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Western Cape /Wes-Kaap

Vakant / Vacant

On the cover:

Zamia pyrophylla, a new species from Colombia, in habitat. See New Publications on page 10. Photo by Michael Calonje, Montgomery Botanical Center.

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Disclaimer

The Cycad Society of South Africa, editor and board members, and authors of articles cannot be held responsible for errors or consequences arising from the use of information contained in ENCEPHALARTOS. The views and opinions expressed do not necessarily reflect those of the Cycad Society, editor, and board. The publications of advertisements do not necessarily constitute any endorsement by the Cycad Society, editor, and board of the products advertised.

FROM THE PRESIDENT

We've been greeted with a very hot spring and are waiting with great anticipation for our first summer rains. Several of my cycads have started to push leaves and cones and I believe many to come. I'm busy placing my seed into the germination beds and have a good amount of work to do. Like most hobbyists I still have to clear the beds of the last of the previous year's seedlings.

The positive feedback to issue 100 was very rewarding and makes one positive for future issues. Hope you will forgive the few errors thanks to the printer's devil!

The final draft of the constitution was provided in issue 100 for voting by members. The voting ballot was not provided, but is in this issue. [See "From the Counsel" in this issue. Ed.] There were a few hyphenation errors in the Afrikaans draft of the constitution but those will be fixed before the final document is made available to members. If approved by the members, the new constitution can be provided to members as a separate publication on request. I request all members to please vote either by snail mail or e-mail. See the ballot paper for details and remember it's important to supply your membership number.

Most of you are aware of the serious poaching of rhinoceros for their horn and it falls in the same league as cycad poaching. Several officials of the Department of Environmental Affairs were recently arrested because of possible involvement in the poaching of *E. middelburgensis*. It is always a major concern if the custodians are involved with poaching.

Since I was voted in as President of the Society in 2008 there was always hostility towards me from the management committee of the Central Branch. This was the direct result of the TOPS (Threatened or Protected Species regulations) debate and most likely the temporary suspension of Prof. Nat Grobbelaar's membership by the Board. The TOPS regulation was successfully negotiated with the Department of Water and Environmental Affairs. The reason and lengthy discussions involved that led to Prof. Nat's temporary suspension are too cumbersome to discuss in this text. An apology was given to Prof. Nat and he accepted it as such. When we asked for nominations for Board members for the current term, none was received. I fooled myself to think that this lack of nominations meant that I had the support of the management committee of the Central Branch. A Request to have a meeting with them was at the time of this writing still unanswered. I must wonder whether these actions carry the approval of the Central Branches members!

As a veterinarian in private practice with limited free time, I decide how I will use my free time. My family is my most important user of my free time and lately I was using more of their time to try and resolve Society related issues. This led me to the decision to resign as president and this will be my last "From the President".

God Bless.

Regards
Xander de Kock

JAARLIKSE PLANTVERKOPE TE KIRSTENBOSCH OP 20 EN 21 MAART 2010. / ANNUAL PLANT SALE AT KIRSTENBOSCH ON 20 AND 21 MARCH 2010.



Figuur 1.—: Van vroeg oggend af is tou gestaan voor die hek.

Reeds van so vroeg as vyf uur die oggend van 20 Maart 2010 het die eerste persone (Figuur 1) hul plek voor die toegangshek ingeneem. Toe die hek teen negeuur oopmaak, was daar reeds 'n lang ry mense wat geduldig buite gewag het met 'n kruitwa, om hul dag se aankope na hul voertuie terug te neem. 'n Paar plante in plastieksakkies kan nogals swaar word as jy dit moet terug dra na jou voertuig.

Binne die verkoopsarea het al die verskillende afdelings wat hul produkte en/of plante te koop aangebied het, elkeen sy eie stalletjie met 'n uitstal ruimte gehad. Hierdie mense (Figuur 2) het ewe geduldig by die broodboom afdeling tougestaan om 'n broodboom of meer aan te koop. Dit was ongelooflik om te sien hoe sommige persone aangehardloop gekom het om voor in die ry te staan om sodoende eerste by daardie skaarste plante uit te kom wat te koop aangebied was.

Kirstenbosch Botaniese Tuin, Prof Frederick de Jager en Jaap Viljoen het plante te koop aangebied. Lede van die Wes-Kaap Tak het vrywillig gedurende die twee dae met die verkope gehelp. In Figuur 3 is twee van die helpers, Aubrey

As early as 05h00 on the morning of 20 March 2010, the first person (Figure 1) started queuing at the main entrance gate. When access was finally allowed at 09h00, there was already a long queue of potential buyers, patiently waiting with wheelbarrows in hand, in order to transport any purchases back to the car park. A few plants in plastic bags can become quite heavy if they have to be carried over long distances.

All the various departments had their own stalls to display their own products and/or plants. These people, (Figure 2) also queued patiently in front of the cycad section in order to acquire a rare cycad or two. It was quite surprising to see the rush of buyers jostling for places to be able to purchase these scarce plants.

Kirstenbosch Botanic Garden, Prof Frederick de Jager and Jaap Viljoen all had plants for sale and members of the Western Cape Regional Branch assisted with the sales over the two days. In Figure 3 we see Aubrey Kable and Charl Gouws, together with Prof de Jager taking a well-earned rest from all the activities. Hans Viljoen was another willing helper and yours truly manned the cycad "information



Figuur 2.—: Toustaan vir 'n broodboom



Figuur 3.—: Aubery Kable, Charl Gous en Prof Frederick de Jager



Figuur 4.—: Vroulike en manlike keëls

Kable en Charl Gous, saam met Prof De Jager onverhoeds betrap toe hulle 'n blaaskans gevat het. Hans Viljoen het ook fluks met die verkope gehelp. Skrywer het die broodbome "inligtingslokaal" die Saterdag beman en Johan Kotze die Sondag. Heelwat van die kopers het vroeë gevra wat gehandel het oor verskillende aspekte van broodbome. Daar was persone wat wou weet hoekom hulle broodbome se saad nie wil ontkiem nie. Van hulle was nie bewus dat daar manlike en vroulike plante is nie en dat keëls bestuif moet word nie. Navrae rondom die bekom van 'n besitpermit/vervoerpermit soos uitgereik deur Natuurbewaring moes ook beantwoord word. Die verwydering van suiers, die waarde van 'n plant, hoeveel spesies daar is, waar anders as by die jaarlikse plantverkope plante te koop is ensovoorts was van die ander navrae, om maar net 'n paar te noem, wat beantwoord moes word. Ons vertrou dat met die volgende plantverkope daar meer van die Tak se lede beskikbaar sal wees wat die "inligtingslokaal" sal beman en sal help om navrae oor broodbome tydens die verkope te beantwoord.

Dit is baie lekker om vroeë te beantwoord as dit met die hulp van goeie hulpmiddels verder verduidelik kan word. Hulpmiddels soos hierdie vroulike keël, die inspuitingnaald en die manlike keël (Figuur 4) het bygedra tot 'n verstaanbare verduideliking van bestuiving van plante en om die verskil tussen manlike en vroulike plante uit te wys.

Die uitstalling van insekte wat geassosieer word met broodbome (Figuur 5) het ook baie belangstelling gewek en vroeë ontlok. Weereens was hierdie 'n uitstekende hulpmiddel wat beskikbaar was in die inligtingslokaal.

So gaan mens te werk, is daar gesê en verduidelik, om jou eie broodbome te kweek. Hierdie bakkie met saad (Figuur 6) moes voortdurend onder die oog gehou word. Almal wou 'n saad of twee hê of koop. Persone wat vroulike plante besit is aangemoedig om hulle plante te bestuif of iemand van Kirstenbosch of die Wes-Kaap Tak te nader om die plante te bestuif. Persone is gewaarsku om nie onwettige plante te koop nie.

Baie dankie aan Phakamani Xaba van Kirstenbosch wat al die hulpmiddels tot ons beskikking gestel het. Daarsonder sou ons taak om broodbome verwante inligting aan kopers oor te dra, baie moeiliker gewees het. Die samewerking tussen Kirstenbosch en die Wes-Kaap Tak tydens die plantverkope was uitstekend.



Figuur 5.—: Insekte geassosieer met broodbome

center" on Saturday, with Johan Kotze on duty on Sunday. There were a lot of questions on various aspects of cycads, including why their cycad seeds don't germinate – they were not aware that the plants are dioecious. There were also a number of queries regarding ownership and transport permits; the removal of suckers; the value of plants; the number of indigenous species of cycads, to name a few. It is hoped that more members of the Society will be in attendance to answer questions at the next cycad sale.

It is a pleasure to answer questions with the assistance of various aids such as the female cone, syringe and male cone, (Figure 4). This made explanation of pollination an easy task.

The display of insects associated with cycads (Figure 5) also created a considerable amount of interest as well as a number of questions.

The dish of seeds (Figure 6) had to be watched carefully as there were quite a few requests "for a seed or two" Owners of female plants were encouraged to pollinate their cones or call for assistance from Kirstenbosch or members of the Western Cape branch. The public were also warned not to purchase "illegal" plants.

Out thanks goes out to Phakamani Xaba of Kirstenbosch who provided the visual aids and without his assistance it would have been very difficult to carry over information to prospective buyers. The co-operation between Kirstenbosch and the Western Cape branch during this period was exemplary.

The following brochures were available and were handed out to the public, namely:

- (i) Information concerning the Cycad Society of SA well as an application for membership form.
- (ii) Cycads Part 1, Propagation.
- (iii) Cycads Part 2, Propagation.
- (iv) Cycads Part 3, Cultivation.

Earlier copies of the journal *Encephalartos* were on display as well as posters, which enhanced the appearance of our stall. Leaves of most species of cycads were on display as well.

I would have liked to provide a list of cycad species and numbers sold, including their costs, but unfortunate-

Die volgende pamflette was ook beskikbaar en is aan die kopers uitgedeel, naamlik:

- (i) Inligting oor die Vereniging tesame met 'n aansoek om lidmaatskap.
- (ii) Broodbome Deel 1, Vermeerdering.
- (iii) Broodbome Deel 2, Vermeerdering.
- (iv) Broodbome Deel 3, Kweking.

Ouer uitgawes van ons tydskrif die ENCEPHALARTOS is ook uitgestal. Daar was 'n verskeidenheid van plakkate wat mooi kleur aan ons inligtingsentrum verleen het. 'n Blaar van die meeste broodboom spesies was beskikbaar en is uitgestal.

Ek sou graag 'n lys van die broodboom spesies en hoeveelhede wat tydens hierdie plantverkope verkoop is, met die pryse wat per plant gevra was, hierby wou insluit. Ongelukkig is hierdie inligting nie tot my beskikking nie. Moontlik DV na volgende jaar se plantverkoop is so 'n lys beskikbaar.

Die enigste opmerking wat ek wil maak is dat ten spyte van ons twee dae se harde werk en dae se voorbereiding vir die plantverkope, daar tydens die verkoping slegs een nuwe lid gewerf kon word om by die Broodboom Vereniging aan te sluit. Wie weet, dalk was al die ander persone wat kom plante koop het, almal alreeds lede?

My dank aan elk persoon, helper, koper en verkoper en wat 'n bydrae gelewer het om 2010 se broodboomverkoop tydens Kirstenbosch se plantverkope 'n sukses te maak.

Artikel en foto's deur Frikkie Conradie



Figuur 6.—: Ontkieming van saad.

ly this information is unavailable. Hopefully a list will be made available after next year's sale.

My only regret is that despite out two days of hard work and, all the preparation before the event, only one new member was signed up – who knows, perhaps all the other buyers are already members of the Society!

Finally, I wish to express my thanks to all the assistants, buyers, sellers and anyone else who contributed to the success of the 2010 cycad sale.

Article and photo's by Frikkie Conradie

IN MEMORIAM

KEN D. HILL

6 August 1948 – 4 August 2010

It is with great sorrow that we record the passing of one of the world's leading cycad biologists, Ken D. Hill, who died in Sydney on 4 August 2010 after a protracted illness.

Ken spent his entire botanical career with the Royal Botanic Gardens, Sydney, Australia, with cycad and eucalypt systematics and bioinformatics as his principal research interests. He travelled widely and was a regular participant at the various 3-yearly International Conferences on Cycad Biology. His participation in CYCAD 93 led him to visit South Africa and meet with many of the members of our Society in Pretoria, Durban, Port Elizabeth and Cape Town. Ken was also the Australian Botanical Liaison Officer at the Royal Botanic Gardens, Kew, England, from mid 1997 to mid 1998.

Ken served on the IUCN/SSC Cycad Specialist Group and provided invaluable information on the conservation status of the Australian and Asian cycads. His expertise with electronic media was instrumental in him establishing the "Cycad Pages" website in 1998. These pages still maintain their position as the foremost global electronic cycad information resource. Ken has published widely in the scientific press, describing 51 new *Cycas* taxa and 4 new *Macrozamia* species. He has also co-authored the popular books "Cycads of Australia" and "Cycads of Vietnam". Ken maintained an active international association with professional and amateur botanists in many countries and will be remembered for his friendly manner and entertaining sense of humour.

We pass on our sincere condolences to Ken's wife, Lesley Greenwood, and his daughters, Phoebe and Zoë. To Ken's colleagues at the Royal Botanic Gardens in Sydney, and to his numerous cycad friends throughout the international community, we share your loss. Let us be sure to remember the significant contributions made by this wonderful man.

Roy Osborne
19 Calhoun Street, Macdowall,
Queensland 4053, Australia



Figure 1.—: Ken Hill inspecting *Encephalartos transvenosus* at Modjajdi's Kraal, Northern Province, South Africa, in July 1993. Photo kindly supplied by the Royal Botanic Gardens, Sydney, Australia.

CALL FOR ARTICLES

ENCEPHALARTOS invites members to submit articles and/or photos on any subject related to cycads. Cultivation notes, special gardens or habitat visits, notes on conservation, traditional usage and natural history are all welcome. Please note too that you do not have to write a scientific treatment! Articles by enthusiasts are just as welcome. If you are not published the first time you submit, do not despair but keep on submitting.

There is a prize for the article judged to be the best of 2010. This year it is a copy of Prof Nat Grobbelaar's book on our *Encephalartos* species. It is one of the best books a cycad grower can have in his library and every member is invited to contribute to win his own copy.

Articles must be in a simple format and sent in a text file. **All photos must be clearly identified and captions provided in a separate text file or at the end of the article text. Do not use captions as file names!**

If you need advice, a sample file or more information about the format you must use, please contact the editor via e-mail. See also the inside of the back page for details and please submit via email to the editor.

NOTE: No advertising is allowed, unless it was previously arranged and paid for.

Wynand van Eeden
Editor / Redakteur

THE CYCAD SOCIETY OF SOUTH AFRICA ANNUAL FINANCIAL STATEMENTS

FOR THE YEAR ENDED 31 DECEMBER 2009

BALANCE SHEET AT 31 DECEMBER 2009

	2009	2008	2007
	R	R	R
ASSETS			
Non-current assets			
Non-current assets - net book value	617	983	1,350
Current assets			
Inventory - back issues	38,012	41,442	10,000
Inventory - grow cycads	1,355	0	0
Inventory - grow clivias	691	0	0
Bank balances	631,881	548,247	395,806
Petty cash float	754	732	30
	<u>673,310</u>	<u>591,404</u>	<u>407,186</u>
EQUITY AND LIABILITIES			
Capital and reserves			
Accumulated reserves	551,986	471,273	338,448
Current liabilities			
Sundry creditors	36,887	36,749	8,750
Accruals	84,437	83,382	59,988
	<u>673,310</u>	<u>591,404</u>	<u>407,186</u>

I hereby declare that I am not a member of the Cycad Society of South Africa, and I have no interest in its financial affairs. These financial statements have been compiled from information and explanations received from the President and Officials of the Society.

I hereby certify the the Balance Sheet and Income Statement for the year ended 31 December 2009 are in accordance with the accounting records.

ALAN SOLEY
Pretoria
12 May 2010

THE CYCAD SOCIETY OF SOUTH AFRICA

INCOME STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2009

	2009	2008	2007
	R	R	R
Income	275,387	244,522	209,627
Subscriptions	202,438	172,056	148,165
Donations - general	10,199	9,693	11,927
Donations - research	9,420	8,654	6,302
Sales - back issues	8,014	406	7,162
Sales - grow cycads	940	3,557	5,114
Interest received on bank balances	42,751	46,587	27,632
Sundry income	0	3,569	0
Advertisements	1,625	0	3,325
Less: Expenses	194,674	111,697	164,867
Auditor's remuneration	500	500	500
Assets under R2 000	2,583	0	0
Bank charges	2,931	2,043	1,946
Board meeting costs	13,103	0	9,614
Branch transfers	1,573	2,966	8,250
Costs - grow cycads	3,772	2,826	2,869
Depreciation	367	367	367
Encephalartos' publication and printing costs	81,352	54,294	93,612
Goode's prints purchased	2,586	0	0
Internet costs	1,730	2,473	1,162
Legal expenses	40,106	0	0
Postage and photo copies	36,687	34,251	42,865
Refreshments	38	68	0
Repairs	1,680	0	0
Stationery	3,359	0	0
Telephone	2,307	0	0
Travel expenses	0	11,909	0
Voting costs	0	0	3,682
Net surplus for the year	<u>80,713</u>	<u>132,825</u>	<u>44,760</u>
Accumulated reserves at beginning of year	471,273	338,448	293,688
Accumulated reserves at end of year	<u>551,986</u>	<u>471,273</u>	<u>338,448</u>

NEW CONSTITUTION

In the last issue you received a copy of the new constitution. Only one person submitted a comment, so it is now up to the members to decide if they want to implement it.

In this issue you should find a ballot paper to fill in and then post to the Secretary. His address is P.O. Box 176, Montana Park, 0159. If you have access to e-mail you can send your vote to cycad@cycadsociety.org.

If you post the ballot paper please make sure you add your NAME and MEMBERSHIP NUMBER on the ballot

paper. If you prefer to submit your vote by e-mail please put in the SUBJECT of your message CONSTITUTION and in the body add your NAME, MEMBERSHIP NUMBER and YES, I accept the new constitution or NO, I do not accept the new constitution.

If your NAME and MEMBERSHIP NUMBER are not given, it will result in a spoiled ballot.

Ian Bassingthwaighte
Secretary / Sekretaris

NEW MEMBERS

The Society welcomes the under mentioned new members who joined between May and September, 2010.

3732	CROWE, Mr D K	WARNER BEACH
3733	EDWARDS, Mnr T X	MEERENSEE
3734	JOUBERT, Mr L M	KRUGERSDORP
3735	KALTENBRUN, Mr G B	MAYTIME CENTRE
3736	MUSEO de DIDOSAURIOS	Salas de los Infantes (BURGOS), Spain
3737	POHL, Mnr I P W	BARBERTON
3738	RAUBENHEIMER, Mr M	LYTTELTON
3739	SPENCE, Mr R M	MORELETA PLAZA
3740	VAN JAARSVELD, Mev E	DANHOF
3741	HOPE, Mr S T	RANDJIESFONTEIN
3742	VAN DER MERWE, Mnr A S P	POLOKWANE
3743	VAN DEVENTER, Mnr G J	MAGALIESKRUIN
3744	BRINK, Mev E	MAGALIESKRUIN
3745	SCHREUDER, Mnr H D J	NELSPRUIT
3746	WOLMARANS, Mnr J T J	HOEDSPRUIT
3747	BEZUIDENHOUT, Mr J P	BEACON BAY
3748	FLORES, Mnr J & Mev S A	PACALTS DORP
3749	DU TOIT, Mnr F P J	GROBLERSDAL
3750	SWANEPOEL, Mnr J H	DE LA HAYE, Bellville
3751	SWART, Mev H	GREENACRES
3752	VILJOEN, Mnr J H	CAPITAL PARK
3753	BAVEREY, Mr C D	HILLCREST
3754	GOMEZ, Mr R J S	METRO MANILA, Philippines
3755	KOTZE, Mnr B P	PHALABORWA
3756	MADONDO, Mr C	CATO RIDGE
3757	TREWICK, Mr J	MINNEBRON

Ian Bassingthwaighte
Secretary / Sekretaris

NEW PUBLICATIONS

ALTANER, C.M.; JARVIS, M.C.; FISCHER, J.B.; & MARLER, T.E. 2010. Molecular xylem cell wall structure of an inclined *Cycas micronesica* stem, a tropical gymnosperm.

IAWA Journal 31(1): 3–11.

The molecular structure of tracheid walls of an inclined eccentrically grown stem of *Cycas micronesica* did not differ between the upper and lower side. The absence of the typical molecular features of compression wood tracheids, .ie. an increased galactose and lignin content as well as an increased microfibril angle, indicated that this cycad does not have the ability to form even very mild forms of compression wood, which lacks anatomical features commonly observed in compression wood. Analysis of the sugar monomers in *C. micronesica* tracheids did reveal a rather unique composition of the non-cellulosic polysaccharides for a Gymnosperm, in that the low mannose and high xylose content resembled a cell wall matrix common in Angiosperms. The crystalline cellulose structure in *C. micronesica* tracheids closely resembled those of secondary cell walls in *Picea sitchensis* tracheids. However, the spacing between the sheets of cellulose chains was wider and the cellulose fibrils appeared to form larger aggregates than in tracheids of *Picea sitchensis*.

Senior author's address: School of Biological Sciences, University of Auckland, Auckland, New Zealand.

E-mail: c.altaner@auckland.ac.nz

CALONJE, M.; & MEERMAN, J. 2009. A new species of *Zamia* (Zamiaceae) from the Maya Mountains of Belize.

Journal of the Botanical Research Institute of Texas 3(1): 31–41.

Yet another new species, *Zamia decumbens* (see Figure 1 and 2), has been described from Belize. This is another species habitually found in sinkholes (another is *Z. prasina*), though some were also found on rocky mountain tops or ridges. The surrounding vegetation comprises tropical evergreen forest. It was observed growing with *Zamia variegata*, *Ceratozamia robusta*, *Chamaedorea adscendens*, and *C. schippii*, all trouble-free in cultivation outside their natural range.

The stems of *Z. decumbens* are globose or, if cylindrical, decumbent (hence the name) and up to 80 cm long by 6 to 11 cm thick. The leaves are up to 17 in number, 90 to 170 cm long of which the petiole accounts for 30 to 50 cm. The petiole is armed with 5 mm long prickles. The leaflets are 17 to 30 cm long and 2.8 to 4 cm wide, straight or somewhat sickle-shaped, tapering gradually to the apices and each with a distinct longitudinal furrow, the margins are entire or with a few teeth near the apices, and the texture is paper-like.

Though several populations were found, they were all small; and the authors consider *Z. decumbens* to be potentially critically endangered should commercial collecting be instituted.

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CALONJE, M.; & STEVENSON, D.; CALONJE, C.; RAMOS, J.A.; & LINDSTRÖM, A. 2010. A new species of *Zamia* from Chocó, Colombia (Cycadales, Zamiaceae).

Brittonia 62(1): 80–85.

Zamia pyrophylla is described from Colombia, from a region said to be one of the most biologically diverse on earth. (See Figure 3 and 4)

The stem is underground, up to about 10 cm across. Only one or two leaves are carried, but these are 1.1 to 3.4 m long, of which the petiole accounts for 0.75 to 2.4 cm. The petiole is heavily armed with prickles of up to 5 mm long. The leaflets are 28 to 50 cm long by 2 to 7 cm wide, straight to somewhat sickle-shaped. The apices are acute to acuminate, and margins entire. The texture varies from paper-like to leathery. The emerging leaves are maroon, turning orange or reddish, and finally turning green.

To some extent it resembles *Z. cunaria* and *Z. ipetensis* from adjacent Panama, all with seldom more than one leaf, underground stems, and various other similarities; but can be distinguished by its entire leaflets, its much longer leaves, and a number of other characteristics.



Figure 1.—: *Zamia decumbens* in habitat. Photo: Michael Calonje

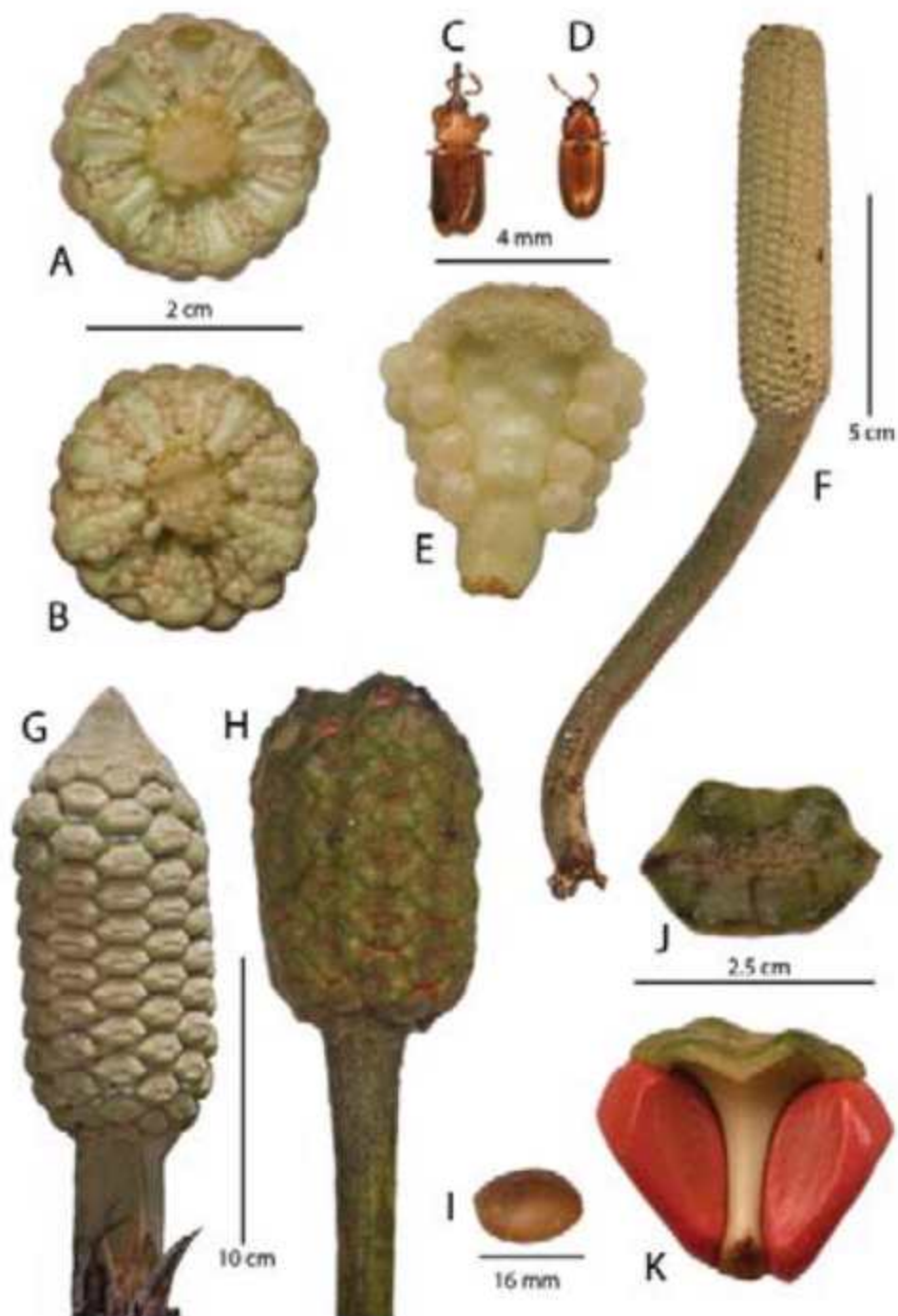


Figure 2.—: Cone detail of *Zamia decumbens*.

The average rainfall where these plants were found is 8558 mm, making it one of the wettest on earth. The plants grow in rainforest, 10 to 100 m above sea level, but thrive and cone in full sunlight after forest clearing.

The total distribution area seems to be about 25 m², and it is threatened by agriculture.

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CIBRIÁN-JARAMILLO, A.; DALY, A.C.; BRENNER, E.; DESALLE, R.; & MARLER, T.E. 2010. When North and South don't mix: genetic connectivity of a recently endangered oceanic cycad, *Cycas micronesica*, in Guam using EST-microsatellites

Molecular Ecology **19**: 2364–2379.

Subject to environmental changes and recurrent isolation in the last ca. 250 million years, cycads are often described as relics of a previously common lineage, with populations characterised by low genetic variation and restricted gene flow. The authors found that on the island of Guam, the endemic *Cycas micronesica* has most of the genetic variation of 14 EST-microsatellites distributed within each of 18 genetic populations, from 24 original sampling sites. There were high levels of genetic variation in terms of total number of alleles and private alleles, and moderate levels of inbreeding. Restricted but ongoing gene flow among populations within Guam reveals a genetic mosaic, probably more typical of cycads than previously assumed. Contiguous cycad populations in the north of Guam had higher



Figure 3.—: *Zamia pyrophylla* in habitat. Photo: Michael Calonje.

self-recruitment rates compared to fragmented populations in the south, with no substantial connection between them except for one population. Guam' genetic mosaic may be explained by the influence of forest continuity, seed size, soil differences, and human transportation of cycads. Also important are the extent of synchrony among flushes of female cones and restricted pollen movement by an obligate mutualist and generalist insects. An NADH EST-locus under positive selection may reflect pressure from soil differences across Guam. This and three other loci are ideal candidates for ecological genomic studies. Given this species' vulnerability due to the recent introduction of the Cycad *Aulacaspis* Scale, the authors also identified priority populations for *ex situ* conservation, and provided a genetic baseline for understanding the effects of invasive species on cycads in the western Pacific and islands in general.

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NELSON SUTHERLAND, C.H. Dos plantas del género *Zamia* (Gimnosperma) nuevas de Honduras. 2006. *Ceiba* **46(1): 41–44.**

This Spanish-language article describes two new species of *Zamia* from Honduras, *Z. sandovallii* and *Z. oreillyi*.

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Figure 4.—: *Zamia pyrophylla* in habitat. Photo: Michael Calonje.

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[A photograph of *Z. sandovallii* can be seen on page 24 – Editor]

NICONALDE-MOREJÓN, F.; VERGARA-SILVA, F.; GONZÁLEZ-ASTORGA, J.; STEVENSON, D.W.; VOVIDES, A.P.; & SOSA, V. 2010. A character-based approach in the Mexican cycads supports diverse multi-gene combinations for DNA bar coding.

Cladistics 26: 1–15.

This article shows just how careful one has to be when trying to reconstruct phylogeny in plants (in order to determine evolutionary relationships) by using DNA. Common wisdom has it that evolutionary relationships can be determined by using a standard group of genes for all plants. I have always cautioned against this, because reproductive isolation (which drives evolution) can be caused by a multitude of diverse factors, each managed by a different set of genes.

The authors set out to determine the optimal combination of loci needed for successful species-level molecular identification in the Mexican genera *Ceratozamia*, *Dioon*, and *Zamia*. They found that none of the three combinations of potential DNA bar coding genes found to be optimal (for a 70 to 79% reliable identification) in a

character-based approach for the three genera, coincides with the “core barcode” of chloroplast markers recently proposed for universal use in the plant kingdom.

This confirms once again how unique cycads are, and is particularly relevant to Phillip Rousseau’s current research on bar coding of *Encephalartos*.

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MARLER, T.E. 2010. Cycad mutualist offers more than pollen transport.

American Journal of Botany 97(5): 841–845.

Specialist insects share obligate mutualisms with some contemporary cycad species whereby the insect’s pollination services are rewarded with a nursery in which the insect’s larvae consume the post-dispersal male cone. The author prevented visits of the pollinator moth *Anat-rachyntis* sp. to male *Cycas micronesica* cones to show that consumption of the cone tissue by the mutualist hastened initiation of the plant’s subsequent reproductive event. This is the first documented case where removal of a post-dispersal cycad pollination structure speeds up subsequent reproductive events, and the current paradigm that the offering of cone tissue as a nursery is a sacrifice by the plant in return for the pollination services is therefore inaccurate. In *C. micronesica*, the herbivory stage of pollination mutualism confers a cryptic benefit of cone tissue disposal, which translates into an increase in ultimate lifetime reproductive effort. The plant population relies on the pollinator for moving gametes, as well as for increasing the number of male coning events. The dual benefits afforded to the plant by associating with this pollinator shows that mutualism can operate simultaneously on very different traits. [from the author’s abstract].

[This article implies that removal of tissue by the moth larvae saves energy for the production of subsequent cones. In South Africa, collectors have long claimed that female plants of *Encephalartos* do not produce suckers as freely as male plants, as the massive (and thus metabolically expensive) female cones use up so much energy that little energy is left for the formation of suckers compared to relatively lightweight and metabolically cheap male cones. Growers also know that after a female coning event, even more so after several in succession, one has to feed your plant heavily otherwise the following leaf flush will be stunted.

Something which I don’t understand, is how the removal of mature male cone material can result in saving energy (the moth larvae only move in once the pollen is released), because at that stage the cone is already full-grown. – Editor]

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MARLER, T.E.; SNYDER, L.R.; & SHAW, C.A. 2010. *Cycas micronesica* (Cycadales) plants devoid of endophytic cyanobacteria increase in β -methylamino-L-alanine. *Toxicon* **56**: 563–568.

The metabolite β -methylamino-L-alanine (BMAA) contained in *Cycas micronesica* has been implicated as causal of human neurodegenerative diseases in Guam. The research on which this article reports set out to test two previously reported contentions:

1. MBAA is caused by cyanobacteria in the coralloid roots.
2. MBAA is synthesised in order to protect the seed and leaves from predators.

The research revealed that MBAA is synthesised in seedling plants from which cyanobacteria were excluded. This demonstrated that the cyanobacteria is not responsible for the formation of MBAA.

Secondly, it was found that 75% of the seedling's ultimate MBAA content was concentrated in the roots, making it unlikely that the MBAA is synthesised specifically to protect the above-ground parts from predators.

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MARLER, T.E.; & MOORE, A. 2010. Cryptic scale infestations on *Cycas revoluta* facilitate scale invasions. *HortScience* **45**(5): 837–839.

The Cycad Aulacaspis Scale (*Aulacaspis yasumatsui*) has invaded numerous geographic regions in the past 15 years. These sequential invasions have decimated many *Cycas* nursery and landscaping industries and threatened *C. micronesica* and *C. taitungensis* in their native habitats.

The majority of the international cycad trade is dominated by *C. revoluta*. The authors sampled dense wool which characterises the stems, excised intact leaf bases from the stems, and scrutinised roots from containerised plants. All three structures were found to be infested with *Aulacaspis* scale on surfaces which cannot be detected even during thorough superficial visual inspection of intact plants. These concealed infestations allow *C. revoluta* to transport scale insects in a cryptic manner, and lends support for a policy of strict prohibition of imported *C. revoluta* plants from countries known to have *Aulacaspis* scale infestations.



Figure 5.—: *Zamia incognita* in habitat. Photo: Anders Lindström.

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MARLER, T.E.; & SHAW, C.A. 2010. Distribution of free and glycosylated sterols within *Cycas micronesica* plants.

Scientia Horticulturae **123**: 537–542.

Flour made from *Cycas micronesica* seeds was once the dominant source of starch for Guam's residents. Cycad consumption has been linked to high incidence of human neurodegenerative diseases. The authors determined the distribution of the sterols *stigmasterol* and β -*sitosterol* and their derived glucosides *stigmasterol* β -*D*-*glucoside* and β -*sitosterol* β -*S*-*glucoside* among various plant parts because they have been identified in cycad flour and have been demonstrated to elicit neurodegenerative outcomes. All four compounds were found to be common in seeds, sporophylls, pollen, leaves, stems, and roots. Roots were found to contain the greatest concentration of both free sterols, and photosynthetic leaflet tissue contained the greatest concentration of both sterol glucosides. Concentration within the three stem tissue categories was low compared to other structures. Reproductive sporophyll tissue contained free sterols similar to seeds, but a greater concentration of sterol glucosides than seeds. One of the glucosides was absent from pollen. Concentration in young seeds was found to be higher than in old seeds, as reported earlier, but concentration did not differ among age categories of leaf, sporophyll, or vascular tissue. The profile differences among the various tissues within these structures may help to clarify the physiological role of these compounds.

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MARLER, T.E.; LINDSTRÖM, A.; & FISHER, J.B. 2010. Stem tissue dimensions correlate with vulnerability to injury for six *Cycas* species.

HortScience **45**(8): 1293–1296.

The relative dimensions of the concentric layers of stem tissue were examined for six species of *Cycas*. These six species were selected for differing markedly in their susceptibility to injuries during horticultural practices such as transplanting and breaching

It was found that the most sensitive species are not those with the largest starch-rich pith, but rather those with the thinnest layers on the outside of the vascular cylinder, suggesting that injury to the vascular cylinder is the most dangerous.

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[The inspiration for this research came from attempts to inject insecticides at high pressure into stems in an attempt to control the devastating scale insect, *Aulacaspis yasumatsui*. This revealed that the stems are highly susceptible to infection whenever the protective external tissues are removed or internal tissues injured. In turn this lends support to reports of plants in South Africa lost after implantation of microchips, and highlights the dangers of sloughing off outer layers of stems for the "traditional medicine" market, not to mention the removal of suckers. – Editor]

LINDSTRÖM, A.J.; & IDÁRRAGA, Á. 2009. *Zamia incognita* (Zamiaceae): the exciting discovery of a new gymnosperm from Colombia.

Phytotaxa **2**: 29–34.

Colombia is the centre of diversity for *Zamia* in South America, and the *Flore de Colombia* (2002) lists 16 species. However, the area has always presented problems for botanical explorers, including the topography, dense vegetation, and life threatening drug-related activities.

Anders Lindström, member of our Society, is well known for his ability and perseverance in tracking down elusive and new cycad species in inhospitable places. *Zamia incognita* (Figure 5) is the latest of his discoveries. It is a dwarf species with an underground stem, 2 to rarely 4 leaves which are up to 1.5 m long, and leaflets which are leathery, glossy green, narrowly obovate with acuminate apices, and 220 to 400 mm long by 4–7 mm wide.

It is a lowland species found from 200 to 500 m above sea level, growing on well-drained hills in shaded but open understory, sometimes in dense stands.

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SUINYUY, T.B.; DONALDSON, J.D.; & JOHNSON, S.D.. 2009. Insect pollination in the African cycad *Encephalartos friderici-guilielmii* Lehm.

South African Journal of Botany **75**: 682–688.

Six species of beetle, in three families, were found to be associated with male cones of *Encephalartos friderici-guilielmii* at the time of pollen release. These are *Amorphocerus rufipes* and *Porthetes hispidus* (both fam. Curculionidae), *Metacucujus encephalarti* and an undescribed species (both fam. Erotylidae), *Platymerus* sp. (fam. Brentidae), and an un-identified species in the family Scarabaeidae. On account of their behaviour, three of these were considered to be potential pollinators, namely *Porthetes hispidus*, *Metacucujus encephalarti*, and the undescribed species in the family Erotylidae. By methods described in the article, the authors were able to demonstrate with reasonable certainty that all three are capable of pollinating the female cones of this species.

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TURNER, B.L.; & HARMS, R.T. 2010. Fasciation of microsporangiate cones of *Cycas revoluta* (Cycadaceae) in Austin, Texas.
Phytoneuron **23**: 1–3.

Crested coning, consisting of six fused male cones of *Cycas revoluta*, is reported and illustrated. The authors postulate that this resulted from “several days of wrestling with an immature sporangium [in the previous year] that finally yielded its trophy”.

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[Crested cones in *Cycas revoluta* were previously reported in *ENCEPHALARTOS* **1**: 11 and **42**: 11 (female), and several reports of crested cones published elsewhere are from *C. revoluta*.

In *Cycas* a single cone is formed by the apical meristem of the stem, and subsequent longitudinal growth of the stem is effected by the formation of a lateral branch. It would be interesting to see if each of the cones results in a vegetative branch. – **Editor**]

Compiled by Piet Vorster

MACROZAMIA MIQUELII (F. MUELL.) A. DC.

¹Roy Osborne & ²Lou Randall

Introduction

It was during the Queensland Gold Rush days of the early 1860s that the French-Australian gardener, nurseryman, botanist, publican and early supporter of the Rockhampton Botanical Gardens Anthelme Thozet (1826–1878), sent a steady stream of plant material from Rockhampton to his friend and mentor, Australian botanist Ferdinand von Mueller (1825–1896), at the Royal Botanic Gardens in Melbourne. Included amongst the many specimens was cycad material that Thozet had collected locally, which Mueller named in 1862 as *Encephalartos miquelii*, honouring the Dutch medico and botanist Friedrich Miquel (1811–1871). The Swiss botanist Alphonse de Candolle corrected the name to *Macrozamia miquelii* in 1868 and the cycad is thus correctly cited as *M. miquelii* (F. Muell.) A. DC.

Taxonomic confusion followed. Mueller’s original description seems to have been based on a composite of what we now regard as *M. miquelii* from Rockhampton, *M. macleayi* from near Brisbane and, oddly, *M. fawcettii* from the Richmond River catchment in New South Wales. This muddled concept followed through in subsequent



Figure 1.—: Hills and mountains of the Berserker Range, central Queensland, where *Macrozamia miquelii* is fairly well distributed; looking north from Mount Archer. Photo: Roy Osborne.

work by Eduard Regel in Europe and Charles Moore in Australia. Both *M. cylindrica* C. Moore and *M. mackenziei* Hort. ex Mast. may be synonyms for *M. miquelii*. Schuster’s 1932 treatment was unhelpful in that he mixed *M. miquelii* with several other cycads under an umbrella of *M. tridentata* with various subspecies, varieties and forms. In his 1959 review, L.A.S. Johnson chose to lectotypify *M. miquelii* with Thozet’s Rockhampton collection, but he kept other published names in synonymy, thus creating a taxon that broadly encompassed a fragmented

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Figure 2.—: *Macrozamia miquelii* is found in fairly large populations on moderate to steep slopes such as this on Mount Archer, near Rockhampton. The plants here occur with grass trees (*Xanthorrhoea* sp.) understorey to mixed eucalypt forest. Photo: Roy Osborne.



Figure 3.—: Leaf detail of *Macrozamia miquelii* showing the striking pattern created by the pale yellow callous swellings at each leaflet base. The suggestion that this pattern serves as a “flight path” for pollinating insects has no experimental support. Photo: Roy Osborne.

distribution of related macrozamia from north of Rockhampton southward into northern New South Wales.

As new species of *Macrozamia* have been described, so the identity of *M. miquelii* has become better defined and its area of distribution progressively reduced to a smaller number of more homogeneous populations. Ken Hill’s (1998) work in the Flora of Australia resolved many of the issues and further clarity was achieved in a review by David Jones, Paul Forster and Ish Sharma (2001).

Distribution, habitat and ecology

In its present concept, *Macrozamia miquelii* occurs in Queensland’s Port Curtis District from just north of Byfield in the north to near Mount Larcom in the south, a band about 100 km long neatly bisected by the Tropic of Capricorn. To the north of this distribution lies only *M. serpentina*; to the south it is replaced by various populations of *M. macleayi*, *M. mountperriensis*, *M. cardiacensis*, *M. longispina* and *M. douglasii*. All these taxa have some affinities with each other and are collectively referred to as the “*Macrozamia miquelii* group” (Hill & Osborne 2001, Jones et al. 2001).

Macrozamia miquelii grows at altitudes from sea level to 600 m in open forest or woodland dominated by eucalypts. The terrain varies from sloping and rocky in the west (Mount Berserker, Mount Archer and others in the Berserker Range) to near level and sandy at the coast (e.g. near Byfield). Dominant species at some localities are *Corymbia citriodora* and *Eucalyptus crebra*, at others it is *Corymbia intermedia* and *Eucalyptus umbra*. Soils



Figure 4.—: A newly-emergent *Macrozamia miquelii* pollen cone on a plant at Mount Archer. Photo: Roy Osborne.

are generally poor. At some sites (e.g. Mount Archer) the macrozamia grows sympatrically with *Cycas ophiolitica*.

Cones shed pollen from October to November and the putative insect pollinator is the thrips insect *Cycadothrips chadwickii* (Thysanoptera, Aeolothripidae) (Forster et al. 1994). Seeds are usually dispersed in March or April and the dispersers probably include birds, rodents and small marsupials. Most of the cycads occur in areas subject to periodic fires that may trigger mast coning events.

Description, vegetative structures

Macrozamia miquelii has a columnar or barrel-shaped, unbranched **caudex**, up to 50 cm long and 45 cm in diameter, this usually subterranean except in stony sites where it is exposed. Stems bear a dense crown of 20–80 **leaves** that emerge light green and mature to a glossy dark green colour above but somewhat paler below, obliquely erect to spreading, 0.5–2.3 m long, elliptic-lanceolate in outline, flat in cross section, arching in profile, with an expanded base 8–15 cm by 3–4 cm that is covered with grey-brown, soft, woolly hairs. The **petiole** is 20–40 cm long by 8–20 mm wide at the first leaflet, greenish, flat adaxially, convex and angular abaxially. The



Figure 5.—: A *Macrozamia miquelii* plant in cultivation in Rockhampton, showing a series of pollen cones in different stages of development. Photo: Lou Randall.



Figure 6.—: An ovulate *Macrozamia miquelii* cone at the seed-shedding stage, on a plant at Mount Archer. Photo: Roy Osborne.

rachis is straight, pale green, similar in cross section to the petiole, and bears 80–180 leaflets inserted at about 40° to the rachis. **Leaflets** are moderate crowded, closely-spaced distally but more widely spaced proximally, linear, 15–50 cm long by 6–12 mm wide, flat, thick-textured, with stomata on the abaxial surface only, with margins entire, tapering to a pungent apex, contracted at the point of attachment to a prominent whitish or pale yellow callous base, with lower leaflets gradually reducing to 6–16 pairs of rigid **pinnacanth**s.

Description, reproductive structures

Male plants of *Macrozamia miquelii* bear 1–5 **pollen cones** that are cylindrical to spindle-shaped, 12–28 cm long excluding the peduncle, 3.8–6.5 cm in diameter, straight but curving with age, green, with a **peduncle** 11–30 cm long by 15–25 mm in diameter, elliptical to circular in cross section, the cones with **microsporophylls** that are broadly wedge-shaped, 12–25 mm by 8–15 mm, each with an erect apical spine 2–20 mm long.

Female plants of *Macrozamia miquelii* bear 1–3 **ovulate cones** that are cylindrical to barrel-shaped, 25–40 cm long excluding the petiole, 10–15 cm in diameter, green, with a **peduncle** 10–30 cm long by 20–30 mm in diameter, elliptical in cross section, longitudinally furrowed, the cones with **megasporophylls** that are broadly wedge-shaped, 15–30 mm by 25–40 mm, each with an erect apical spine. **Seeds** are oblong to ovoid, 20–30 mm by 15–20 mm, the sarcotesta yellowish, light orange or red.

Distinguishing features

The *Macrozamia miquelii* group is one of the 3 groups within genus *Macrozamia*, section *Macrozamia*. It comprises 7 species (*Macrozamia miquelii*, *M. cardiacensis*, *M. douglasii*, *M. longispina*, *M. macleayi*, *M. mountperriensis* and *M. serpentina*) that are distributed in a close geographic replacement pattern in south-eastern Queensland. The group is characterised by glossy leaflets with stomata on the lower surfaces only, bearing cones with delicate apical spines on the sporophylls, and usually with orange-red sarcotestae on mature seeds. *Macrozamia miquelii* is recognised within this group by its intermediate stature, often lighter green leaves, with petioles spine-bearing almost throughout, with lowermost leaflets grading evenly into spines in a regular progression to the smallest spine, and with the pollen and ovulate cones of intermediate size.

Key to distinguish between the taxa in the *Macrozamia miquelii* group

(from Jones et al. 2001)

1. Lower 8 or more leaflets reduced to pinnacanth 2
Lower 4 or less leaflets reduced to pinnacanth, or pinnacanth absent 5
2. Ovulate cones narrowly ovoid; pollen cones 35–40 cm long. *M. cardiacensis*
Ovulate cones cylindrical to barrel-shaped; pollen cones 12–28 cm long. 3
3. Pollen cones 2.5–3.5 cm diameter; microsporophylls 8–12 x 4–8 mm *M. serpentina*
Pollen cones 3.5–6.5 cm diameter; microsporophylls 12–25 x 8–15 mm. 4
4. Leaves glossy above, thin-textured; ovulate cones 7–10 cm diameter *M. macleayi*

- Leaves glossy above, thick textured; ovulate cones 10–15 cm diameter *M. miquelii*
5. Lower 1–4 leaflets reduced to pinnacanth *M. douglasii*
Pinnacanth absent 6
6. Leaflets 50–110, 6–9 mm wide; pollen cones 12–25 x 3–4 cm; distal megasporophylls with spines 2.5–4 cm long *M. mountperriensis*
Leaflets 100–140, 3–6 mm wide; pollen cones 8–15 x 2.5–4 cm; distal megasporophylls with spines 4.5–7 cm long *M. longispinna*

Ethnobotany

The second author was involved with a project in which specimens of *M. miquelii* were planted at the Rockhampton's Dreamtime Cultural Centre so as to illustrate this plant's importance to the local [Darumbal] Aboriginal people. The basis for this was traced back to Anthelme Thozet's 1866 publication in which the use of three central coastal Queensland cycads is mentioned: viz. "*Cycas media*", "*Encephalartos* sp./Leichhardt's arborescent *Zamia*" and "*Encephalartos miquelii*". These three species would now be represented respectively as *Cycas ophiolitica*, *Macrozamia moorei* and *M. miquelii*. Thozet's notes on the last species have that "the seeds ... are baked for nearly half-an-hour under ashes; the outside covers and the stones are then broken, and the kernels divided by a stroke of the *kondola*, are put into a dilly-bag and carried to a stream, where they remain six or eight days before they are fit for eating". Variations on this method of detoxification of cycad seeds, involving roasting and water leaching, are known from many other communities in Australia and elsewhere.

Conservation status

Although the total plant number is thought to be decreasing, *Macrozamia miquelii* is widespread and abundant, and has a number of populations in designated reserves such as Byfield and Mount Archer National Parks. It is classified in the conservation category as "Least Concern" (IUCN 2010 Red List). In terms of the *Queensland Nature Conservation Act 1992*, this species is "common protected wildlife". Harvesting of seeds from habitats outside the National Parks is possible under a permit issued by the Queensland Environmental Protection Agency.

Cultivation

Macrozamia miquelii makes an attractive container plant, and may be used to good effect as a single specimen or in group plantings. It requires minimum maintenance and is reasonably cold hardy. This species has been used very successfully in street plantings by the Rockhampton City Council.

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Figure 7.—: An ovulate *Macrozamia miquelii* cone shedding seeds, from a plant in cultivation in Rockhampton. Photo: Lou Randall.



Figure 8.—: *Macrozamia miquelii* used to good effect in a median strip planting in central Rockhampton. Photo: Roy Osborne.

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A Cycad-hunting expedition to Honduras

Piet Vorster¹



Figure 1.—: Honduras: some of the expedition members at breakfast in Tela. Front row from left: Irene Terry, Harvey Ottley, Piet Vorster, Elsa Vorster, Jody Haynes; back row: two Honduran government officials, Al Taylor, Greg Holzman and Mark Bonta.

When early in 2004 I received an invitation from Jody Haynes of the Montgomery Botanical Center to participate in a cycad expedition to Honduras prior to the CYCAD 2005 conference, I needed little time to make up my mind. Honduras is a name that crops up occasionally in cycadology, but most of us don't even know exactly where it is.

The purpose of the expedition was twofold. Firstly we wished to study the known Honduran cycad species in nature, and secondly we were invited by the Honduran government to advise them on the conservation status of the species and make recommendations on how they should be managed.

The leaders of the expedition were Jody Haynes, then from the Montgomery Botanical Center, and Mark Bonta of the Delta State University in Cleveland, Mississippi. Mark is a geographer with an interest in plant-human interactions. The other members were Dr. Harvey Ottley from Darwin, Australia; Dr. Irene Terry of the University of Utah who is a cycad pollination expert, Prof. Al Taylor of Panama who has wide experience of tropical American cycads, Greg Holzman of Hawaii who has done much to make cycads readily available to horticulture through intensive propagation, Chris Dalzell of the Durban Botanic

Garden, and my wife Elsa and myself as experts on African cycads (Figure 1). Prof. Li Nan from China had to cancel at the last moment because she could not arrange travel documents in time.

We also had problems: visas are needed by South Africans visiting Honduras, but Honduras has no diplomatic representation in South Africa which means that one has to get visas in either London or Miami. We opted for Miami because it afforded the opportunity to visit the Montgomery Botanical Center (Figure 2) and the adjoining Fairchild Tropical Botanical Garden, both renowned for their living cycad collections.

We flew into San Pedro Sula, capital of Honduras, on a stormy evening early in January 2005. It was winter in the Northern Hemisphere, but San Pedro Sula lies at about 16 degrees N, well within the tropics, and we experienced the weather as warm and humid. Honduras is a small country, some 550 km across from east to west and 200 km from north to south. On the south it borders on Nicaragua, on the southwest on El Salvador, and on the west on Guatemala. The northern shores are bathed by the Caribbean Sea, and the southern shores by the Pacific Ocean (Figure 4). It has a narrow coastal plain adjoining the Caribbean, and the interior is very mountainous. This means that there is a large variety of habitats, ideal for promoting plant evolution. Though it lies between Mexico with its huge variety of cycads and south-central America with its many species of *Zamia*, at the time of

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Figure 2.—: Fairchild Tropical Garden, with Byron & Libby Besse and Elsa Vorster.



Figure 3.—: *Zamia integrifolia* in habitat at the Montgomery Botanical Center.

our visit only five species of cycad had been recorded in Honduras, and three of these were still undescribed. All these cycads are in the northern part, and personally I would not be surprised if many more lurk in the hinterland. Also of interest is that the Honduran *Dioon mejiae* occurs several hundred kilometers away from the closest *Dioons* (in Mexico).

The first species we investigated, was a “giant” arborescent *Zamia*, since described under the name *Zamia oranreyesii*. To reach these plants we had to ascend a pretty high mountain and descend again on the other side. On leaving the coastal plain we entered dense tropical evergreen forest, festooned with epiphytes and climbers. Quite soon the unpaved road became impassable due to heavy rains shortly before. I have never seen such mud, at least 60 cm deep on the road, and we had to abandon our vehicle and proceed on foot for several hours (Figure 5).

As we gained altitude, the rain forest changed into cloud forest which here consists mostly of pines. To me the sight of pine trees full of epiphytic bromeliads, orchids, and ferns presented a novel and unexpected sight. Eventually we reached a watershed and then descended again through the rainforest, keenly aware thereof that every meter we descend would have to be regained on the return trip. My impression was that this forest was somewhat drier and more open than that encountered previously, but I could have been wrong. A disconcerting distance down the slope we finally found the cycads: robust plants with trunks 1 to 2 m tall and up to 15 cm thick, crowned by a full compliment of shiny green fronds (Figures 6 & 7). We were also fortunate to find some female cones (Figure 9). Like all *Zamias*, the stems are



Figure 4.—: Honduras



Figure 5.—: The road to *Zamia oranreysii*.

naked (Figure 8), *i.e.* without the remains of leaf bases, which are so characteristic of the stems of *Encephalartos*. There were a respectable number of plants, they are difficult to reach, and there seemed to be little pressure on them. Collectors already know about the plants and a considerable amount of seed destined for to be shipped to unknown clients, are harvested by locals. Later we found a local nursery where these plants are propagated quite successfully from wild-collected seed, and there is little reason why they cannot become common garden plants in Honduras as well as abroad.

Our next quest was for an undescribed *Ceratozamia*. Phytogeographically this is also interesting. In neighbour-



Figure 6.—: *Zamia oranreysii* in rainforest habitat in Honduras.



Figure 7.—: *Zamia onanreysii* in rainforest habitat in Honduras.



Figure 9.—: *Zamia onanreysii* in Honduras: a female cone.



Figure 8.—: *Zamia onanreysii* in Honduras: the trunk, about 15 cm thick. Typical for *Zamia* there are no leaf base remains.



Figure 10.—: *Ceratozamia hondurensis*



Figure 11.—: *Ceratozamia hondurensis*: leaf detail.



Figure 12.—: *Zamia sandovalii*: plant in habitat. Photo: Greg Holzman.



Figure 13.—: *Zamia sandovalii* leaf.

ing Belize there is a *Ceratozamia* called (perhaps wrongly so) *C. robusta* but there is a break of several hundred kilometres between the Honduran plants and the closest ones in Mexico. These plants were found in a patch of moist evergreen forest along a stream at a relatively low altitude, and surrounded by subsistence farming activities. This is one of the most startling *Ceratozamia*s I have yet seen. It is a big plant (Figure 10) with broad blue-green leaflets (Figure 11) which look very much like those of the Mexican *Ceratozamia europhyllidia*, but instead of a few erect leaves it has many more spreading-erect leaves, and my impression was that they are somewhat more thick-textured. No cones were found. We did not see many plants, and gained the impression that they are very localised. The habitat is by no means as secure as one would wish, and apart from thoughtless habitat destruction I can imagine that collectors would go to a lot of trouble to add this delectable plant to their collections. This species has now been described, under the name *Ceratozamia hondurensis*.

Our third aim was to see an undescribed *Zamia* growing in the mountains. By nature it is a cliffhanger, a growth form hitherto found only in a few species of *Zamia* and *Ceratozamia*, and remarkably it is said to have benefited from road building activities because road cuttings provided additional habitat for the *Zamia* to colonise. The locality was quite off the beaten track, and as it turned out we only reached it well after sunset. In fact, it was so dark that I was unable to focus my camera. Greg Holzman was able to take photographs (Figures 12 & 15). Fortunately someone collected a leaf sample, which enabled me to take photographs the next day (Figures 13 &



Figure 14.—: *Zamia sandovallii*: leaf detail.



Figure 15.—: *Zamia sandovallii*: a female cone. Photo: Greg Holzman.



Figure 16.—: *Dioon mejiae* at a forest margin in Honduras.



Figure 17.—: *Dioon mejiae* within a low evergreen forest in Honduras. Photo: Mark Bonta.

14). This *Zamia* has only one or two glossy leaves. Again, this species has recently been described under the name *Zamia sandovallii*.

Our last visitation was to the habitat of *Dioon mejiae*. Though never in large numbers, a constant trickle of seeds and even small plants have reached collectors over the years. Recent fieldwork by Mark Bonta and Jody Haynes suggested that the original description had been misleading, both in respect of the true appearance of the plants in nature, their habitat, and abundance; and this was rectified in a paper published in the Proceedings of the CYCAD 2005 conference [HAYNES, J.L.; & BONTA, M.A. 2007. An emended description of *Dioon mejiae* Standl. & L.O. Williams. (Zamiaceae). Pages 418–443 in Proceedings of CYCAD 2005. *Memoirs of the New York Botanical Garden*, vol. **97**.] . To reach these plants, we travelled inland into increasingly dry savannah country, which looked much like the area around Hoedspruit in South Africa. Much small-scale agricultural activities were evident and the vegetation was quite degraded. Some cacti were present as well as huge and fearsomely thorny plants of terrestrial *Bromelia*. Gradually and almost imperceptibly we gained altitude, passing through a mixed oak-pine savannah that quite abruptly gave way to a low evergreen forest. Here the *Dioon mejiae* grew, within the forest (Figure 16) as well as more in the open on a bluff overlooking a stream (Figure 17). We saw a substantial number of plants, but found it difficult to gain an impression of huge numbers due to the density of the forest. Interestingly these plants looked quite different from those which I grow in Stellenbosch: instead of rigid, straight, and soap-green leaves, these wild plants had more flaccid, arching, and glossy green leaves (Figure 18)



Figure 18.—: *Dioon mejiae* leaf detail. Note how green it is.



Figure 19.—: *Zamia hererae* in Honduras.



Figure 20.—: *Zamia hererae* in Honduras: leaf detail.

and looked very much like *D. spinulosum* in Mexico. They were big plants, up to 5 m tall, but Jody Haynes measured them elsewhere up to 10 m tall. This is an abundant species, and Jody estimated a total of about 50 000 plants. Its huge seeds have ethnobotanical value as a seasonal source of flour, and there are indications that it is respected by the users. There are also indications that, in spite of its forest habitat, it benefits from the opening up of the forest through grazing.

This evergreen forest borders on fairly open oak-pine forest, where here and there plants of *Zamia hererae* can be seen (Figures 19 & 20). In nature this is a singularly inconspicuous plant, not more than 30 to 50 mm tall, with only one or two leaves. Given the relatively cool habitat

and its close proximity to *Dioon mejiae*, it is strange that I cannot keep them alive in Stellenbosch, yet *D. mejiae* grows well and fast for me and cones regularly.

Honduras is an interesting place, scenically through its mountainous topography and abundant big and fast flowing rivers partitioning the coastal plains; and botanically through the varied vegetation, which is not as well known as it could be. As far as the cycads are concerned, they seem to be holding their own in spite of man, but habitat loss is an ever-present threat. It is not too late to create protected areas for the known cycads, and there is much scope for economically viable artificial propagation in order to diminish collectors' pressure on the wild plants.

CYCAD FEEDING: WHAT TO DO AND WHEN

Andre Cilliers ¹

Many cycad collectors have asked me to advise them on cycad feeding. What to use, when to apply feed, how much and so on. For this question to be best answered, we must consider what a plant needs to grow. The answer is rather more complicated than it initially seems. To begin with, all plants require the three basic macro elements, namely nitrogen, phosphorous and potassium (N,P and K). Apart from these, all plants require micro- or trace elements to grow optimally. These include calcium (Ca), boron (B), copper (Cu) and iron (Fe). Trace elements are required in smaller quantities than the three macro elements are. However, they are equally important for optimal growth, just as vitamins are just as important for us as proteins and starch.

The basic ratio between the three macro elements is very important for optimal growth of any plant, since different plant species have different requirements for optimal growth. In general, nitrogen is required for foliar or vegetative growth. Phosphorous is required for root development and potassium is important for protein synthesis, storage of starch and meristematic growth in plants. It also activates enzymes in plants. For this reason a fertilizer blend is named to indicate the ratios between the three macro elements. For example, a 2:3:2 fertilizer contains the three macro elements (N,P and K) in this ratio. The ratio between these elements will determine the efficacy of the blend on the specific plant species. Tom Broome, a highly respected cycad authority from the USA(<http://www.plantapalm.com/vce/horticulture/fertilizer.htm>) recognised this need in cycads and went about performing careful tests on cycads using different NPK ratios. He identified Scotts mixture in the ratio 24:7:8 as being the most effective ratio for optimal cycad growth. Cycadfeed has exactly this ratio. As with Scotts mixture, Cycadfeed also contains a full range of micro elements, to ensure that no deficiencies occur.

An important factor to consider when using any fertilizer is the availability of the elements to the plant. A simple test to check this is to see how quickly the fertilizer dissolves in water. The quicker the fertilizer dissolves, the purer the source of elements in the fertilizer and the easier the elements can be absorbed by the plant. Anybody who has used Cycadfeed will know that it dissolves completely almost instantly. Therefore, the elements in Cycadfeed are immediately available to the plant. Also, the source and form of the elements used in a fertilizer blend are critically important. Cycadfeed contains pure ammonium nitrate, the best form of nitrogen for uptake into the plant. Cycadfeed contains all your cycads need, be it winter or summer.

I always suggest that growers feed throughout the year, with less feed in the winter months. Cycadfeed is designed to generate growth, and this included leafing and cone production. Too much feeding in the winter months can induce leafing in the winter. If we have a winter like 2010, new leaves can emerge in the winter and be burned by the cold. I suggest feeding two-weekly in the summer months (October to April) and monthly in the winter months (May to September). This will ensure optimal growth of your cycads.

The amount of feed is very difficult to determine accurately. However, it is important to remember never to feed too much. This can be harmful to any plant. More is not necessarily better. For seedlings I always suggest dissolving your fertilizer in water and applying the feed in a dissolved form. Here again the dissolvability of fertilizer becomes an important factor.

Happy Growing!! By the time this article appears in ENCEPHALARTOS, it will be summer and the ideal time to feed your cycads. Hope it is a great season!

[See André Cilliers' advertisement "CYCAD COLLECTORS PRODUCTS" at the back of ENCEPHALARTOS. Ed.]

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