ significantly enough to warrant separate taxonomic status. For each of the genera which they recognise, a description is provided but no indication of how it differs from others, and neither is there a key. This makes it quite impossible to understand how they distinguish these genera from each other. For instance, *Encephalartos longifolius*, *E. arenarius*, and *E. latifrons* are grouped together in the genus *Rugostrobus*, whereas *E. princeps*, *E. lehmannii*, *E. trispinosus*, and *E. horridus* are placed in the genus *Acanthozamia*; but it is totally unclear on which grounds they distinguish these groups as separate genera from *Encephalartos*, not to say from each other. Earlier on they make an issue of shared and derived characteristics, and in the first two genera treated (*Encephalartos*, *Dracostrobus*) several characteristics are thus indicated without any reason why, for instance, "woody [sic] to lightly woolly bracts" should be primitive and "dense golden brown tomentum" be derived.

The genus *Encephalartos* in the sense of these authors contain only *E. villosus*, *E. aplanatus*, *E. cerinus*, *E. ngoyanus*, *E. caffer*, and *E. umbeluziensis*.

Their genus *Dracostrobus* contain *D. brevifoliolatus*, *D. cycadifolius*, *D. friderici-guilielmi*, *D. ghellinckii*, their new *D. mkomaasiana*, *D. humilis*, *D. lanatus*, *D. laevifolius*, and their new *D. dedekindii*.

E. ferox is placed in a genus called *Pyrrostrobus*. It does seem as if *E. ferox* does not have close relatives, yet they undermine their argument by stating that it is close to *E. arenarius*, for which there is no evidence at all.

The genus *Xanthostrobus* contains *X. natalensis* as well as *X. altensteinii*, *X. aemulans*, *X. msinganus*, *X. woodii*, *X. lebomboensis*, *X. senticosus*, plus three new species viz. *X. currachii*, *X. pietretiefii*, and *X. mgeniensis*. Inexplicably *E. transvenosus* is excluded, yet it is morphologically so similar to *E. natalensis*.

The genus *Inezamia* contains *I. paucidentatus*, *I. heenanii* and *I. relictus*, but also *I. transvenosus* (*Encephalartos transvenosus*) which should be grouped with *E. natalensis*.

The genus *Glaucostrobus* contains *G. eugene-maraisii* as well as *G. middelburgensis*, *G. dolomiticus*, *G. dyerianus*, *G. hirsutus*, *G. nubimontanus*, and *G. cupidus*. None of the evidence provided distinguishes it from their *Acanthozamia* (q.v.). They make the extraordinary but unmotivated statement that "its affinities seem to lie with *Dracostrobus*".

Dyerstrobus inopinus is the sole species in the genus. Again it is suggested, without any evidence, that it is most closely related to *Dracostrobus*.

The genus *Viridestrobus* contains *V. manikensis*, *V. pterogonus*, *V. concinnus*, *V. chimanimaniensis*, and *V. munchii*.

All the other tropical African species with well-emergent trunks are grouped together in the genus *Tanzamia*, while *Congostrobus* includes *C. poggei*, *C. delucanus*, *C. schaijesii*, *C. marunguensis*, *C. schmitzii*, and (surprisingly) *C. barteri*.

Should the reader use these generic names? At least some of them do reflect natural groupings according to our latest information, but in my opinion the differences are far too small to justify the recognition of separate genera. Acceptance of these genera are likely to make it very difficult to decide in which genus an unknown plant should be placed. Moreover, these names are not valid according to the International Code of Botanical Nomenclature. The authors didn't do their homework.

At the CYCAD 2005 conference in Mexico I will discuss the evidence supporting this grouping of species, and the merits of the generic proliferation.

The five new species, which are described, are probably of more interest to our readers, especially to collectors yearning for names for all their plants.

Firstly, *Dracostrobus dedekindii* is the name given to a single plant from near Tugela Ferry, hitherto assigned to *Encephalartos laevifolius*. Plants from the Port Edward area, some years ago removed by the then Natal Parks Board amid much publicity and now practically extinct, are also included here. I have previously examined material of both, and concluded that both should be referred to *E. laevifolius*. It is very regrettable that no plant from either locality is in any public collection, because phytogeographically these outlying populations are interesting, and molecular studies of these could probably tell us a lot about the past history of this species.

Also in *Dracostrobus*, *D. mkomaasiana* is based on what was hitherto known as the coastal form of *Encephalartos ghellinckii*. If one looks only at the two extreme forms, the foliage is recognizably different, though the cones are practically identical in spite of what the authors claim. However, the matter is not so simple because of geographically and morphologically intermediate populations. Their respective maps of the distribution of *Dracostrobus ghellinckii* and *D. mkomaasiana* show a very small break between the distributions of the two, but the map on page 5 of Scott-Shaw's *Rare and threatened plants of KwaZulu-Natal* (1999) shows the distribution to be continuous. I consider all the plants to be part of a continuous variation and distribution, and there is insufficient evidence for the recognition of taxonomically distinct entities at any rank.

Xanthostrobus currachii is based on plants from the Ubombo Mountains. Furthermore, the Pongola valley plants hitherto placed in *Encephalartos lebomboensis* are described as yet another new species, *Xanthostrobus pietretiefii*. I cannot distinguish these two from *Encephalartos lebomboensis* or from each other by means of either the diagnoses or the illustrations, and consider the supposed distinctions to be spurious.

Lastly, the fifth species, *Xanthostrobus mgeniensis*, is a rather interesting thing. Plants have been traded under the name *Encephalartos umgeniensis*, and this is apparently

what we have here. The problem is that the origin of the plants is unknown, all being in cultivation. Furthermore, all are males, and one can but wonder whether they aren't all suckers of the same plant. The cones are indistinguishable from those of *Encephalartos natalensis*, but the leaflets have an arresting appearance: they are broad, quite blunt at both ends, heavily toothed, and the surfaces are wavy rather than flat. They are not unlike those of the so-called Highflats population of *Encephalartos natalensis* depicted in Goode's *Cycads of Africa volume 1*: 128 (2001) and which is not mentioned in this book. What is to me really interesting, is that the leaflets of this *X. mgeniensis* are so very similar to at least the subadult leaflets of the so-called "false *Encephalartos woodii*", likewise known only in cultivation and only from male plants. I am curious as to why the latter is not mentioned at all. While very interesting, I am not convinced that it is prudent to describe a new species from material known only from cultivation. I also feel that much more work should be done before it can definitely be recognised as a separate species. One only has to look at the bewildering range of leaflets shapes and leaflet orientations in the widespread *Encephalartos natalensis* depicted in Grobbelaar's *Broodbome* pages 250 to 257 and including material from Highflats and of *X. mgeniensis* (as "Umgeniensis"), but especially his figure 6.29.2, to realise that it is irrational to single out this *X. mgeniensis* as specifically distinct. There is a map showing nothing, because the natural origin of the plants is unknown, though they are suspected of coming from the Mgeni River.

Regrettably these specific names are also invalid, and as detailed below, some of the epithets are grammatically incorrect.

We therefore have a set of fine decorative illustrations which in the case of many species don't show the reproductive structures. We also have new generic and specific names which are not only technically invalid or incorrect from a nomenclatural point of view, but are also based on characteristics which make it impossible to reliably key out the species. Lastly the presentation is of a poor standard:

The *table of contents* is not representative of the text. For instance, it refers to *the evolution and classification of African cycads*, but does not indicate where new species are described. It refers to, amongst others, *Genus Dracostrobis gen nov.*, but the generic description is not on the indicated page 32.

In the bibliography many titles have no bearing on the KwaZulu-Natal species, especially as there are no literature references in the text. Some very obscure titles are included, while extremely important ones such as Chamberlain (*The Living Cycads*, 1919), Norstog & Nicholls (*The Biology of the Cycads*, 1997), and Whitelock (*The Cycads*, 2002) are ignored. Hutchinson (1945) does not exist, and the reference to Vorster (2003) on page xi probably refers to Walters & Osborne (2004, not 2003). Phiney should read Pinhey. Read & Stolt should be Read & Solt. The reference to Stapf & Burtt Davy should read *A manual of the flowering plants and ferns of the Transvaal with Swaziland, South Africa*.

Claasen should be Claassen. *Excelsia* should read *Excelsa*. Grobbelaar is consistently misspelt, also in the main text.

The date of publication is given as 2004. Because of the principle of priority, one of the six pillars of the *International Code of Botanical Nomenclature*, it is customary to indicate the date of publication to the day in works in which new taxa are published. The new genera lack a Latin description and are therefore invalid. This means that the new new species in these genera are also invalid, and the new combinations are invalid because they lack references to the basionyms. In the case of species it is not stated in which herbarium the type is lodged.

Throughout the book species are glibly referred to as e.g., *woodii*. That is incorrect: the name of a species consists of a combination of the correct genus name with the oldest available epithet, and should always be used thus. It is also wrong to refer to a name as a *sp. nov.* [new species] in any place other than where it is originally described. It is incorrect to cite authors of names in recombinations as, for example (Bertoloni) [page 72]. The name of the author who first published the epithet should be between brackets, followed by the author who published the recombination, thus (Bertoloni f.) Cooper & Goode.

On page 8 it is stated that species of "toktokkies" [Tenebrionidae] are amongst the pollinators. That is news to me. It is also claimed that the weevil *Metacucujus goodii* is a pollinator of *Xanthostrobis natalensis* (i.e. *Encephalartos natalensis*) but I am not aware of any published proof of this assumption. On page 10 it is claimed that the sclerotesta of the seed is poisonous – I presume they mean sarcotesta. *Stroboli* on page xii should read *strobili*. *Pinnules* on page xx and elsewhere should be *pinnae* – there are no pinnules in African cycads.

It is stated (page 10) that *Cycas thouarsii* is 140 million years old: I would like to know on what evidence this is based, as molecular research on three continents showed that that all living cycad species which were examined are less than one million years old.

The *International Code of Botanical Nomenclature* allows names of genera and species and genera to be taken from any source whatsoever, or even to be made up arbitrarily. As such the names used in this book are not wrong, but rather quaint. Several of the new generic names in this book ends in –*strobis*, which has no significance – *strobis* means something which rotates. Do they perhaps mean –*strobilus*, pertaining to cones? As such *Xanthostrobis* would mean "yellow cone", but *Congostrobis* would mean "cone from the Congo" which is a bit silly. *Dyerstrobis* and *Viridestrobis* are grammatically wrong. Some of the specific epithets are also strange: *pietretiefii* (page xviii) means "of [the man] Piet Retief". Now why would they be so politically incorrect to name a plant after a Voortrekker leader eliminated by Dingaan 170 years ago and who, moreover and contrary to Recommendation 20A.1.h of the *Code* (which also applies to specific epithets), had no connection with botany? *Dracostrobis mkomaasiana* should be *D. mkomaasianus*.

Vernacular names are those used by people who utilise plants. In practice useful or damaging plants have

vernacular names, but those not used for any purpose don't have vernacular names. There has been a deplorable move by some botanists to invent vernacular names for plants, apparently in an attempt to gain public popularity. This cannot be condemned too strongly: firstly, such invented vernacular names make it impossible to distinguish the genuine vernacular names, and secondly such invented vernacular names are unlikely to be adopted by real enthusiasts – I have never met a cycad enthusiast who couldn't memorise and use names such as *Encephalartos friderici-guilielmi* or *Lepidozamia peroffskyana*. In this book the authors go overboard: not only are vernacular names invented for every species, but these are in English, Afrikaans, German, French, Portuguese, Spanish, and Italian – all spurious -, but there are no vernacular name in any Bantu language. These queer names head the treatment of individual species, and the scientific names are in the smallest type on each page. No synonyms, *i.e.* equivalents in *Encephalartos*, are given.

I am not against the inclusion of the cycad moths, however unwelcome these pests may be in the garden. These include one attempted new species, again invalid. The very brief text neatly summarises the information and the plates are a delight. I remind the reader of the excellent, if brief, chapter *African cycads and cycad moths*

by Staude on pages 307–311 of Goode's *Cycads of Africa, volume I*. Again every species has a string of spurious vernacular names in every conceivable language.

In conclusion, this book is an irresponsible, incompetent, and negligent attempt to upset current nomenclature and taxonomy, and adds unnecessarily to the synonymy. It looks like a deliberate attempt to commit damage, and I cannot accept either the attempt at classification or the nomenclature. This is an example of where people, however impressive their qualifications outside the field of plant taxonomy may be, try to emulate the deceptively simple-looking results of plant taxonomy without understanding the philosophy behind it.

The *International Code of Botanical Nomenclature* (Articles 32.8 and 32.9) makes provision for a list of *suppressed works*, publications which are to be ignored. This book comes close to being a candidate for inclusion in that list.

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CYCAD 2005 - SEVENTH INTERNATIONAL CONFERENCE ON CYCAD BIOLOGY - FINAL ANNOUNCEMENT

Readers of this issue of *ENCEPHALARTOS* may just have time to pack their bags and jump on a plane to Mexico, to join our other representatives at CYCAD 2005.

This, the Seventh International Cycad Conference, has been three years in the planning and promises to be the leading scientific meeting so far. Over the period 9-14 January, a total of some 60 oral and 20 poster presentations on cycad matters will be given at the Institute of Ecology at Veracruz.

Keynote addresses are those by Andrew Vovides (Cycads of Mexico), Dennis Stevenson (Cycads - Then, Now and Forever) and Paul Cox (Biomagnification of Cycad Toxins). South Africans presenting material at the meeting include Chris Dalzell, Diekie de Klerk, John Donaldson and Piet Vorster.

Apart from the scientific presentations, a series of working group sessions will address diverse matters of concern to our members. We anticipate that the various events will generate a fair amount of good reading - and some great photos - for the next few issues of *Encephalartos*.

Registrations can still be accepted for attendance at CYCAD 2005 but may incur a late-registration penalty.

Enquiries by e-mail to: vovides@ecologia.edu.mx

Roy Osborne
Conference Co-ordinator, Cycad Specialist Group

FOCUS ON ...

In this 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 die 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:

Cycas pranburiensis

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DISCOVERY

During the last decade much fieldwork and taxonomic study have been conducted in Southeast Asia on the genus *Cycas* (e.g. Hill and Yang 1999, Hill et al. 2004, Tang et al. 1997, 1999, Wang 1996). Many new species have been identified. Among the most distinctive is a dwarf coastal species found growing on cliffs at only a single locality in Thailand. This species was first collected as a herbarium specimen in 1926 by the British botanist Arthur F.G. Kerr. In 1971 Smitinand evaluated this specimen as part of his review of the Cycadaceae of Thailand, placing it under the catchall name *Cycas circinalis*, a name which is now restricted to plants occurring naturally only in mainland India (see Hill 1995). In expeditions sponsored by Nong Nooch Tropical Garden in 1996, this cycad was examined in greater detail in the field and was recognized as a new distinct species and was described by an international team in 1999: Si-Lin Yang and William Tang representing Fairchild Tropical Garden, Ken Hill of the Royal Botanic Gardens, Sydney, Australia, and Poonsak Vatcharakorn, working at Nong Nooch Tropical Garden. Its specific epithet *pranburiensis* refers to the locality where it occurs in Pranburi, Prachuap Khiri Khan province.

DESCRIPTION

The description below is based on the original description by Yang et al. (1999) and supplemented with information from Tang et al. (1997) and "The Cycad Pages" (Hill and Stevenson).

1. STEM

The stem of *Cycas pranburiensis* forms an aerial trunk up to 3 m long, with a diameter 20 cm at the base and 8-10 cm towards the apex. Leaf bases are persistent near the apex, but the trunk texture becomes smooth with age (Front page, Fig. 1-2, Colour Fig. 1). Due to its cliff dwelling habit, the trunk often leans and branching occurs frequently.

2. LEAVES

Leaves number 10-25 in a crown; are relatively short 0.45-1.2 m long, and slightly keeled with opposing



Figure 1: A large branched *Cycas pranburiensis* with *Euphorbia* growing nearby.

leaflets forming an angle of 120-140°; the rachis is frequently terminated by a spine 1-3 mm long; the petiole is 8-30 cm long (10-30% of total leaf length), mostly unarmed with 0-1 (but occasionally up to 7) pairs of spines below the lowest leaflet (see Colour Fig. 1, Fig. 3-4); leaflets number 15-53 pairs bright green and glossy above, pale green below

(see Colour Fig. 2), tips sharp basal leaflets do not gradually reduce to spines; median leaflets are leathery in texture, 12-24 cm long x 8.5-16 mm wide, narrowed to 2-4 mm at base (to 15-25% of maximum width), spaced 10-20 mm apart on the rachis, margins flat, midribs raised above and below (Colour Fig. 2).

Cataphylls (scale leaves) are narrowly triangular, soft, 2.5-8 cm long, 0.9-1.2 cm wide at the base, covered with grey to yellowish brown hair.



Figure 2: An old plant of *C. pranburiensis* dangling from its limestone perch.



Figure 3: Emerging leaves of *C. pranburiensis* in cultivation.

3. REPRODUCTIVE STRUCTURES

Female sporophylls are relatively long and thin, with a narrow terminal blade, overall appearance is similar to that of a miniature *C. rumphii* female sporophyll (see Colour Fig. 3); 10-24 cm long, covered with grey to yellow hair; with 2-4 ovules, terminal blade lance shaped, 22-90 mm long x 12-27 mm wide, tipped with a spine 22-40 mm long, edges on either side flanked on upper half with 12-24 smaller spines; seeds flattened ovoid 25-45 x 21-32 mm, fleshy coat initially green becoming orange when mature, not hairy, fibrous layer present, stony coat underneath fleshy layer is not strongly crested at its apex and there is no spongy layer underneath as in *C. rumphii* and its relatives (therefore the seed does not float in water and is presumably not sea dispersed as in *C. rumphii*).

The male cone is ovoid in shape, orange, 9-28 cm long x 5-10 cm diameter; flattened ends of cone scales 12-18 mm wide, with a fertile zone (e.g. with pollen sacs) 13-24 mm long, sterile zone 15-25 long terminating in a spine 10-45 mm long that is broad at the base and bends upward in the direction of the apex of the cone (see Colour Fig. 4-6).

DISTRIBUTION AND HABITAT

Cycas pranburiensis is restricted to a range of limestone hills on the eastern side of upper peninsular Thailand. This area is near the town of Pranburi and is known as Sam Roi Yot, which means "300 hills" in the Thai language. Plants grow on steep limestone slopes and cliffs, with little or no soil, at elevations of 5-30 m above brackish estuaries which were originally covered with mangrove vegetation. On these hills they are usually surrounded by low scrub vegetation adapted to drought and includes species of *Ficus*, *Euphorbia*, and *Dracaena* (see Front page, Fig. 1-2). Plants grow in full sun or partial shade. The climate is tropical and monsoonal with distinct wet and dry seasons. The rock on which these plants grow is a hard metamorphic limestone. This cycad has a scattered distribution on these hills, growing on some but absent on others. Hill formations in this habitat appear to consist of two different kinds of limestone and plants appear to be scarce or absent on the hills with more reddish colored rock, suggesting that this species has specific substrate preferences.

AFFINITIES AND DIAGNOSTIC FEATURES

Although the pollen and seed cones of *Cycas pranburiensis* are similar to that of the true *C. circinalis* from India, it is more closely allied to the *C. pectinata* group. Within the *C. pectinata* group, *Cycas pranburiensis* is a fairly distinct species and has only one close relative, *C. lindstromii*, a species found in southern Vietnam (see Focus On in *Encephalartos* 76 by Tang). Both are dwarf species. Their leaves are similar in size and overall texture and appearance, but can be readily distinguished by the more numerous spines on the petioles of *C. lindstromii*. They both live in drought-prone coastal habitats, but *C. pranburiensis* is adapted to limestone cliffs, whereas *C. lindstromii* is a subterranean-stemmed species growing in deep silica sand. Their female reproductive organs are quite different; the terminal blades of *C. lindstromii* are much wider and deeply incised. The spines on their male cones differ; they are broader in *C. pranburiensis* and elongate throughout the cone, while in *C. lindstromii* they are narrower and are elongate on the

upper half of the cone and relatively short on the lower half. These two species are separated by 700 kilometers, with no close relatives occurring in the area between them. One interpretation of this distribution pattern may be that they are relicts of a once more widely distributed group of *Cycas* species and that intermediate forms in the area between them have died out. Analysis of continental drift in Southeast Asia (see accompanying article in this issue), however, indicates that peninsular Thailand was once connected to south Vietnam 35 million years ago and that the area that these two species presently inhabit was once adjacent. The collision of India into Asia caused the southeast Asian continental block, which includes Vietnam, Laos, Cambodia and upper Thailand to shift east, while causing peninsular Thailand and Malaysia to swing clockwise westward, separating these two land areas and forming the Gulf of Thailand, which now constitutes a ocean barrier between what were once neighboring species. This tectonic event allows us to place a time of 35 million years ago for when these two species were last likely to have been interbreeding as one population, and it is interesting for us to compare the amount of evolutionary change that has occurred since.

Within Thailand, the short leaves with short, nearly spine-free petioles, and the stout spines on the males cones of *C. pranburiensis* will serve to distinguish it from all other species in the genus.



Figure 4: Leaves from two plants of *C. pranburiensis*, left – upper surface, right – lower surface.

INSECT VISITORS TO CONES

Two types of beetles have been found to be associated in large numbers with the male cone of *Cycas pranburiensis* (Tang et al. 1999, Yang et al. 1999). One is an undescribed species tentatively placed in the genus *Pharaxonotha*, a genus of beetles associated with cones of *Zamia* and *Ceratozamia* in North America. This beetle was formerly assigned to the family Languriidae, however, this family has been sunk into the Erotylidae (Leschen 2003). The other beetle found in *C. pranburiensis* male cones is a weevil currently placed in the genus *Tychiodes*. Species related to these two beetles occur on *Cycas* cones throughout Thailand and Vietnam (Tang et al. 1999) and they are believed to be involved in the pollination of *Cycas*.

CULTIVATION

Cycas pranburiensis is moderate in its growth rate. It is a tropical species and will respond to regular watering and fertilizing throughout the year, if warm conditions are maintained, by flushing leaves twice a year. Its cliff habitat indicates that once its roots are established it should be tolerant of drought and heat. As in most cliff-dwelling species, it likes excellent drainage. Although native to metamorphic limestone hills, it does not like soil with oolitic limestone (commonly found in Miami, Florida) and will tend to exhibit nutrient deficiencies in its leaves when grown in such alkaline soils. In these conditions, it responds best to application of acidic fertilizers. It is one of the few dwarf species of the genus *Cycas* and is suitable for small yards and greenhouses where space is at a premium.

The *Cycas* scale, *Aulacaspis yasumatsui*, is native to Thailand and is a natural pest of *C. pranburiensis*. This cycad shows moderate to strong resistance to this pest but may be subject to heavy infestations if predators of the *Cycas* scale are not present.

I first saw this species in 1993 in the garden of Ian Turner in Zimbabwe, at which time I coined the name *Cycas "microrumphii"*, because of its resemblance to a miniature *C. rumphii*. This is not a valid scientific name, although seeds produced from Ian Turner's plants have been distributed with this name.

CONSERVATION STATUS

Much of the habitat where *Cycas pranburiensis* occurs is a national park, Khao Sam Roi Yot, and plants number in the thousands. Plants of this species are collected by locals for the ornamental plant trade and many severed trunks were viewed on my visit to the wild population. Under the current IUCN system for classifying endangered status, it is ranked as "Lower risk, near threatened". As with many cycads, the inclusion of a species within a national park or other kinds of protected zones, does not guarantee its safety from plant collectors. This species, because of its small size, ornamental qualities, and relatively low number of spines, may be an ideal candidate for a village nursery project (see Stalmans 1995, Vovides et al. 2002, van der Walt and van der Walt 2003, Tang et al., in press), where sales of propagated plants can fund local education and conservation.



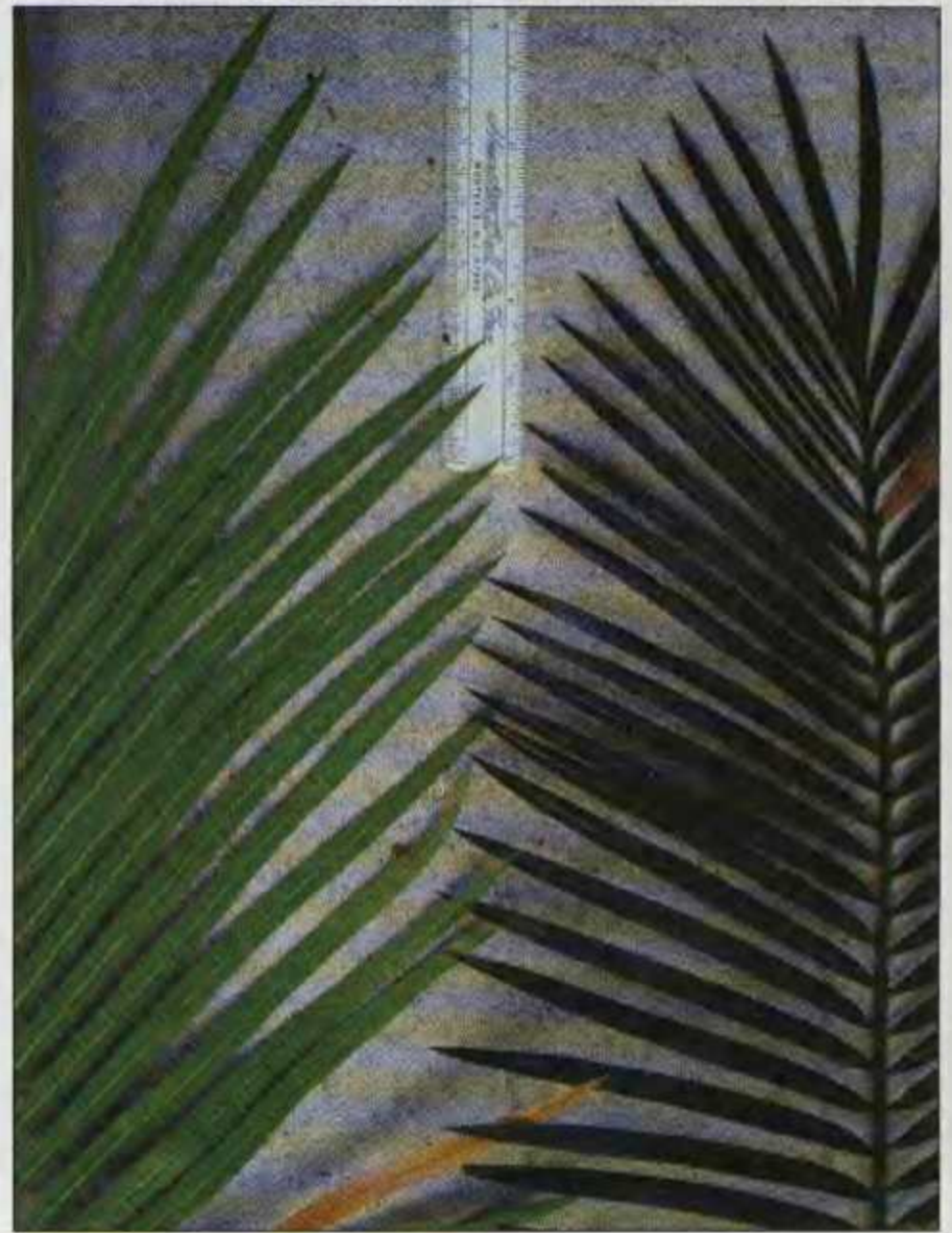
Colour Figure 1: Stem of a young *C. pranburiensis* in cultivation, note the small suckers and relatively unarmed petioles. [Photo by William Tang]



Colour Figure 3: Old female sporophylls of *Cycas pranburiensis* in habitat; note the loose configuration of sporophylls. Fertile seeds are absent in this specimen. [Photo by William Tang]



Colour Figure 4: A young male cone of *Cycas pranburiensis* growing at Nong Nooch Tropical Garden, note the stout spines even at this early stage of development. [Photo by William Tang]



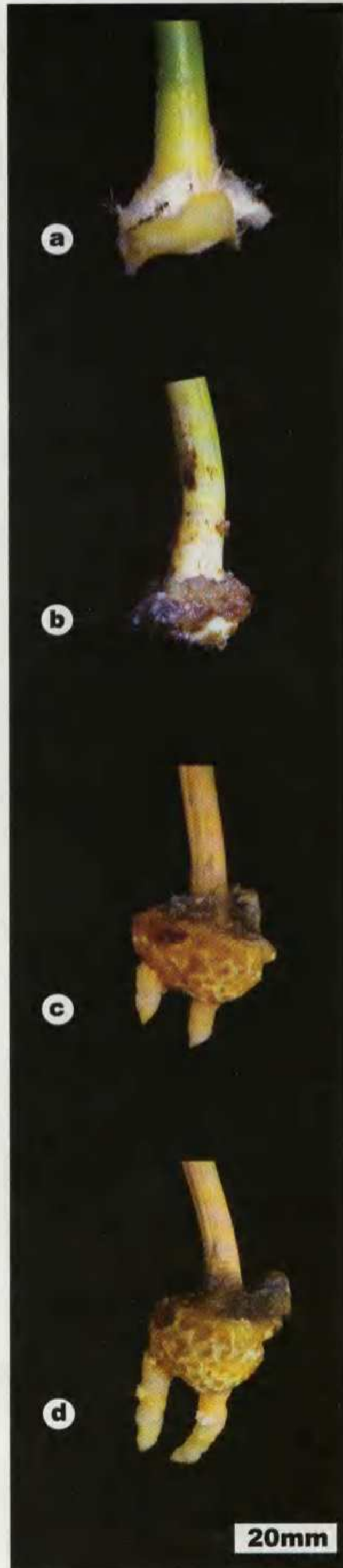
Colour Figure 2: Close-up of leaves of *C. pranburiensis*. Note the colour difference between the upper (right) and lower (left) surfaces. [Photo by William Tang]



Colour Figure 5: A spent male cone at Nong Nooch Tropical Garden. Note the petioles of this specimen have unusually high numbers of spines. [Photo by William Tang]



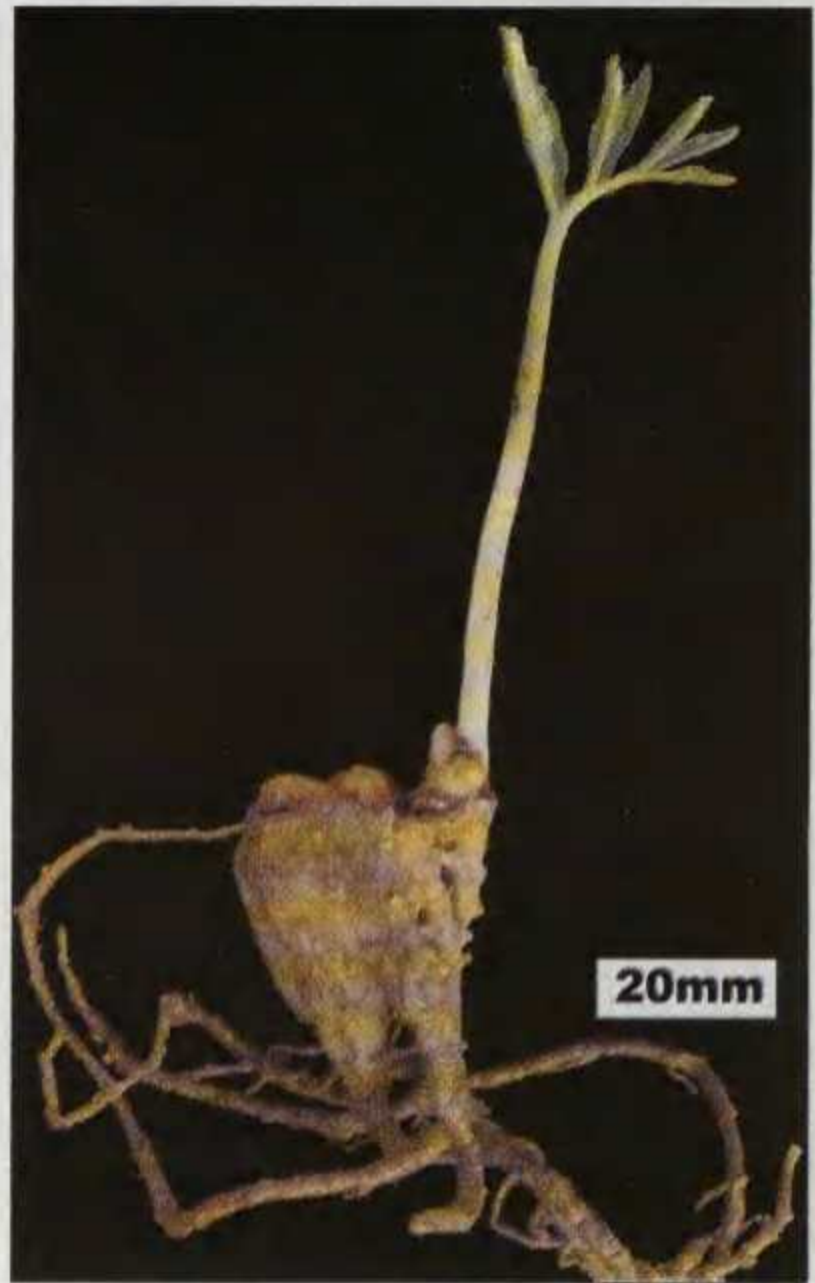
Colour Figure 6: A male cone of *Cycas pranburiensis* in habitat just prior to pollen shedding. [Photo by William Tang]



Colour Figure 7. : (a) Leaf-stem base after removal from a lignotuber; (b) callus formation at 10 weeks; (c) root differentiation at 12 weeks; (d) further root development at 14 weeks. [Photo by Errol Douwes]



Colour Figure 8: Leaf-stem cutting showing trimmed pinnae and advanced root development at 18 months. [Photo by Errol Douwes]



Colour Figure 9: New shoot developing from rootstock at 26 months. [Photo by Errol Douwes]



Colour Figure 10: *Stangeria eriopus* growing in the Durban Botanic Gardens. [Photo by Errol Douwes]



Colour Figure 11: Cycads spilling out onto the lawn as part of Plantique's cycad display at "Sydney in Bloom". The crowds were so big for most of the time that you couldn't see the plants for the people. [Photo by Craig Thomson]



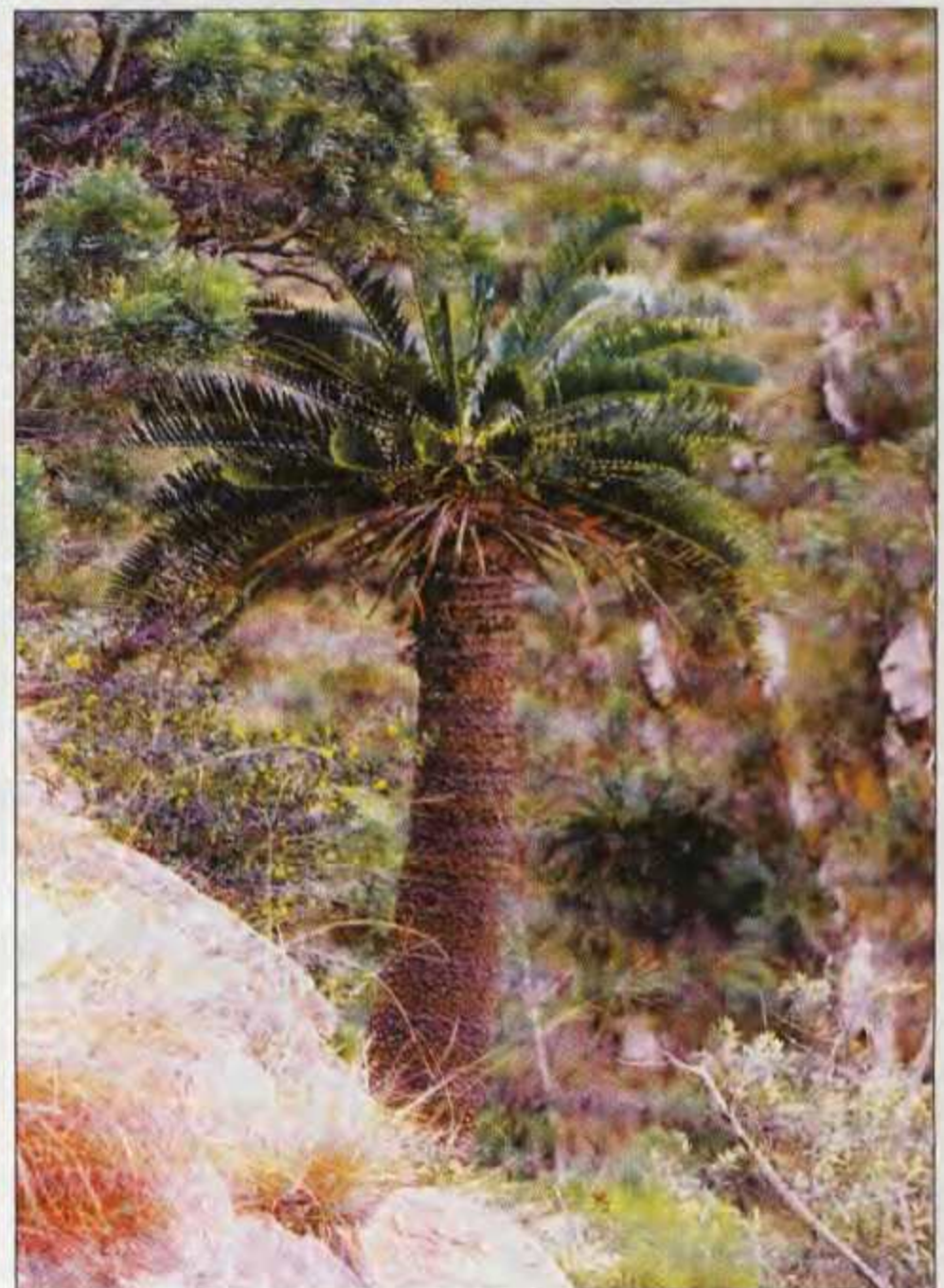
Colour Figure 12: Part of Plantique's display of cycads in the "Sydney in Bloom – Festival of Gardens" showing a variety of foliage textures and colours from various cycads from around the world. [Photo by Craig Thompson]



Colour Figure 13: A large *Bowenia spectabilis* in a small pot as part of the Royal Botanic Garden's display tent with a member of staff for scale. My recommendation for a repot was "taken on board". The plant was donated to the Gardens by the Sydney Museum where it had been growing on the roof. [Photo by Nurelle Thompson]



Colour Figure 14: Ita van der Walt with a cycad exhibit. [Photo courtesy of her family]



Colour Figure 15: *Encephalartos longifolius* in habitat in the Suurberg Reserve. Note the slope, making it possible for the plants to grow in heavy clay soil. [Photo by Wynand van Eeden]

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ARTICLES AND SHORT COMMUNICATIONS

ARTIKELS EN KORT MEDEDELINGS

CONTINENTAL DRIFT AND THE EVOLUTION OF ASIAN CYCAS

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INTRODUCTION

The positions of the earth's landmasses, once thought fixed and unchanging, are now understood to be in a constant, though gradual state of motion. Over the course of tens of millions of years the shape and location of continents have altered radically. For a group of plants as old as cycads, these constant and often profound shifts of landmasses and the accompanying changes in topography and climate have had major impacts on its evolutionary history.

In previous articles (see Tang 1989, 1990, 2002) I have discussed the affects of continental drift on the evolution of cycads in Africa, Australia, and the Caribbean Basin. This paper is the fourth in the series and will focus on the Asian *Cycas* and how continental movements may have shaped their diversity and distribution from India across to China, Thailand and Vietnam.

ASIA AND CYCAS IN THE LATE PALEOZOIC

Mamey (1976) and other paleobotanists have argued that *Cycads* first evolved from seed ferns in the late Carboniferous period, over 300 million years ago. Seed ferns, now extinct, were the first plants to have evolved the structures that we now know as true seeds. By the Permian period, some 270 million ago, cycads appeared to have spread throughout much of the earth, as fossils that can be confidently identifiable as cycads can now be found in rocks of this age on every continent including Antarctica. The world's major continental masses, at that stage of cycad history, were connected together in one supercontinent called Pangaea (see Fig. 1). Pangaea had the shape of the letter "C", with the landmasses of what are now Africa, South America, Australia, Antarctica, and India forming the lower part of the "C" and North America and Europe forming the upper part. In the middle of the letter "C" there existed an ocean basin, now vanished, that geologists call the Tethys Sea. Pangaea would exist in this basic configuration as a single continent for another 100 million years. What about the landmass we now call Asia? What position did it occupy during the early evolution of cycads?

The geologic history of Asia is very complex. Essentially, east and southeastern Asia is a conglomeration of continental fragments that "rafted" across the Tethys Sea from southern Pangaea (Metcalf 1998). In fact, the floor of the Tethys Sea can be roughly described to have been a giant conveyor belt moving from south to north. Ocean floor was created on its southern edge while at the northern edge of the Tethys it was pushed underneath the crust and destroyed. Continental

fragments from southern Pangaea rifted off and rode on this gradually moving seabed.

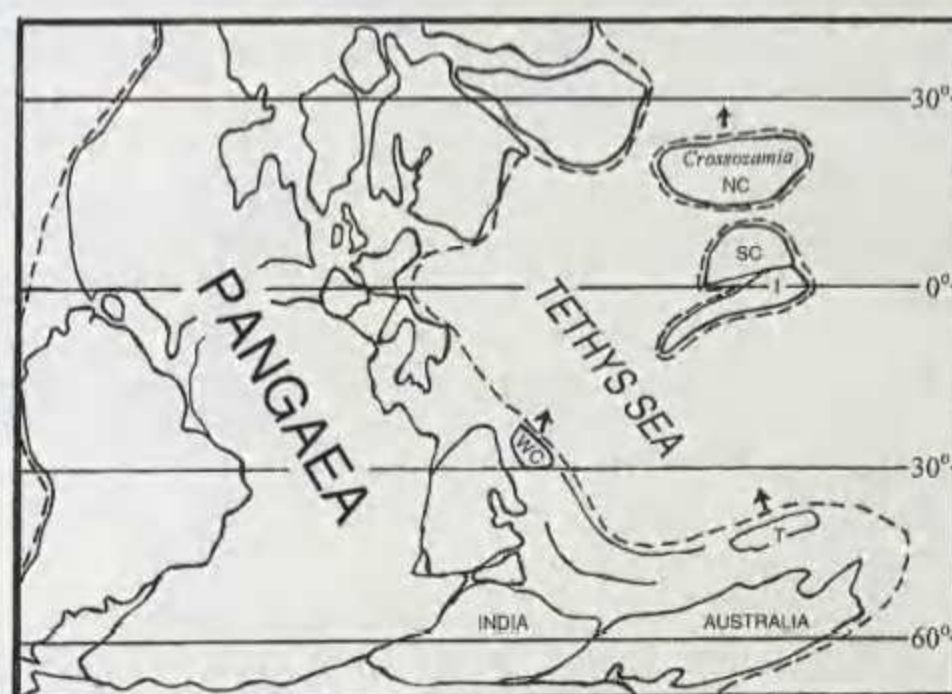


Figure 1: Reconstruction of the earth's landmasses during the early Permian period, approximately 290 million years ago; dotted lines indicate the edge of Pangaea's continental shelf; arrows indicate direction of movement of continental fragments. The oldest possible ancestor of *Cycas*, *Crossosamia*, is indicated. NC - North China, SC - South China, WC - West China, I - Indochina, T - Thailand. Map based on Metcalfe (1998).

These fragments crashed one by one into the growing landmass of Asia and where they collided mountain ranges such as the Altai and Hindu Kush formed. As a result the topography of Central and SE Asia is very mountainous, with many basins and valleys isolated by mountain ranges of varying and sometimes very great heights. Today, the area that the vanished Tethys Sea occupied corresponds roughly to the Indian Ocean and the movement of southern continental fragments from south to north continues. In recent times (that is in the last 65 million years!) India and Australia have broken off from the south and moved north. India, like so many fragments before it, crashed into Asia, forming a high mountain range, the Himalayas, and Australia continues its movement closer and closer to Asia.

Now that we have formed a picture of where Asia was relative to the rest of the earth's landmasses at the dawn of cycad history, we may ask: how does the history of the genus *Cycas* fit into the above sequence of continental movement? During the Permian period the fragments of land that now correspond to west, north, and south China and Indochina were islands in the Tethys Sea (see Fig. 1). The oldest fossils that might be ascribed to *Cycas* or an

ancestor are fossilized female sporophylls given the name *Crossozamia*, which look amazingly similar to those of a modern *Cycas revoluta* (Gao and Thomas 1989, Norstog and Nicholls 1997, see Fig. 2). These come from the Lower Permian rocks of north China. If these fossils are indeed of *Cycas* or an ancestor, this lineage of cycads may well have been present in Asia from near the beginning of cycad evolutionary history. How did cycads arrive in Asia and how might they be related to other cycads of Pangaea? It is possible that the *Cycas* lineage originated in southern Pangaea and rode to Asia on one of many traveling continental "arks". Millions of years of isolation on one of these continental rafts may have allowed it to evolve the characteristic leaf and reproductive structures that make *Cycas* so distinctive from other living cycads.

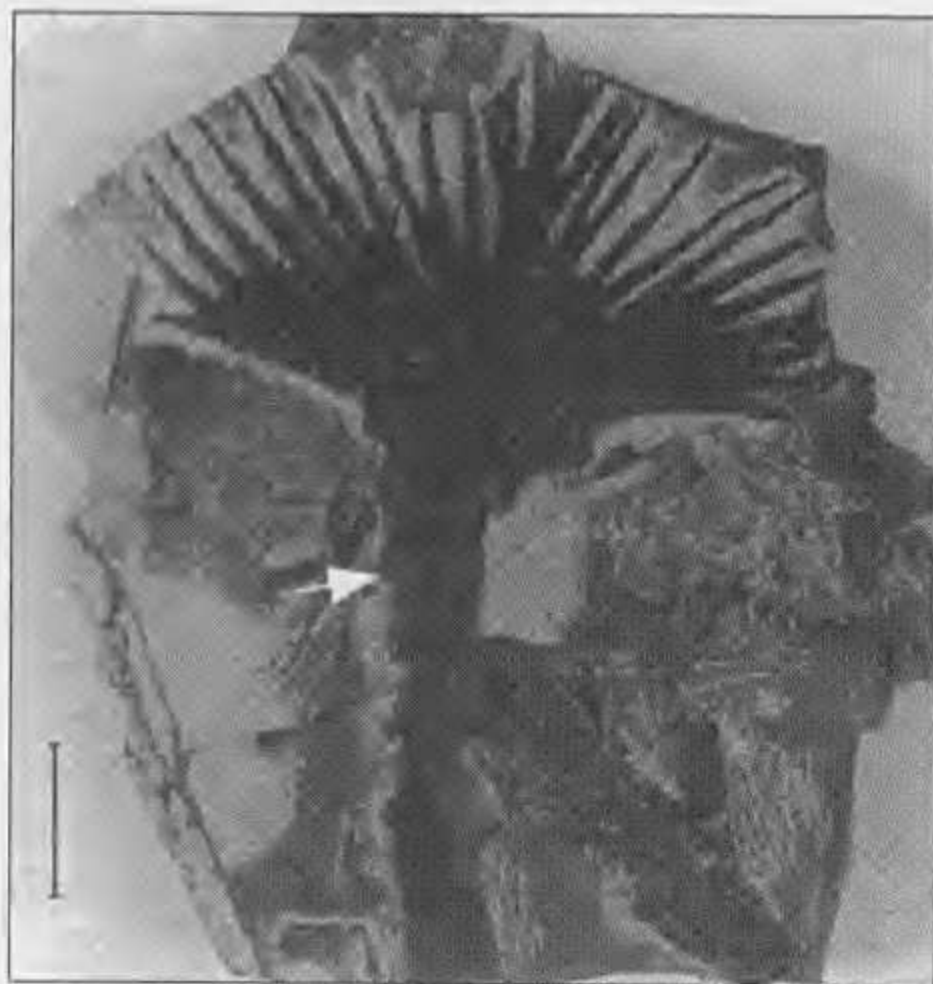


Figure 2: Fossil female sporophyll of *Crossozamia*, also known by the name *Primocycas*, from early Permian rocks of north China. From Norstog and Nicholls (1997).

Alternatively, we know from fossil vertebrates that dispersal of animals (and therefore plants) over land from southern Pangaea to China and Indochina was possible as early as the late Permian period, some 250 million years ago. *Dicynodon*, a fossil reptile of this age from South Africa (southern Pangaea), is also present in west China and Laos (Lucas 2001). By the late Permian continental fragments corresponding to west, north, and south China had moved far enough north that they had begun colliding with the rest of Asia and land bridges had formed connecting them with the rest of the Asian continent. The ancestor of *Cycas* may have spread to Asia by a land route, along the coastlines of ancient Pangaea. The shores of Pangaea were a more likely route of plant dispersal than the interior, which was mostly desert. Computer modeling of Pangaea's climate suggests that the interior of this vast ancient continent experienced extremes of heat, cold, and drought exceeding those experienced today (Waters 1992). Large landmasses promote extremes of heating in summer and cooling in winter because their interiors are far from the moderating influences of oceans. Pangaea's coast probably experienced warm wet summer monsoons, but

because water borne clouds had to travel so far from the sea to the interior, the central areas likely received only around 45 cm of rain or less per year. The interiors of Pangaea's northern and southern regions were colder than Siberia and its deserts were hotter than the Sahara. Climates with mild seasonal variation like that in the present day Cape or Natal were almost unknown. Given these conditions, most cycads probably lived and evolved along coastal regions, just as they do today. The drainage systems of coastal mountain ranges likely confined many higher altitude species, but given the lack of seas to block dispersal, low elevation coastal species could conceivably spread widely and cover most of the world's shorelines. Due to the existence of Pangaea and its climate, the Permian was a time of much evolutionary activity in plants, as well as animals. Swamp dwelling forms declined or went extinct, while drought tolerant lineages, such as reptiles, conifers, and cycads, evolved and came to dominance during this time. This trend would continue into the Mesozoic Era.

CYCAS IN THE MESOZOIC

During the Mesozoic Era, spanning the Triassic, Jurassic, and Cretaceous periods (245-66.4 million years ago), a wide diversity of cycad fossils have been identified (see Osborne 2002 for a summary). Because of the fragmentary nature of these fossils, the relationships among them and with modern cycads are difficult to determine. Microscopic examination of just some of the Triassic cycads indicates that the diversity of leaf cuticular structures of the ancient genera greatly exceeded that found in the living genera (Anderson and Anderson 1989). Undoubtedly this was a time of evolutionary expansion for cycads. Some types of fossil cycad leaves are widespread during this time. Fossil leaves of *Nilssonia*, for example, are found in both the southern and northern hemisphere (including China) from the Triassic to early Cretaceous (Hu et al. 1999, Osborne 2002). In the Triassic/Jurassic, England and China shared the cycad genus *Androstrobus* (Hu et al. 1999), suggesting that a common cycad flora spanned the northern continent Laurasia, which formed after Pangaea split into a northern and a southern half (called Gondwana). Fossils assigned to *Cycas* have been identified from the late Cretaceous of Greenland (Osborne 2002), suggesting that *Cycas* may also have had a wider distribution in the northern hemisphere than today. A review of fossil cycads of the Mesozoic (Osborne 2002) suggests that *Cycas* or fossils resembling it are absent from the southern hemisphere. At the very least, such fossils, if they exist, are in no way common in lands that were part of Gondwana.

CYCAS IN THE EARLY CENOZOIC

In the early half of the Cenozoic period (which spans 66.4 million years ago to present), fossils clearly recognizable as modern genera, as well as now extinct genera, are found in North America, South America, and Australia. None of these are recognizable as *Cycas*. Fossil leaves of *Cycas*, almost identical to *C. revoluta*, however, are known from the early Cenozoic of Japan. *Cycas* is also known from the early Cenozoic of China (Liu et al. 1991). This pattern of Mesozoic and Cenozoic fossils evidence would suggest that *Cycas* was restricted to Asia or at least Laurasia for most of its evolutionary history. Although there were other cycad genera in Asia in past eras, *Cycas* is the only one to survive in Asia to the present. The fossil record thus suggests that Asia, particularly its eastern sections, such as China, is an

ancient center of *Cycas* evolution. Because of the lack of *Cycas* fossils in other areas where it is found today, its presence in Africa, Australia, and the Pacific islands is probably a result of dispersal via ocean currents by only one lineage of *Cycas* within the last 20 million years (Hill 1999).

CONTINENTAL DRIFT IN S.E. ASIA AND THE LATE CENOZOIC EVOLUTION OF CYCAS

The middle to late Cenozoic was a time of great change in the configuration of landmasses in S.E. Asia. India had broken away from Africa and started colliding with southern Asia. This set off a chain of tectonic events in the

region, and thus also a chain of evolutionary events in *Cycas*. Upon collision of India with Asia, plants of *Cycas* (of the section *Indosinensis*) likely dispersed into the Indian subcontinent and began diversifying there. Today the diversity of *Cycas* in India remains relatively low compared with S.E. Asia.

The Indian collision caused massive shifting of surrounding continental blocks. Vast expanses of land were uplifted to form the Himalaya Mountains, and the Indochina block, consisting of Burma, upper Thailand, Cambodia, Laos, and most of Vietnam, shifted eastward (see Fig. 3)

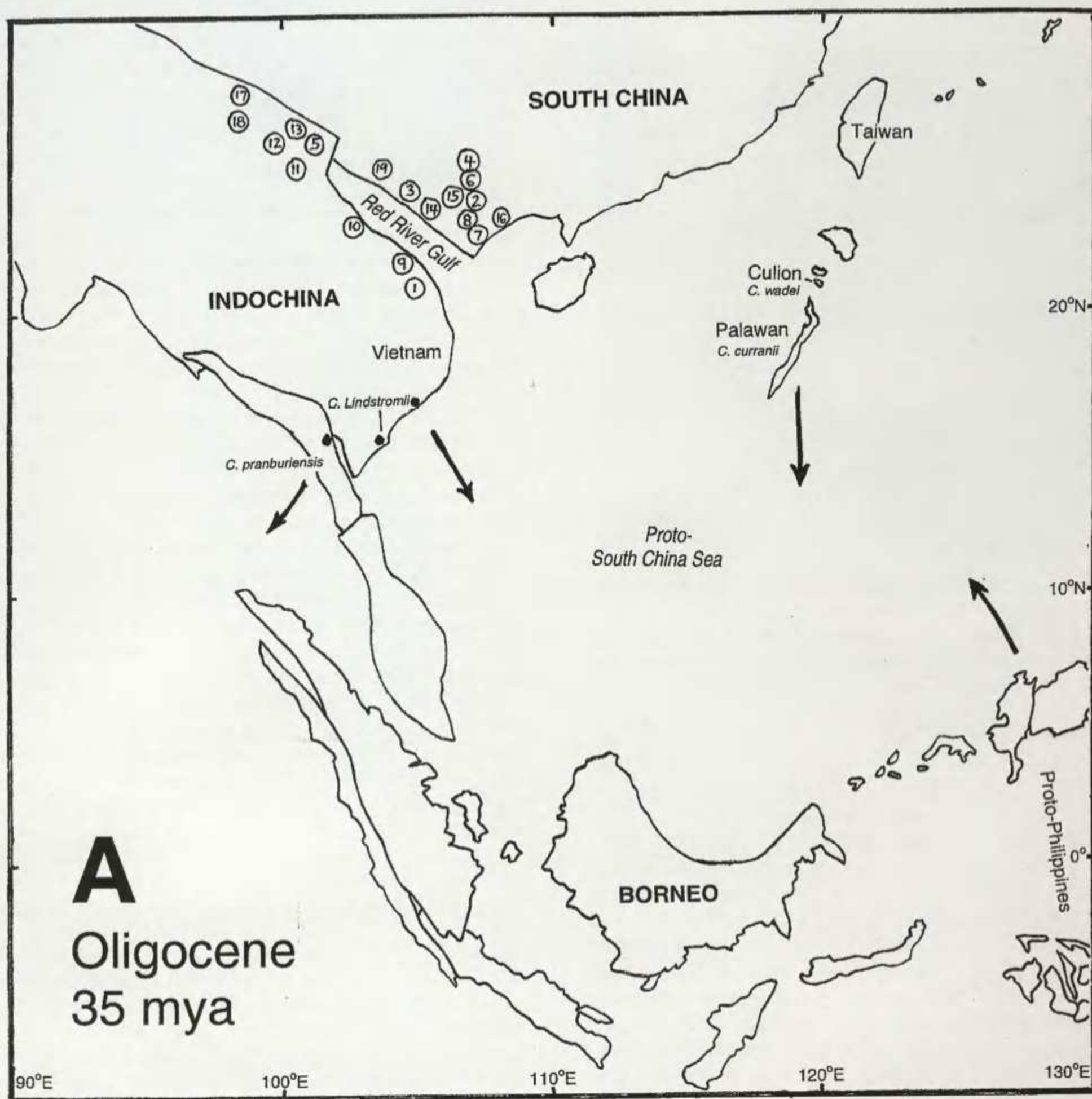


Figure 3. A): Reconstruction of southeast Asian landmasses during the Oligocene period, 35 million years ago. Note three areas of interest: Red River Gulf, southern Vietnam, and Culion and Palawan Islands; arrows indicate direction of movement of continental fragments. Superimposed, using circles, are corresponding localities of modern cycads, suggesting possible ancient distributions of their ancestors.

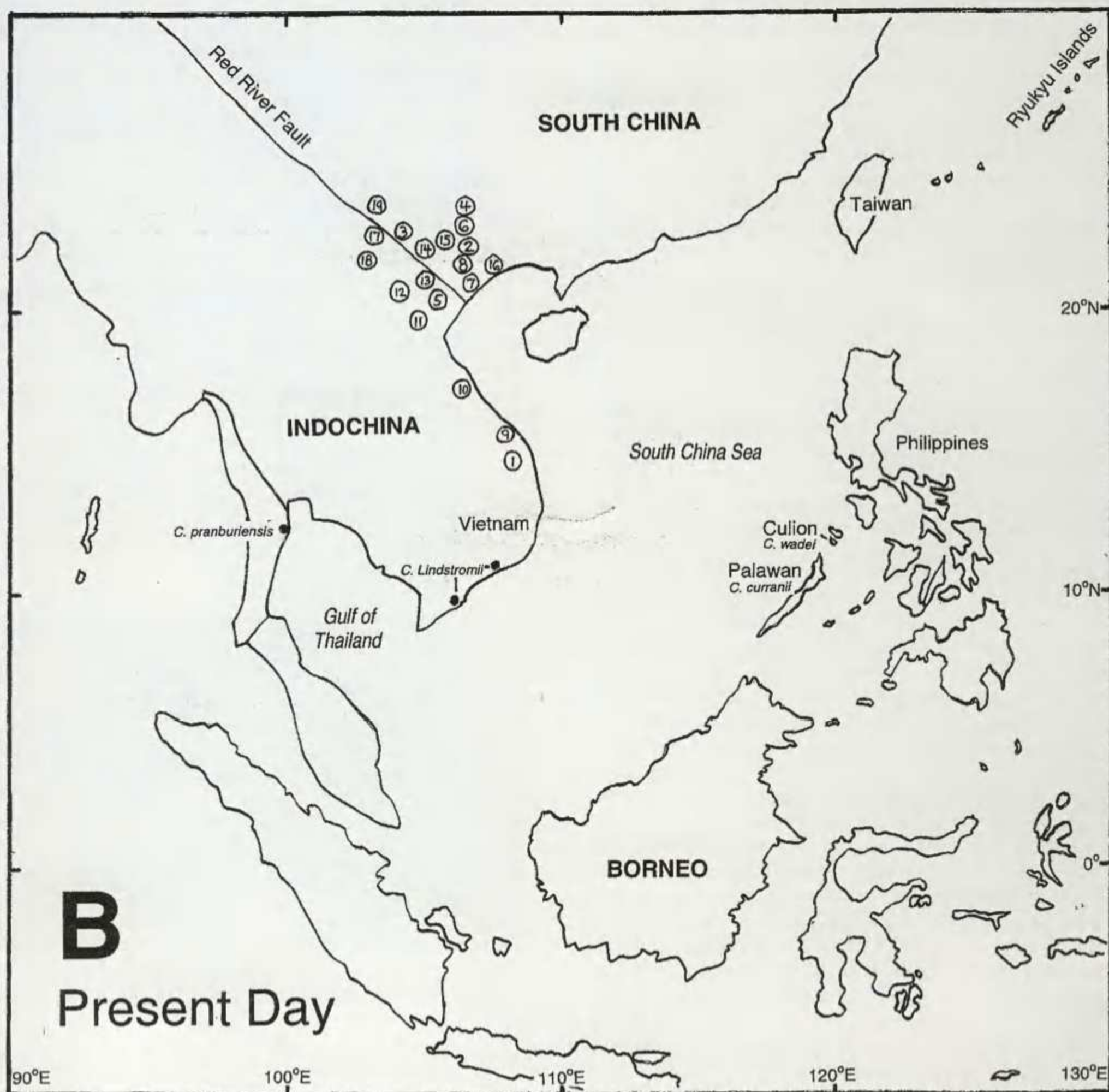


Figure 3. B): Present day configuration of landmasses in southeast Asian. Circles indicate locations of corresponding Cycas species in 3A, showing how continental drift may have moved them. Maps based on Hall (1998).

1. CYCAS OF THE RED RIVER FAULT ZONE

The collision of the Indian block with Asia caused the Indochina block to move some 700 km east relative to the South China block along the Red River fault line. Prior to this event, a large gulf existed in northern Vietnam where the Red River now flows. I will give this gulf the name "Red River Gulf" to distinguish it from any present day body of water. The intrusion of a warm water body, such as this, into the interior of a continent probably brought warm air and more frequent rains to an area that would otherwise be cooler and drier. During one period of the middle Cenozoic, the Oligocene, there was a drop in worldwide temperatures. Siberian winds sweeping down from the north likely brought freezing

temperatures into this mountainous subtropical zone. The Red River Gulf region may have acted as a buffer to the cold and served as a refugium for many plants. Cycads may have persisted here while they went extinct in other areas. Today, the lands along the Red River, from the coast of Vietnam well into the interior of China have an unusually high diversity of *Cycas*. There are at least 19 species in this small region, making it one of the most diverse areas for cycads in the world. Almost all of these species are endemic to this restricted region. What is even more interesting - if we map the present day locations of *Cycas* on to their corresponding spots on the ancient Oligocene configuration of landmasses (Fig. 3A) we find that many of the species may once have been quite separate

geographically. For instance, sister species, such as *Cycas micholitzii* of southern Vietnam and *C. bifida* of northern Vietnam would have been separated by the Red River Gulf. The cliff dwelling *Cycas haobinensis*, now found south of the Red River and near other cliff species such as *C. sexseminifera*, *C. tropophylla*, and *C. ferruginea* on the north side of the Red River, may have originally been hundreds of kilometers further away at the western end of the Red River Gulf during the Oligocene. The movement of landmasses along the Red River Gulf likely brought many formerly separated species into closer proximity. Conversely, some closely related populations of *Cycas* may have been separated from one another by this tectonic movement, stimulating the production of new species through subsequent isolation. The combination of bringing together formerly separate species and the production of new species via splitting of populations would likely have contributed to forming the high concentration of *Cycas* species we see in this region today. It thus appears that tectonic activity in this region acted as a driving force in creating an evolutionary center for *Cycas*.

2. THE RIDDLE OF *CYCAS WADEI* & *C. CURRANII* - CONTINENTAL OR PHILIPPINE SPECIES?

Based on morphological study, Hill (1999) recognized *Cycas wadei* and *C. curranii* as among the more primitive living species of *Cycas*. They are inhabitants of the closely associated islands of Culion and Palawan, which now form part of the Philippine archipelago. The presence of such primitive species so far east of the hypothesized evolutionary center of mainland S.E. Asia, is a puzzle. Among the most primitive living species are *C. panzhiuanensis* in the interior of China and *C. revoluta* and *C. taitungensis*, found along margins of the shallow sea basin formed by the south coast of China, Taiwan, and the Ryukyu Islands. Other relatively primitive species related to *C. wadei* and *C. curranii* are concentrated in south China. Why are *C. wadei* and *C. curranii* located on these relatively small and remote oceanic islands? Would its geographic location challenge the hypothesis that southern China/northern Vietnam is the main locus of Cenozoic *Cycas* evolution? How did *C. wadei* and *C. curranii* get to where they are now? Reconstructions of Cenozoic S.E. Asia (see Hall 1998) show that in the early Oligocene, 35 million years ago, Culion and Palawan islands were just south of the island of Taiwan and part of a chain of islands along the continental shelf of mainland Asia. The remaining islands that we know today as part of the Philippines were located far to the southeast, east of Borneo (see Fig. 3A). Over the next 35 million years this southern portion of the Philippine archipelago swung counterclockwise and northward relative to Borneo. Culion and Palawan islands moved 700 km south (Fig. 3B). They met in their present location. In a dramatic shift of landmasses over the ocean surface, a continental species became part of a remote island flora.

3. GULF OF THAILAND -RIDDLE OF *CYCAS LINDSTROMII* AND *C. PRANBURIENSIS*

Reconstruction of Oligocene S.E. Asia also shows that south Thailand and continental Malaysia were once adjacent to southern Vietnam and Cambodia (Fig. 3A). The Indian collision that forced the Indochina block east and closed the Red River Gulf would also have profound affects in this area. The strip of land we now recognize as peninsular Thailand and Malaysia was torn from the rest of S.E. Asia, and

the Gulf of Thailand, that now separates them, was formed. One gulf in the north was destroyed while another in the south was created. Today two odd *Cycas* species are separated by 700 km by the Gulf of Thailand. In southern Vietnam there is a distinctive dwarf species, *C. lindstromii*, inhabiting coastal sands (see Tang in *ENCEPHALARTOS* 76). Its closest relative *C. pranburiensis* lives on cliffs in the upper peninsula of Thailand (see Focus On in this issue). It appears that these were neighbor species 35 million years ago and the differences we see between them today evolved since this separation.

CONCLUSION

The modern geographic distributions and evolutionary relationships of Asian *Cycas* do not always match or make sense. Analysis of cycad morphology or even DNA does not always give clarity. When we combine these methods of analyzing evolutionary history, however, with our understanding of past continental movements in Asia, an answer to a difficult cycad riddle begins to emerge. With a lineage as old as *Cycas*, we may make educated speculation, but never know for sure what happened at the dawn of the age of cycads. Toward more recent times, however, nearer to the modern age of cycads the truth may be revealed to us through continuing research along many different lines of study.



Figure 4. : Female *Cycas wadei* in cultivation with a cone.

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List of numbered species:

Divided-leaflet species: 1 - *C. micholitzii*, 2 - *C. bifida*
3 - *C. multipinnata*, 4 - *C. debaoensis*;

Cliff species: 5 - *C. hoabinhensis*, 6 - *C. sexsemnifera*
7 - *C. tropophylla*, 8 - *C. ferruginea*;

Simple-leaflet, forest species: 9 - *C. aculeate*
10 - *C. chevalieri* 11 - *C. simplicipinna*, 12 - *C. collina*
13 - *C. fugax* 14 - *C. dolichophylla*, 15 - *C. brachycantha*
16 - *C. balansae* 17 - *C. diannanensis*, 18 - *C. tanqingii*
19 - *C. hongheensis*.

VEGETATIVE PROPAGATION OF *STANGERIA ERIOPUS* FROM LEAF MATERIAL

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ABSTRACT

Stangeria eriopus, a monotypic cycad, endemic to south eastern Africa is under increasing threat from habitat loss and commercial exploitation for the medicinal plant trade. Vegetative propagation of *S. eriopus* by means of leaf cuttings has been investigated and found to give promising results. In a recent trial, hormone-dipped whole leaf-stipes with trimmed pinnae were placed in sterilised river sand, and development of callus material, roots, coralloid root nodules and shoots was recorded. Approximately eighty percent of the leaf cuttings developed new and healthy root systems. The simplicity of this method will appeal to horticulturists and cycad enthusiasts wishing to propagate this attractive cycad.

INTRODUCTION

Stangeria eriopus (Kunze) Baill, commonly known as Stanger's Cycad, or the Natal Grass Cycad, is threatened by both habitat loss (mismanagement through overgrazing, bush encroachment, frequent fires and deforestation) (Scott-Shaw, 1993) and commercial

collection for traditional medicinal use (Osborne et al., 1994; Mander, 1998). The *Stangeria* Conservation Project, initiated at the Durban Botanic Gardens (DBG) in collaboration with the University of KwaZulu-Natal (Durban) and the South African National Biodiversity Institute is concerned with the 'whole-plant' gene-banking of this species (Crouch et al., 2000). This approach requires that plants are collected from wild populations and held in a nursery in the botanic gardens. The collection is currently available to researchers and provides access to plants from numerous sub-populations, bypassing the need for in situ sampling. Current research projects include taxonomic work, seed and pollen research, and propagation and micropropagation studies. Should the need arise for re-introduction, a range of genetic material from the DBG collection will be available. One method of vegetative propagation currently under investigation viz. via leaf material is reported here.

Cycads are generally regarded as being slow growing – especially when grown from seed (Giddy, 1990).

S. eriopus is no exception, and plants currently sold at nurseries are often in excess of three years of age. The method described here, while yielding clonal material appears to produce larger plants in a shorter time compared with traditional seed propagation methods. Furthermore, while success through in vitro micropropagation (tissue culture) has been reported for *Stangeria* (Osborne et al., 1987; Douwes, 2003), this approach has not been used to produce *S. eriopus* in large numbers. This is primarily due to proliferation of callus, and insufficient tissue differentiation in vitro (Appleton pers. comm.). The protocol discussed here for propagation of plants by means of leaf-stem cuttings is based on a method reported for other cycad species (Grobbelaar, 1995; Osborne & Dalzell, 1996; Mattson and Dalzell, 2003), and has obvious implications for horticultural propagation of *S. eriopus*.

METHOD AND MATERIALS

SOIL PREPARATION

Medium grain river sand was sterilised with a solution of 1mL n-alkyl-dimethyl benzyl ammonium chloride diluted into 1L water. This is a standard 20% quaternary ammonium compound used in industry for sterilisation purposes – we purchase a brand called BACSAN-50 which we dilute by adding 5mL to 1L water.

LEAF PREPARATION

Whole leaves were removed from the parent plants by firmly bending the leaf stipes until they broke free of the lignotuber. This ensured that a portion of 'stem' tissue (Colour Fig. 7a) remained at the base of the leaf stipe. Leaf pinnae were trimmed (Colour Fig. 8) to reduce evapotranspiration while maintaining photosynthetic capacity, as leaf transplants are vulnerable to water loss. Leaf stipes were dip-sterilised using the ammonium solution described above, dried, and then dipped in a standard rooting hormone mixture. The concentrated hormone mixture contained IBA (Indolebutyric acid) (10000ppm) and NAA (Naphthaleneacetic acid) (5000ppm), and was applied as a 1:4 dilution in water. Control leaf transplants (i.e. untreated with root hormone) were retrospectively prepared to establish whether root hormone treatment was needed to promote root development. Leaf stipes were inserted into the soil to a depth of approximately 80mm. Pots were transferred onto a hotbed in a greenhouse and watered twice daily by sprayer.

RESULTS

Callus material was observed at the base of hormone-dipped and control leaf stipes at 10 weeks (Colour Fig. 7b), root differentiation was visible at 12 weeks (Colour Fig. 7c), and further root development was apparent at 14 weeks (Colour Fig. 7d). Coralloid root nodules were observed at seven months, giving evidence for possible nitrogen fixation. Colour Fig. 8 shows a well developed root system at 18 months. New shoots (Fig. 9) developed after approx. 26 months, and appeared after the original leaves had died and fallen off the new plants. The stock plants from which leaf material was sourced, suffered no

long-term damage from the leaf removal (new leaves developed within three months).

DISCUSSION

The stem of *S. eriopus* does not make up the entire subterranean lignotuber, but is limited to the apical portion, and the transition between stem and root is not easily detectable (Vorster, P. & Vorster, E., 1985; Dyer, 1966). The method employed here for removing leaves from the lignotubers may therefore result in the inclusion of 'stem' tissue at the base of the stipe. It is this tissue that apparently undergoes differentiation and callus production when planted in soil. However, it is unclear if this 'stem' tissue is essential for root production, as vegetative propagation using other portions of leaf material was not investigated. It has previously been reported that regeneration and growth of new plants does occur from chopped lignotubers (Douwes et al., 2003), giving some indication of the regenerative properties of the plant. It should also be noted that cuttings in this experiment are referred to as 'leaf-stem cuttings' to indicate the inclusion of mother plant material removed together with the leaf base, as was the case with propagules of *Encephalartos woodii* reported by Mattson and Dalzell (2003).

Stangeria eriopus is one of the easier cycads to grow, and growth rates are relatively fast when the root system is not cramped (Buckley, 1999). However, disturbance of developing callus and root material (e.g. removal of leaves from the soil for purposes of photography) hinders root development. Thus, attempts to replicate this approach should make use of deep pots/bags and minimise disturbance to cuttings. Lignotubers of plants growing in situ are generally 1 to 2 inches below the soil surface, which likely prevents desiccation and exposure of sensitive new leaf material to potentially damaging light intensities. This idea is supported by observations in the nursery, where deeply planted lignotubers develop new leaves faster than those protruding from the soil surface. Observations from plants collected in situ and transplanted into containers also indicate that new leaf development is stimulated by the removal of all existing leaves. Based on these observations, we postulate that leaf removal from leaf-stem cuttings with well-developed rootstocks will stimulate new leaf production. Trials are ongoing to establish protocols for stimulating early onset of leaf production from cuttings.

The plants make excellent garden subjects and excel when grown in pots, both indoors and out. *S. eriopus* is not tolerant of cold weather and will lose leaves if temperatures drop below freezing. Plants should also be protected from high winds, as leaves may break if whipped about. Areas of full or semi-shade are perhaps best for *S. eriopus* garden subjects as low light conditions produce larger, more attractive foliage (Colour Fig. 10). However, these cycads can also grow in full sunlight. Pests and fungi found to target the plants growing in the DBG include mielie bug, scale insect, white fly and sooty mould – all of which can easily be treated with available pesticides and fungicides.

Experimental leaf propagation of *S. eriopus* is ongoing and further results will be reported. For more information on the *Stangeria* Conservation Project, please visit the website at: <http://www.und.ac.za/und/biology/stangeria/index.html>

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The staff of Bridgevale Production and Display Nursery of the Durban Parks Department are thanked for their assistance in running the trials, and Margaret Appleton of the Micropropagation unit at the Durban Botanic Gardens is thanked for her comments. The Bressler Foundation – USA and the SABONET Threatened Plants Programme are thanked for continued financial support of the *Stangeria* Conservation Project. KZN Wildlife is thanked for support in the form of plant collection permits and assistance in collection of plants from the field.

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CYCADS AT “SYDNEY IN BLOOM – A FESTIVAL OF GARDENS” A REPORT FROM DOWN UNDER.

Craig Thomson

Received 28 September 2004

Sydney (Australia) held its largest gardening show during the week 22nd – 26th September 2004 where an estimated 50,000 people were treated to a variety of landscape displays, floral exhibits, plant stalls and associated gardening products. The 5 day event was blessed with perfect weather – it seems to have forgotten how to rain here – and was staged in “The Domain”; an open grassy area in the centre of Sydney city. The Domain is part of The Royal Botanic Gardens – unfortunately separated from each other by a six lane expressway - and as would be expected contains many fine specimen trees as part of the Gardens collection. Of all the gardening shows in Sydney

(of which there are a few) this one is billed as the biggest and best so my wife Nurelle and I were honoured to have been invited to exhibit our cycads there.

Anyone can obtain a stall at these events but most smaller growers are daunted by the cost of a stall which run at around AUS\$3,500 for a 3m x 3m tent. That sort of money is out of our league but we were offered a site in The Australian Institute of Horticulture’s huge marquee for free – well actually on condition that I give a 30 minute talk on the stage about cycads. We accepted and set up what I think was a representative sample of

the variety of cycads that will grow successfully outdoors in Sydney. We were told that our site would only be 2m x 2m which wouldn't be enough room for us both to stand in let alone display cycads but we hired a truck and filled it to the brim knowing that once they saw these beautiful plants they would find room for them and it worked. We grabbed the front corner of the marquee and spilled out the door and down the steps onto the lawn. Some of the larger plants were used to brighten up the stage surrounds at the other end of the marquee so that cycads were a very dominant part of the 'greenery' – and so they should be. Ironically we had supplied 3 large *Macrozamia communis* to Sydney City Council for their bedding display, which just so happened to be next to where we spilled out on the lawn.

The large potted cycads that featured as part of our display included *Bowenia spectabilis*, *Ceratozamia mexicana*, *Cycas guizhouensis*, *C. thouarsii*, *Dioon spinulosum*, *Encephalartos lehmannii*, *E. longifolius*, *E. natalensis* and *Zamia furfuracea*.

Cycads that were offered for sale included all those species mentioned as well as *Cycas revoluta*, *C. revoluta* x *C. taitungensis*, *Dioon califanoi*, *D. edule*, *Encephalartos altensteinii*, *E. ferox*, *Lepidozamia peroffskyana*, *Macrozamia communis*, *M. spiralis* and *Stangeria eriopus*.

It is always hard trying to compete with the pretties of the plant world – those flowering orchids, colourful bromeliads etc. when you are relying purely on foliage, but with the help of Paul and Margaret Kennedy we were able to have the colourful red seeds of *Cycas revoluta* on display, as well as for sale. Paul and Margaret kindly donated the seed and went so far as to bag them up in small plastic bags complete with labels for us. The amount of interest in these little bags of colourful seeds surpassed my expectations but only goes to show that bright colours attract attention.

For much of the show there was a traffic jam to get into the marquee as our display kept the queue moving quite slowly. I don't think that there has ever been this much interest in cycads in Sydney. It was most gratifying to see the interest in our plants, as the amount of effort that is required to plan and man the stall is exhausting. I feel that we must have spoken to nearly everybody who visited the show – not only about cycads but also general horticultural questions. I don't think that we could have lasted another day.

I truly believe that we have lifted cycads' profile with the greater gardening public as well as with landscapers and the media and have shown to all that there are more than three sorts. Now if we could only get our plants to cone on queue we *could* get more plants out into the market place. We live in hope that we will be invited back next year bigger and better.

ITA VAN DER WALT
GEBORE SCHOEMAN - 27 JUNIE 1936 TOT 28 JANUARIE 2004
BORN SCHOEMAN – 27 JUNE 1936 TO 28 JANUARY 2004

Derik Minnaar

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Dit was vir my 'n voorreg om hierdie merkwaardige dame te ken, wat diep spore in die broodboom kringe getrap het. Sy het so ook diep in ons harte ingekruip en sal vir lank 'n groot leemte laat. Ek publiseer graag haar lewens geskiedenis soos wat haar familie dit aan my voorgelê het.

Ita is gebore op 27 junie 1936 op Potgietersrus, waar sy skool gegaan en later gematrikuleer het. Sy het toe gaan studeer aan die Universiteit van Pretoria, waar sy Henkie van der Walt ontmoet en later met hom getrou het. Hulle het in 1956 na die Limburg distrik verhuis waar hulle met tabak en sitrus geboer het saam met haar pa, die baie bekende boer Japie Schoeman. In 1956 het sy haar eerste broodboom as geskenk gekry, 'n *Cycas revoluta* saailing. Vandag, na 48 jaar, staan die plant nog voor haar huis.

Ita het vyf kinders, drie seuns en twee dogters. In 1964 het hulle verhuis na Trichardsdal aan die voet van die Drakensberge, ongeveer 70 km van Tzaneen. Daar het

haar groot liefde vir plante haar aangevuur om een van die mooiste tuine in die laeveld te vestig. Sy het dan ook deur die jare verskeie eerste pryse vir die mooiste tuin ontvang. Daar het ook gereeld artikels verskyn met pragfotografie van haar tuin, in boeke, tydskrifte en koerante. So was verskeie tuinbouklubs en selfs oorsese persone gelukkig om uitstappies na haar tuin te ervaar.

Tussen 1964 en 1968 het sy haar eerste *E. inopinus*, *E. laevifolius*, *E. transvenosus* en *E. dolomiticus* plante versamel. Die bure het vir haar *E. laevifolius* plante geskenk wat natuurlik op hul plaas voorgekom het. Die een groot plant is gered nadat toordokters in die veld stukkie bas daarvan verwyder het vir "muti". In 1968 het sy 'n permit vir 20 *E. ferox* plante gekry en Henkie met 'n vriend het dit in Mosambiek gaan koop.

In 1969 het die welbekende mr Munch van Zimbabwe, na wie *E. Munchii* vernoem is, haar besoek en hulle het plante begin uitruil. Tussen 1968 en 1970 het sy haar

eerste Kaapse en Natalse broodboom spesies begin versamel. In daardie jare was 'n skenkingsbrief voldoende en kon dien as as permit. Sy het deur die jare 'n unieke plante versameling opgebou. In die vroeë sewentiger jare het sy 'n broodboom kwekery op die been gebring. Sy het saad van haar eie versameling geplant en ook aangevul met ingevoerde saad en plante.

In 1982 het die "ou regering" honderd boere se plase uitgekoopt vir die ou tuislandregering en hulle moes noodgedwonge hulle spogplaas verkoop. Hulle verhuis toe in 1982 na Pretoria en begin Cycad Kwekery in Montana. Sy het al haar broodbome, oor die agthonderd plante, van haar tuin plante en kwekery na Montana geskuif. Daar het sy weereens 'n pragtige tuin geskep.

In 1985 het mr Jean Pierre Slavov, na wie *E. Slavovi* vernoem is, haar kom besoek. Hy was verantwoordelik vir die broodboom versameling van die Franse botaniese tuin. Ita het van haar tuin plante aan hom verkoop en die

transaksie was moontlik gemaak deur voormalige minister Pik Botha in samewerking met Natuurbewaring.

In die negentiger jare het Ita se gesondheid 'n terugslag gekry en haar kragte het begin afneem. Hulle het na 'n kleiner perseel geskuif wat vandag nog die Cycad Kwekery is.

Sy het altyd haar kennis en passie van oor die veertig jaar, haar liefde vir plante, met ander gedeel. In 1993 is die wêreld kongres oor broodbome in Pretoria gehou en Ita het die uitstalling voor die gebou gedoen (sien Kleur Foto 14). Broodbome was haar groot passie in die lewe. Een van haar laaste nagedagtenisse was: "Ek het op my lewenspad baie wonderlike broodboom vriende gemaak waarvan al baie jare lank oorlede is. Probeer om nooit vyande in hierdie bedryf te maak nie".

So wil ons dankie sê aan ons Hemelse Vader vir haar as mens met haar liefde en kennis wat sy aan almal oorgedra het op haar lewenspad.

BROODBOOM KONFERENSIE IN DIE LAEVELD

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Received 1 October 2004

Gedurende die naweek van 7 en 8 Augustus is 'n informele broodboom konferensie gehou in die Laeveld net buite Nelspruit, in die Ingwenyama Lodge en konferensie sentrum. Goeie bywoning van 58 gaste en organiseerders het sedert 6 Augustus by die Lodge ingeboek waar lotery kaarties verkoop is. Gaste is genooi om broodboom saailinge te skenk, wat later uitgeloot is. Die wins is aan die Transvaalse Streektak van die Vereniging geskenk. Vroegoggend van 7 Augustus het begin met 'n heerlike ontbyt, waarna die lesings in die konferensie sentrum aangebied is. Elk van die sprekers is voorgestel deur John Kloppers en na afloop van elke spreekbeurt het Derik Minnaar hulle namens die Broodboom Vereniging bedank en die nuutste broodboom publikasie deur Cooper en Goode oorhandig.

Prof Nat Grobbelaar het 'n inleidende lesing aangebied met algemense aspekte rakende broodbome en ook gewys op die talle taksonomiese foute wat in die nuutste boek *The Cycyds and Cycad Moths of Kwazulu-Natal* van Cooper en Goode gemaak word.

Buite die konferensie lokaal was 'n groot uitstalling van deur Danie Nel en Avis Meresman van Natal se Cycad Centre. Talle boeke, t-hemde en pragtige plakkate was te koop aangebied. Tussen spreekbeurte is hier lekker gesels rondom 'n koppie tee.

Die middag se lesings was ewe interessant. Dr Gerrie de Haas het die verskillende vorme van *E. transvenosus* bespreek en die blaarvorme uitgestal. Carl Bischoffberger het die nuutste gemiddelde broodboom pryslys uitgedeel en



Figuur 1: Gerrie de Haas wys verskille in *E. transvenosus* vorms buite die lokaal. [Foto deur Morné Ferreira]

verduidelik hoe dit bereken is en hoe die waarde van verskeie plante bepaal kan word. Na ete het Ben Jordaan die verskillende vorme van *E. nubimontanus* behandel. Weereens het hy al die verskillende blaarvorme uitgestal en bespreek. Dr Diekie de Klerk het gedurende sy spreekbeurt die verskillende vorme van *E. laevifolius* behandel en 'n hele klomp verskillend blaarvorme is rondgestuur.

Die laaste lesing van die dag het Steve Trollip sy uitgebreide ondervinding met suier voortplanting en groeitempo met die gaste gedeel. Die lesings is afgesluit met 'n lekker braai gedurende die aand waarna daar tot laat gekuier is.



Figuur 2: Lede ontspan in die Laeveldse Botanies Tuin.
[Foto deur Derik Minnaar]

Sondag 8 Augustus het die gaste vroeg by die Laeveldse Botaniëse Tuin vergader. Gedurende die dag is daar vryelik tussen die plante rondbeweeg waarna die Transvaalse Streektak se algemene jaarvergadering gehou is. Hierna is daar terugbeweeg na die Lodge waar die geskenkte plante uitgeloot was.

Verskeie mense het hierna huiswaarts gekeer en die wat agtergebly het, het Maandag 9 Augustus twee tuine in die omgewing besoek.

Hierdie inisiatief van John Kloppers was 'n groot sukses en daar is voorgestel dat dit 'n jaarlikse instelling word. Elke jaar behoort 'n ander Streektak van die Broodboom Vereniging so 'n konferensie aan te bied om sodoende die publiek en ander broodboom entoesiaste te betrek.

ALGEMENE JAARVERGADERING VAN DIE TRANSVAALSE STREEKTAK VAN DIE VERENIGING GEHOU OP 7 AUGUSTUS 2004

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Derik Minnaar verwelkom almal hartlik in die Laeveldse Botaniëse tuin en bedank John Kloppers vir al die reëlings van die naweek. Die agenda word bespreek, waarna John Kloppers die finansiële jaarverslag voorlê.

Onlangse diefstalle van broodbome word bespreek en 'n aktiewe debat word gevoer rondom moontlike voorstelle om die probleem aan te spreek. Die res van die Jaarprogram vir 2004 word bespreek, wat 'n lesing deur Martin Schwelnus insluit op 9 Oktober 2004 by die Nasionale Botaniëse Instituut se herbarium, 'n besoek aan *E. waterbergensis* by Entabeni op 16 Oktober 2004, asook die jaarafsluiting in November 2004. Verskeie voorstelle word gemaak vir die jaarprogram van 2005.

'n Nuwe komitee word verkies vir die volgende ampstermyn, nl. Morné Ferreira as voorsitter, Loubser de Kock as ondervoorsitter, Remo Bischoffberger as sekretaris en John Kloppers as tesourier.

Avis Meresman van die Natalse Streektak van die Vereniging spreek haar dank uit vir die veelsydige aktiwiteite wat hierdie Streektak aanbied om broodboom belangstelling te bevorder. Prof Nat Grobbelaar bedank die uittredende voorsitter en sekretaresse, Derik en Lynette Minnaar, vir hul jarelange toewyding en harde werk in die Transvaalse Streektak van die Broodboom Vereniging. Die vergadering verdaag vir middagete na 'n heerlike dag in die Laeveldse Botaniëse tuin.

Please renew your membership in time to ensure you receive the next issue of
ENCEPHALARTOS.

Hernu asseblief u lidmaatskap betyds om te verseker dat u die volgende uitgawe van
ENCEPHALARTOS ontvang.

GROWING CYCADS FOR THE BEGINNER

Wynand van Eeden

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As promised in *ENCEPHALARTOS* 79, a series of articles will be presented in the next few issues, aimed specifically at the beginner. Topics to be covered include soil conditions and types, fertiliser applications, positioning of the various species with regard to light requirements, hardiness of different species, sources of plants and Cycad Literature and sources of information.

SOIL

Cycad habitats range from sandy beaches, *E. ferox*, to heavy clay soil in the case of *E. longifolius* in the Suurberg reserve (See Colour Figure 15) to limestone cliffs, which is favoured by *Cycas clivicola*. Based on habitat information it seems you can grow them in just about any soil type, if you take the habitat conditions into consideration! Most cycad growers are aware that cycads need a well-drained soil to grow in. So what is meant by a "well-drained" soil? If it does not become soggy or waterlogged, I consider it well drained. Very few of us are lucky enough to have a good loam soil, with lots of organic material, in the garden.

CLAY SOIL

Let us look at clay soil first. A popular misconception is that you cannot grow cycads in clay. This is certainly true if your clay patch is nice and level, preventing the water from running off and becoming waterlogged. Digging a hole in the clay and filling it with the best soil any cycad can wish for, only serves to aggravate the problem. What you have created is a sump that will fill up with water and eventually kill the plant. Clay is very dense and effectively seals the sides of the hole, keeping the water in the hole and preventing it from seeping into the surrounding soil. One solution if you have clay soil, is to create a slope to let any excess water run off. When you plant a cycad, use the soil you dug out, to put back in the hole. This keeps the soil uniform, thus avoiding a sump.

A second method you can use on clay, is to build a little "hill" on top of the clay with better soil. Use large rocks to keep the top soil together and prevent it from being washed away. The water can now drain through this soil, onto the clay, and then run off, without leaving the soil waterlogged.

SANDY SOIL

Sandy soils drain very well but this creates other problems for the gardener. Sand typically has very little mineral content making it poor in nutrients for the plants. Because it drains so well most of the nutrients are leached out of the soil and lost to the plants unless the gardener applies more fertilizer. Not only are nutrients lost, but the water runs off and the soil dries very quickly. Any succulent grower will tell you that sandy soil is the preferred medium for plants

like *Conophytum* and *Lithops*, simply because it dries out quickly, preventing rot from setting in.

To improve sandy soil, add compost to enrich and enhance its water retaining abilities.

SOIL pH.

As long as the pH is within a range of 6.5 to 7.5 you should have no problems. Effecting a long lasting change is difficult and best avoided.

COMPOST AND MULCHING

Cycads respond favourably to good compost, just like any other plant in your garden. Cycads are slow growing in nature but if provided with optimum conditions and nutrients, some species become really fast growers. It is also easy to make your own compost from old leaves, grass cuttings and other garden material. Locked up in this material is the fertiliser you applied last season. If you just discard it, your expensive fertiliser goes with it to the refuse dump!

Mulching has a number of advantages for the gardener. It keeps the soil cooler and improves moisture retention. It is also beneficial to the coralloid roots close to the soil surface. It also helps to minimise weed growth and therefore competition for nutrients.

WATER

More plants have been murdered by watering too much than from neglect. Once established large mature cycads can withstand long dry periods. Once again a look at the habitat will provide a clue as to the water requirements of the plants. Cycads from rain forests will require more water, throughout the year, than a species from a semi-arid area, like *Encephalartos lehmannii*. Generally, cycads with broad, green pinnae will need more water than species with narrow, bluish pinnae. Younger plants should also be watered more regardless of species, since they have not built up the necessary reserves to withstand long dry periods.

SUMMARY

Growing cycads is easy and very rewarding if you stick to the basic principles. Germinating a seed and growing it to maturity does not take a lifetime because we can, in our gardens, provide the ideal conditions. In the next issue we shall look at fertilizers and how to grow plants from seed. If you have not already done so, acquire a book on cycads and read it from cover to cover. Our website has a list and reviews on some of the books available. [See www.cycadsociety.org]

MAN GAVE NAMES TO ALL THE PLANTS

André Cilliers

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Received 23 September 2004

Whether you believe in Creation, evolution or any other origin of the species, one thing is certain and that is that the biodiversity on this planet boggles the mind. The insect kingdom alone is so fantastically diverse, that new species are being discovered almost daily. Not even to mention the microbial kingdom, where it is estimated that the number of described microbes is less than 10% of the total number of species out there. Probably the best-described kingdom is the animal kingdom where we have been able to see and describe the species with relative ease. The sea, no doubt, has a great number of undisclosed secrets waiting to be discovered. The same is true for the plant kingdom. Some of the readers may know the statistics of undescribed plant species estimates. I do not even want to venture a guess.

The science of naming living organisms is called taxonomy and many of us may know that we (human beings) are *Homo sapiens*. If you did not know that, where have you been? This scientific name consists of two parts (binomial nomenclature) namely the genus name, in this case *Homo* and the specific name [or epithet, Ed.], in this case *sapiens*. These names are Latinized since Latin is the language of science. But how did this all start?

A long long time ago there lived a Swedish man called Karl von Linne (1707– 1778) or Linnaeus, as he preferred to call himself. He took note of the situation on Earth and decided to attempt to bring a little order into the plant and animal kingdoms. He then took upon himself the enormous task of attempting to describe and name all of the known plant and animal species at the time. He also came up with the system of binomial nomenclature (mentioned above) which is still used today. After the species name the authority can be found. This is the name (or a reference to) the person who first described the specie. Many species names will have the authority of L., which means the species was described by Linnaeus himself (eg *Homo sapiens* L.).

When a new species is collected, the taxonomist must first establish whether the species has been described before. This can lead to some confusion, as was the case with *Encephalartos striatus* and *E. umbeluziensis* (this issue was clarified by Prof Nat Grobbelaar in *ENCEPHALARTOS* No. 77, March 2004).

If the species has not been described before, the taxonomist can describe it, using certain scientific criteria, depending on what it is that is being described. In the case of cycads the criteria include detailed leaf, cone and seed morphology (Vorster and Heibloem, *South African Journal of Botany*, 61(6): 347–351 is an example). In the case of plants, herbarium material is also filed for preservation and reference. The new description is then submitted for publication in a recognized botanical journal

and the submitted paper is “peer reviewed” by other botanical taxonomists for validity and scientific content. If found to be acceptable, the publication is released and a new species is legitimized.

In some cases it can be that a species has variation within the population. An example of this is certain plant pathogenic fungi. It has been shown that a specific pathogenic fungal species may have isolates that are specific to a host plant species. The population of *Fusarium oxysporum*, for example, may contain isolates that are pathogenic only to banana. Other isolates may not be pathogenic to banana, but to maize only. Here we have a “*forme specialis*” situation. This means that we refer to a “special form” of the population or species. We then refer to the pathogen as *Fusarium oxysporum* forme *specialis* Zea, which is the specific form found on maize. Now we start to get into serious population dynamics, including the variation within populations.

In the cycads, we have seen a move (in some cases) towards sub-species as is the case with *Encephalartos barteri*. Here there has been enough variation observed in a sub-population of the species to justify the recognition of two subspecies (*E. barteri* subsp. *allochrous* and subsp. *barteri*).

In the cycads (perhaps especially *Encephalartos*) there is SO MUCH VARIATION within the species, that one needs to keep a cool head when it comes to splitting species, and even describing new ones. Look at the tremendous variation within the various populations of *E. natalensis* and *E. trispinosus* as an example. Collectors have always (and correctly so) spoken of the “Kranskop” form of *E. natalensis* and so on. This gives the plant a specific identity without placing the plant in a subspecies or new species.

What is important is to bear in mind, at all times, WHAT MAKES A SPECIES A SPECIES. Here most of us are in the dark, including me. This is up to guys who have dedicated their lives to studying plants, and describing them. An interesting new form of *E. trispinosus* does not mean that it is necessarily a new species. It is most probably just a variation within the existing species. However, new species DO come up from time to time which are dramatically different from existing ones and these should be described.

VARIATION within a species is something that is a natural thing, and Europeans, Africans and Chinese do not belong to different species according to the modern laws of taxonomy, even though we all appear to be very different physically. If somebody feels that we are different species, then that person should follow scientific channels mentioned above and motivate why the species should be split.

A recent cycad publication has just seen the light where the taxonomy of the *Encephalartos* species (or at least some

of them) has been totally jumbled. New names have been allocated to old described species, and variations of certain described species have been classed on their own, with new, totally unrelated names. This process, to my best knowledge, was undertaken unscientifically and therefore holds no water. The process of describing a new species, as was set out above, was not followed in this book and, in my opinion, all "scientific" names in the book relating to cycads should be ignored. It is a pity that the cycad taxonomy, which is difficult enough as it is, should be thrown into further disarray by publications such as this one. A far more sensible approach would have been to scientifically distinguish subspecies or specific forms of the cycads and follow the correct paths to name the plants accordingly.

[Botanical Latin has its origin in the use of Latin by the Romans who wrote about plants and most notably Pliny the Elder (A.D. 32- 79). Latin has survived through the Middle Ages to the eighteenth century and was widely used in Europe for diplomatic, legal and ecclesiastical purposes. Carl Linnaeus (1707-1778) wrote his works in Latin and made it possible for botanists from all over Europe to read and understand it. The few botanists in Europe at the time followed his example and thus contributed to a common pool of knowledge, crossing the barriers of geographical isolation. (Stearn, William T, Botanical Latin, 4th Ed. 2000) Botanical Latin (\$30-\$40 from Barnes & Noble) is a good book for anyone curious about the names of plants and will keep you reading for a long time. It is in my library and regularly consulted! Ed.]

LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Value, availability and demand: what is going on?

I love all the cycad species, yet one thing has never tied up for me, and that is the value (cost), availability and demand of some of the species. If we look at the pricing structure of the South African species of *Encephalartos*, the same pattern emerges time and again with a little variation from time to time. The pattern is this: *E. latifrons*, *E. cupidus*, *E. dyerianus*, *E. woodii* etc. are very rare and therefore very expensive. *E. ngoyanus*, *E. humilis*, *E. ghellinckii*, *E. cycadifolius* and *E. msinganus* are much less expensive per cm, BUT JUST TRY FINDING THESE AT A CYCAD NURSERY!!!! They are practically unavailable at most cycad nurseries while the rarer species are often easier to get hold of (at a price). They are without doubt more common in nature, but they are certainly not common in nurseries.

This has always tickled me. Does nobody want these plants because they are less spectacular than the others? Or does nobody want to grow them because there is not a big return on the seedlings? I have a soft spot for the "less spectacular" species such as *E. ghellinckii*. Just look at the attached photo of a beautiful specimen of the lowland form that has two sets of leaves at the moment (rather rare for species such as *E. lanatus*, *E. humilis* and *E. ghellinckii*). Since this plant has been in my possession, it has had two sets of leaves most of the time. It is now busy shedding the old set, but I see that the crown is nice and ripe for a new set, or perhaps a cone (I still do not know the sex of this plant)!!!



Let's try to get a few more of the less spectacular (yet equally beautiful) species into circulation. If there is a cone that needs pollen, let somebody know and a plan can be made to generate seedlings of these orphans!!

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[*E. cycadifolius* is available from Kirstenbosch Botanical Garden Nursery from time to time. I had three plants of which two survive and regularly produce flushes of leaves. A question we need to get an answer to is what happens to all the suckers harvested from the *E. woodii* plants at Durban Botanical Garden and Kirstenbosch Botanical Garden? Ed.]

Young hope for Cycads

If you attended a general meeting or see the membership list of a Nature or Environmental Organisation (NGO) in South Africa, it's normally noticeable that such an organisation is dominated by older, white, often wealthy and mostly English first language members. Although these people were and are the backbone of many success stories, it is always refreshing to see a young new face making an appearance. Philip Rousseau is such a person.

Philip is a Grade 11 pupil from Hoërskool Waterkloof and he excels in his research on *Encephalartos* species, for which he has won numerous awards. His interest in cycads began when he was in primary school. For as long as Philip can remember, his father, Robert (Society membership nr 2171), has collected cycads, and it was he who installed his son's love for them.

Although Philip has conducted many different projects on cycads, his main project began in 1998, which was about the artificial pollination effort of *Encephalartos middelburgensis* in the small Rhenosterpoort Nature Reserve. His project has different categories, which include, general characteristics, conservation, first and second fertilisation, germination and seedlings. Philip has won gold at the annual Hoërskool Waterkloof Expo, which permitted him to enter the Northern Gauteng Expo, where he has also achieved gold. In 2002 he also received the National Botanical Institute's First prize and his project was exhibited at the Education Centre of the Pretoria Botanical Garden. He has won the UNISA Trophy for Environmental Education, which was presented to the learner from Hoërskool Waterkloof, which had made the biggest contribution to Conservation.

In 2003 he repeated his 2002 success and received the University of Pretoria's Engineering Faculty, Best Overall Senior Project award. This enabled him to attend the National Expo. He won the National Botanical Institute Award and was chosen as one of only five pupils to represent South Africa at the European Science Expo in Dresden, Germany during July 2004. There was a huge response and interest in his project. The Expo was not in a competition format, but the experience and international exposure was wonderful.

Due to his superior knowledge Philip also lectures to his fellow learners in Grade 11 Biology on gymnosperms. He is also instrumental in the annual tree-planting week at school where they concentrate on *Encephalartos* species. Philip's project is also available on the South African branch of the Internet Company called Eco Port (www.ecoport.org). He is also working on the updating of Eco Port cycad records. Philip has donated his project to the Rhenosterpoort Nature Reserve's Museum. The future for the *Encephalartos* species in Africa looks a bit brighter, as young enthusiastic people like Philip get involved.

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[It is certainly very encouraging to see younger people getting involved in conservation and cycads. All too often the news, like the newspaper clippings in this issue, is negative and the kind of publicity cycad growers don't need. Keep up the good work Philip. Ed.]

