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COVER / VOORBLAD : *Dioon mejiae*: female cone, about 400 mm long, on a plant coning for the first time in Stellenbosch (March 1998). The previous year we had a male cone. / *Dioon mejiae*: vroulike keël, ongeveer 400 mm lank, op 'n plant toe dit vir die eerste keer in Stellenbosch gekeël het (Maart 1998). Die vorige jaar het ons 'n manlike keël gehad.

Photo / Foto: Piet Vorster

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FROM THE PRESIDENT



VAN DIE PRESIDENT

It is the end of another year for our Society. It has been a good year: our members have been doing exciting things, we have had the congress in Thailand, some beautiful and useful books on cycads have appeared, and our web site has become established. I don't think that we have ever before had such an eventful year, and my only fear is that we won't be able to keep it up next year. But you never know.

The success of the past year can be ascribed directly to you, our members. The members of our Council also did a great job, but two of our number stand out. One of them is Guillaume Theron who kept our administration running like an oiled machine, and miraculously kept our finances on a sound footing. The other is Isabella Claassen who equally miraculously enabled *ENCEPHALARTOS* to appear every quarter more or less on time (those issues which were late, were caused by the President being late with his column). *ENCEPHALARTOS* is a product of which we can be justly proud, and I know that you all read it from cover to cover. Dare it be even a few days late, calls start coming in to enquire.

What is not generally appreciated, is the part that Isabella plays. Not only does she get all the information together and puts it in order, but she actually does the page lay-out herself. Initially she worked in the computer language WordPerfect and provided the printer with a camera-ready printout. More recently we changed this procedure, and now we provide the printer with an electronic version because it saves costs and produces a crisper lettertype. However, the electronic version has to be prepared in the computer language MS-Word, because that is the only computer language supported by our printer (at the University of Stellenbosch). Isabella had to learn it from scratch. Not unexpectedly, she runs into severe practical problems every now and then, which the printer cannot help solving because the printer is in Stellenbosch and Isabella in Pretoria. THEREFORE: is there any of our members in Pretoria who is really smart with the finer points of MS-Word as it applies to page lay-out, and who would be prepared to come and help Isabella when problems crop up? PLEASE, make yourself known to Isabella.

Piet Vorster

Dit is die einde van die jaar vir ons Vereniging. Dit was 'n goeie jaar: ons lede het opwindende dinge gedoen, ons het die kongres in Thailand gehad, 'n aantal mooi en bruikbare boeke oor broodbome het verskyn, en ons webwerf het op dreef gekom. Ek dink nie dat ons ooit tevore so 'n gebeurtenisvolle jaar beleef het nie, en my enigste vrees is dat ons dit nie volgende jaar sal kan volhou nie. Maar mens weet nooit.

Die sukses van die afgelope jaar kan direk toegeskryf word aan u, ons lede. Die lede van die Raad het ook 'n waardevolle diens gelewer, maar twee van hulle staan uit. Die een is Guillaume Theron wat ons administrasie laat vlot het soos 'n ge-oliede masjien, en wonderbaarlik ons finansies op 'n gesonde grondslag gehou het. Die ander is Isabella Claassen wat net so wonderbaarlik vir *ENCEPHALARTOS* elke kwartaal min of meer betyds laat verskyn het (daardie uitgawes wat laat was, was veroorsaak deurdat die President laat was met sy kolom). *ENCEPHALARTOS* is 'n produk waarop ons met rede trots kan wees, en ek weet dat u elkeen dit van voor tot agter deurlees. Durf dit maar net 'n paar dae laat wees, begin die navrae instroom.

Wat nie algemeen besef word nie, is die rol wat Isabella speel. Nie alleen kry sy al die inligting bymekaar en sit dit oor in die korrekte vorm nie, maar sy doen ook die bladsy-uitleg. Aanvanklik het sy gewerk in die rekenaar WordPerfect en 'n kamera-gereed uitdruk vir die drukker gelewer. Meer onlangs het ons hierdie prosedure verander en nou word die drukker voorsien van 'n elektroniese weergawe omdat dit koste bespaar en 'n skerper lettertype lewer. Die elektroniese weergawe moet egter voorberei word in die rekenaar MS-Word, die enigste rekenaar wat deur ons drukker (by die Universiteit van Stellenbosch) ondersteun word. Isabella moes dit van nuuts af aanleer. Soos wat mens sou kon verwag, het sy elke nou en dan ernstige praktiese probleme teengekom, wat die drukker nie kan help oplos nie omdat die drukker in Stellenbosch en Isabella in Pretoria is. DAAROM: is daar enige van ons lede in Pretoria wat regtig vaardig is met die fynere punte van MS-Word soos van toepassing op bladsy-uitleg, en wat bereid sou wees om vir Isabella te kom help wanneer probleme opduik? ASSEBLIEF, stel uself bekend aan Isabella.

Piet Vorster

FOCUS ON ...

In each edition of *ENCEPHALARTOS*, we focus on one cycad species, in the form of an in-depth article in layman's language. In this edition the spotlight falls on:

FOKUS OP ...

In elke uitgawe van *ENCEPHALARTOS* fokus ons op een broodboomsoort, in die vorm van 'n in-diepte-artikel in leketaal. In hierdie uitgawe val die kollyg op:

CYCAS ELONGATA (Leandri) D.Y. Wang

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and

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PREFACE

*The name of the second author is given in the traditional Vietnamese format with family name first (Nguyen) and given names following (Tien Hiêp); this article should however be cited or indexed under the author names R. Osborne and T.H. Nguyen. The country name "Việt Nam" has been anglicised in this article to the more familiar "Vietnam", but names of towns and provinces have been kept as close to the authentic local names as possible within font capability constraints.

INTRODUCTION

Evidence from the fossil record, comparative morphological studies and molecular analyses is proving that *Cycas* has an origin predating all other extant cycad genera. In addition, this genus - in the form of the ubiquitous *C. revoluta* - provides by far the most horticulturally-important of the cycads. But until recently, the international cycad community had little knowledge of the full extent of this genus. Increasing awareness and appreciation of the Asian cycads has arisen from activities such as the recent and vigorous taxonomic work by Ken Hill and collaborators, several popular publications (Hill & Vatcharakorn 1998, Jones 2002, Tang *et al.* 1997, Wang *et al.* 1996, Whitelock 2002), articles in "*Encephalartos*" (Tang 1998, 1999, 2001, Tang & Young 1995), meetings such as the Fourth (China, 1996) International Cycad Conference (Chen 1999) and the Sixth (2002, Thailand) International Cycad Conference, and the work of Fairy Lake Botanical Garden and Nong Nooch Tropical Garden.

Those of us on the 2002 Vietnam Cycad Expedition were privileged to see 12 *Cycas* species in the wild. One of the most impressive of these was *C. elongata*, the subject of this "Focus on ..." report.

TAXONOMIC HISTORY

Francis Buchanan-Hamilton, superintendent of the Calcutta Botanic Garden, reported details of the widespread Asian cycad, *Cycas pectinata*, to the Linnean Society in London in 1823, his description for that species being published in 1826. Over a century later, the French botanist Jacques Leandri (1931) recognised that a population of cycads in southern Vietnam differed slightly from this species, naming these plants as *C. pectinata* var. *elongata* in reference to the elongated apical spine on the megasporophyll (see discussion later). Leandri cites the herbarium specimen "Poilane 9328", said to be collected near Cà Ná in south-eastern Vietnam, in the accessions of the Paris Herbarium. In the 1990's, Chinese botanist Si-Ling Yang studied these plants in the wild in Vietnam, while his countryman Ding-Yue Wang assessed *ex situ* specimens at Shenzhen Fairy Lake Botanic Gardens in China. Wang (1996) then elevated the taxon to specific level as "*C. elonga*" - corrected in *errata* to *C. elongata*. The situation became clouded when De Laubenfels and Adema (1998) assigned this and other Asian cycads to a new genus, *Epicycas*, a move that was firmly refuted at the recent Cycad Classification Concepts Workshop at Montgomery Botanic Center, Miami, USA (Chen *et al.* in preparation). The taxon under review in this article is thus correctly cited as *Cycas elongata* (Leandri) D.Y. Wang.

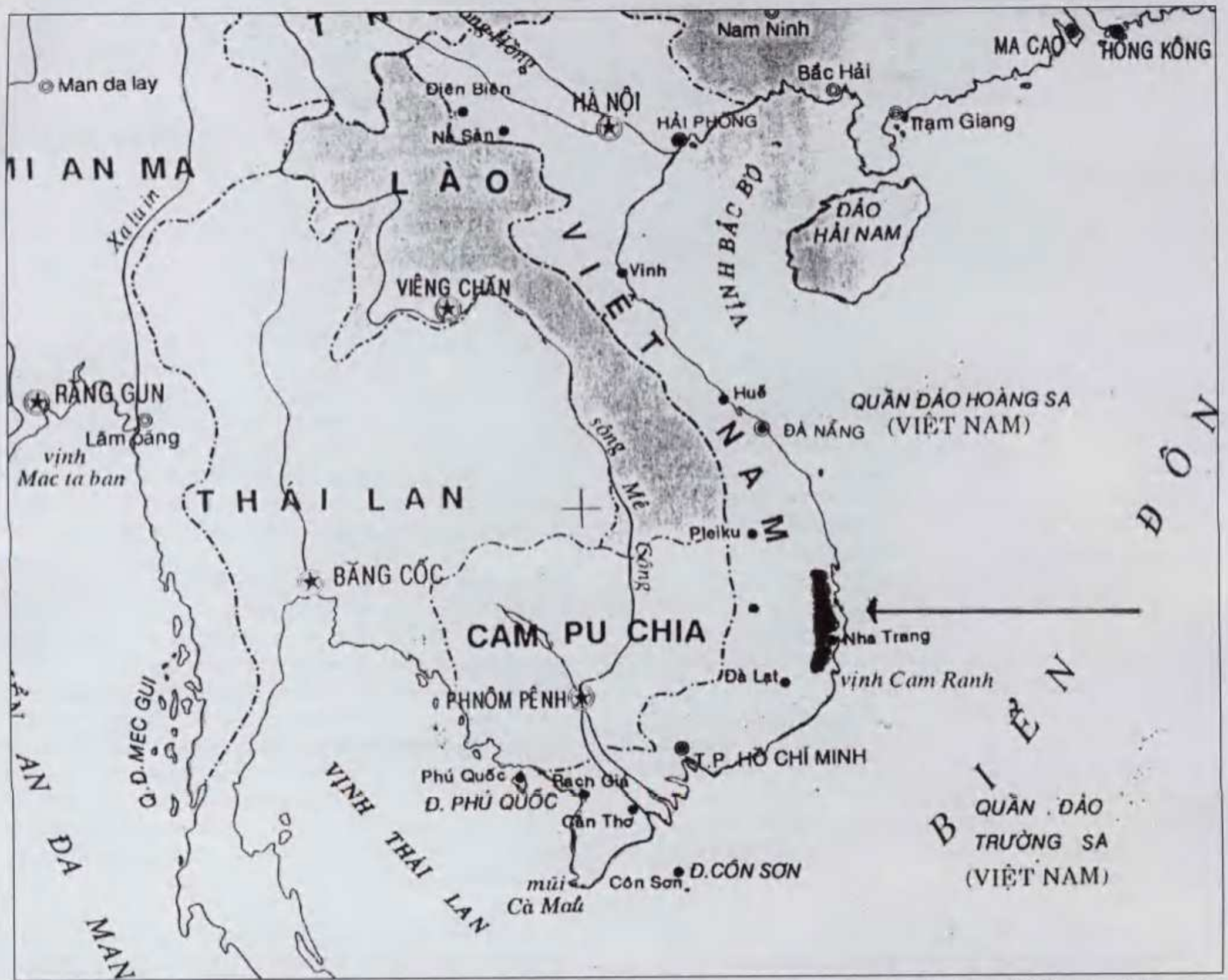


Figure 1 *Cycas elongata* plants are found in an approximately 200 km long narrow near coastal zone which extends from the northern border of Ninh Thuận Province, through Khánh Hòa and Phú Yên Provinces to the southern boundary of Bình Định Province, in south-eastern Vietnam.

DISTRIBUTION AND ECOLOGY

Endemic in south-eastern Vietnam, *Cycas elongata* plants are found discontinuously in an approximately 250 km long, narrow, near-coastal zone which extends from the northern border of Ninh Thuận Province, through Khánh Hòa and Phú Yên Provinces to the southern boundary of Bình Định Province (Figure 1). Four main populations comprise the distribution: (1) northern Ninh Thuận Province, (2) west of Cam Ranh in Khánh Hòa Province, (3) Sông Cầu district of Phú Yên Province, and (4) in the area of the Cu Mong pass which forms the boundary between the Phú Yên and Bình Định Provinces.

The southern end of the *C. elongata* range is not far from the Ninh Thuận Province localities for *C. pachypoda* and the acaulescent *C. lindstromii*, while, at the northern end, *C. elongata* populations may intergrade with the closely-related *C. pectinata* in Bình Định Province.

Although the Vietnamese people have no common name for cycads generally, or for *C. elongata* in particular, the

phrase “tuê luoc lá hep” would be an appropriate descriptor.

Cycas elongata grows fairly abundantly in the coarse granite-derived soils on the sunny, rocky, east-facing slopes of coastal hills, at altitudes from 50–200 m. The vegetation in these areas has been somewhat degraded from the original primary forests and now mainly comprises mixed thorny scrub. The sites appear to be subjected to periodic fires. The climate is essentially tropical with hot dry weather alternating seasonally with warm south-western monsoon periods when heavy rainfalls are experienced.

In their recent fieldwork on putative cycad pollinating insects in Asia, Tang *et al.* (1999) collected several species of the long-snouted *Tychioides* (family Curculionidae) and *Xenocryptus* (family Languriidae) beetles from both male cones and female megasporophyll clusters of *Cycas elongata*. Examples from both these beetle genera have been collected from the *C. pachypoda* populations to the immediate south. There is increasing evidence that these

insects are critical in the pollination of Asian cycads and that some degree of species-specificity is involved. Little is known of seed dispersal agents; small terrestrial animals, birds and water may all play a rôle in this respect.

DESCRIPTION

[Details which follow are derived mainly from the *Cycas elongata* species description in "The Cycad Pages" (Hill and Stevenson 1998)].

1. STEM

Cycas elongata is an arborescent cycad with stems unbranched or occasionally dichotomously branched (see Figure 12 on p. 20), typically 2–5 m tall and 10–20 cm in diameter, bearing 30–60 leaves in the crown (Figure 2). In old specimens, the phelloderm (bark) becomes relatively smooth and the trunk thickness at ground level can be significant with diameters up to 1 m being recorded.

2. LEAVES AND LEAFLETS

Leaves of *Cycas elongata* range from bright semi-glossy green on the newly-emergent foliage to grey-green with maturity (Figure 3 {and Figure 7 on p. 19}). A whitish tomentum on the emergent leaves is lost as the leaves mature. Leaves are typically 90–140 cm long, moderately keeled, with 130–240 leaflets, the opposing leaflets inserted at 90–150° on the rachis. The petiole is about 20–40 cm long, glabrous, and covered with small spines for 60–100% of its length.

Median leaflets are 140–220 mm long, 8–11 mm wide, inserted about 10–18 mm apart at 50–60° to the rachis, flat in section with a pronounced raised midrib. Leaflet margins are flat and the apex is sharp but not spiny. Leaflets do not progressively reduce to spines.

Cataphylls are 60–90 mm long, soft, sparsely hairy, and narrowly triangular.

3. REPRODUCTIVE STRUCTURES

Male cones of *Cycas elongata* are narrowly ovoid, orange to pale brown, 25–35 cm long and 9–13 cm in diameter (Figure 6 {and Figure 14 on p. 20}). Microsporophyll blades are firm, not dorsiventrally thickened, and terminate in a short upturned apical spine.

Tightly-packed megasporophyll clusters are terminal on the female *Cycas elongata* trunks (Figure 4 {and Figure 13 on p. 20}). Individual megasporophylls are 20–27 cm long, grey-tomentose to brown-tomentose, each bearing 2–6 glabrous ovules. The megasporophyll blades are deeply to shallowly pectinate (comb-like) with 36–38 soft lateral spines 20–25 mm long and 1–2 mm wide (Figure 5). Each megasporophyll terminates in an extended apical spine 30–55 mm long, 4–5 mm wide at the base.

Cycas elongata seeds are flattened-ovoid in profile, about 40 mm long by 30 mm wide. The sarcotesta is yellow

when ripe and contains a fibrous layer covering a smooth sclerotesta.

AFFINITIES

Cycas elongata falls within the *Cycas* Section Indosinensis subsection Indosinensis as presently circumscribed (Hill & Stevenson 1998). This group includes three *Cycas* species that are widespread in south-east Asia (*C. clivicola*, *C. pectinata*, *C. siamensis*) as well as species endemic in Thailand (*C. chamaoensis*, *C. elephantipes*, *C. nongnoochiae*, *C. petraea* and *C. tansachana*) and Vietnam (*C. condaoensis*, *C. pachypoda*). The group collectively comprises plants with aerial trunks, pectinate megasporophylls and several other unifying characters, while the individual species are distinguished one-from-another on the basis of appearance of the bark, morphology of the male cones and microsporophylls, and the presence or absence of basal prickles on the leaves.

In the distinguishing features for *Cycas elongata*, "The Cycad Pages" (Hill & Stevenson 1998) gives the following: "*C. elongata* is closely allied to *C. pectinata*, but readily distinguished by the short leaves with short petioles and broad flat leaflets, the smaller and narrower male cones with shorter apical spines on the microsporophylls, and the overall smaller and narrower megasporophylls. The short, mostly spinescent petioles also distinguish *C. elongata* from *C. clivicola* and *C. condaoensis*. Male cones of *C. elongata* are also larger than those of the latter two species, with longer microsporophylls."

To the above, we can add other important distinguishing characters for *Cycas elongata*. The relatively smooth trunk surface is unlike the deeply fissured or corky layer seen in *C. pachypoda* and *C. tansachana*. The absence of a prominently swollen (bulbous) base separates *C. elongata* from *C. elephantipes*, *C. nongnoochiae*, *C. pachypoda*, *C. petraea*, *C. siamensis* and several other Asian cycads. The fact that leaflets do not progressively reduce towards the base distinguishes *C. elongata* from *C. siamensis*.

[Literature comparisons in the megasporophyll morphology of the *Cycas elongata* vs. *C. pectinata* are confusing and in some cases erroneous. Leandri's (1931) paper* states that the megasporophylls of his *C. pectinata* var. *elongata* were narrower than those of *C. pectinata* and more elongated at the tip. Wang's (1996) description cites Leandri [incorrectly] as *C. elongata* having "lateral megasporophyll segments which are longer than the apical segment", although figures are not presented and details not illustrated. De Laubenfels and Adema (1998) state that their *Epicycas elongata* is superficially similar to *Cycas pectinata* but distinguished "by the narrow elongated megasporophyll and, especially [and incorrectly], by the bulbous base of the trunk". Both Jones (2002) and Whitelock (2002) correctly allude to the etymology for the taxon as being in apparent reference to "the elongated apical spine on the megasporophyll", but then each of these authors gives figures showing that apical and lateral megasporophyll spines of *C. elongata*



Figure 2 Specimens of *Cycas elongata* in the Sông Cầu district, Phu Yên province, towards the northern end of the distribution for the species.



Figure 3 *Cycas elongata* – leaf detail from a specimen in the Cam Ranh area of Khánh Hòa Province, near the southern end of the distribution for the species.



Figure 4 The cluster of sporophylls on a female *Cycas elongata* specimen in a garden at Ba Ngòi, Khánh Hòa Province.



Figure 5 Remains of a megasporophyll cluster from a *Cycas elongata* specimen in a garden at Ba Ngòi, Khánh Hòa Province.



Figure 6 A male *Cycas elongata* cone, approaching the pollen-shedding stage, on a plant in cultivation in Saigon.



Figure 7 Numerous seedlings, as seen in the wild *Cycas elongata* populations during the 2002 Vietnam Expedition, indicate healthy recruitment.

ta are significantly shorter than those on *C. pectinata*. Perhaps the intended meaning in all these writings is that the *proportional* length (i.e. apical-to-lateral spine length ratio) is greater in *C. pectinata*. Perhaps the intended



Figure 8 Although *Cycas elongata* plants are presently abundant in the wild, populations in southern Vietnam are under threat from land-clearing for agricultural projects – such as this site intended for bananas.



Figure 9 Alarming numbers of *Cycas elongata* specimens, usually large mature plants, are removed from the wild for sale along the roadside or in nearby towns.



Figure 10 Apart from local sales, large numbers of wild-collected cycads are transported to holding nurseries along the north-eastern Vietnam border, for sale as landscaping feature specimens to Chinese buyers. Members of the 2002 Vietnam Cycad Expedition came across this cache of about 50 large *Cycas elongata* specimens near the town of Đông Dăng, in Lang Son province, and only about 20 kms from the Chinese border.

meaning in all these writings is that *proportional* length (i.e. apical-to-lateral spine length ratio) is greater in *C. elongata* (usually about 2:1) than in *C. pectinata* (usually

about 1:1), although this character is by no means constant.]

[Leandri's (1931 original description for *C. pectinata* var. *elongata* reads as follows: "Var. n. *elongata* - Carpophylles á extrémité sterile plus étroite et allongée, atteignant presque la demi-longueur du carpophylle, divisée á la partie supérieure seulement." Ken Hill (pers. comm) interprets this as : "Carpophylls (?megasporophylls) narrower and elongated at the sterile extremity (?apex), reaching almost half the length of the carpophyll, divided only in the upper part."].

CONSERVATION AND CULTIVATION

The present I.C.U.N. Red List (1994) status for *Cycas elongata* is **VU A2c**; ["VU" means vulnerable, "A" indicates a decline in population numbers, "2" refers to an estimated 20% decline in population numbers over the next 3 generations and "c" means the decline is based on the extent or quality of the habitat]. Although the wild populations are extensive, and seedling recruitment is healthy (Figure 7), the species is coming under increasing threat from large-scale clearing for agricultural development (Figure 8) and from the removal of significant numbers of plants for domestic (Figure 9 {and Figure 16 on p. 21}) and export (Figure 10) sales. Export out of Vietnam continues despite that country being a signatory to CITES regulations which prohibit such trade. In addition, the cycad megasporophyll clusters are sought after for decoration - possibly because they represent a fertility symbol loosely analogous to the lotus flower - and numerous female plants are decapitated in these harvests. These combined activities cannot be sustained in the long term and we believe the authorities need to pay urgent attention to some form of protection for this and other Vietnamese cycads.

Ex situ plants of *Cycas elongata* are in the collections of several major botanical gardens. The Fairy Lake Botanical Garden at Shenzhen, China, has some 200 mature specimens in its accessions. Smaller numbers are held by other Chinese gardens and at Nong Nooch Tropical Garden, Thailand, while a single specimen grows at Montgomery Botanical Center, Miami, USA. The species appears to adapt well to cultivation but would probably not survive a winter frost environment.

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CYCAD ECOTOUR OF MEXICO, NOVEMBER 2001.

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After the success of the March 2000 Cycad tour of Southern Mexico, I was eager to return and see some more of this plantsmans paradise. I was very fortunate to have the support of my employers at Abbotsbury Subtropical Gardens and sponsorship from the Royal Horticultural Society without which the trip would not have been possible, and for this I am very grateful.

The trip was planned for November 2001, the end of the rainy season in Mexico. A time that would prove perfect for observing plants in general but most particularly the cycads.

Jeff Chemnick was to lead the tour, organise and plan the route. His experience and knowledge on the cycads of Mexico is probably second to none. Other members of the tour included Stephen and Pieter, cycad enthusiasts from Europe also on a return visit, Jane Allen from the Eden Project, Corey from Lotusland California, Julie from San Francisco, Leo from Phoenix and Mark from Puerto Rico.

The aim of the tour was to visit and photograph some of the significant cycad localities in the southern states of Mexico. To make comparisons between related plants, to look at habitats, coning and recruitment. Also to note other plants of interest particularly the Agavaceae. The itinerary was ambitious covering localities hundreds of miles apart.

Jane and I arrived in Veracruz on the 8th November some eighteen hours after departure from Gatwick and the cold leaden skies of England. It was close to midnight and after enduring customs and the 30-minute taxi ride to the city centre, we checked into the hotel Emporio. The hotel was ideally situated and overlooked the container port with a broad esplanade alongside. The next day was spent walking round the city. Battered old buses fully loaded continually roared by, leaving clouds of dust and smoke as we walked through the streets. Veracruz is hot, noisy and very busy but at the same time full of atmosphere and history. So it was well worth dodging the traffic and potholed sidewalks to sample the full flavour of the city. The picturesque Plazas surrounded by cafes and bars date back to the early part of the last century and offer a chance to escape from all the noise and chaos. Here businessmen read the newspaper whilst getting a shoeshine and locals sit and chat in the cool shade of the Roystoneas and watch the flocks of Grackles scavenge.

We finally met up with Jeff in the late evening and drove to

our rendezvous hotel. Located on the seafront and with an outdoor pool this hotel could well fool the unsuspecting into thinking a night of comfort was ahead. However, only the first three floors of the building were complete and above this was just the concrete framework. This was made even more bizarre by the fact that the completed floors were in desperate need of refurbishing. The all night traffic and 2am commotion in the corridor further added to a memorable stay.

By early morning next day the group was complete and ready to go. It was a damp start, as we made our way north out of the city, towards the first of many cycad localities. Fields of Sugarcane, Mangoes and Papaya passed as we followed the coast road to Palma Sola, then headed inland through stands of *Sabal mexicana* and *Acrocomia*. Higher up the Palms gave way to oak and pine. On the ridges at 650 metres the oaks supported vast numbers of *Tillandsia* and epiphytic orchids, away from these ridges their numbers quickly dwindled.

We stopped at the *Ceratozamia* locality, thought possibly to be the one the Dutch botanist Miquel used to describe *Ceratozamia robusta* in 1847. The cycads were of varying sizes and in great abundance some with immature cones. It was interesting to note that the plants only occurred on the slopes and were absent from any level ground and that they were most common on the unshaded slopes of a relatively new road cut. The area was rich in other plants of interest including *Salvia*, *Begonia* and *Chamaedorea*.

Only a few miles down the road to Palma Sola were populations of *Dioon edule* growing among boulders and stunted oaks. The particular area we visited had *Dioon* in good numbers and ranged in size from seedling to 2.5 metre plants. Many had new leaves and a few were coning. Other plants in the vicinity included prostrate cacti growing over the boulders, *Laelia* in flower and *Tillandsia*.

We got back on the fast coast road and started the long drive north towards Tamazunchale stopping in Almo for the night and continuing inland through Tantoyuca. The roads in Mexico can vary from dirt track to pristine motorway and this can't always be read from a map. The road towards Tamazunchale was of the worst kind, neglected tarmac. Numerous deep potholes littered the road for mile after mile slowing our progress right down. Tamazunchale affectionately known to some as "Thomas and Charley" wasn't what I expected either, but after a good lunch and on

to a better road we went in search of *Ceratozamia latifolia*. The road took us through a steep walled canyon with limestone cliffs covered in tall *Neobuxbaumia* and *Agave*. A few *Ceratozamia* were seen growing on open rock but more commonly amongst dense vegetation.



Figure 1 Edward James Garden.

We arrived at our destination the Edward James garden (Figure 1) near Xilitla with just enough time to absorb the strange atmosphere of this eccentric garden before sunset. Edward James was an English aristocrat who spent his latter years building strange concrete structures in a wild sub-tropical garden. The garden runs through a steep sided, forested canyon with waterfalls, streams and pools. The bizarre concrete stairways and columns of enormous proportion feature throughout the garden alongside dense planting of *Begonia*, *Bambusa*, *Heliconia* and *Tetrapanax*, mixed with native species giving a most unusual but pleasing effect. *Ceratozamia latifolia* (Figure 5) were spotted growing on the rocks near the falls. We stayed the night in cabins in the garden, which gave us an opportunity to experience the noisy nocturnal insect life.

In the cool mist of dawn we departed from the garden and headed west leaving the state of San Luis Potosi for Queretaro and another *Ceratozamia latifolia* locality. Blue and magenta *Salvia* were growing at the foot of the northerly slope. The hillside was under a thick canopy of forest with rich and loamy soil, broken by rocky outcrops.

The best examples were at the top, having arching leaves up to a metre in length. *Ceratozamia latifolia* was originally named in 1848 but all type material was lost leading to some confusion with *Ceratozamia microstrobila* which perhaps in some respects is a similar looking plant.

On route to the next locality we made a couple of stops. The first was at El Lobo, a small town in the mountains. During lunch we looked on as the villagers poured out of the church at the end of service, whilst nearby a man was boiling meat in a huge pot over an open fire and hanging strips up to dry. After lunch we stopped briefly to look at fossils on an eroded slope on the outskirts of town before driving to the *Dioon* locality.



Figure 2 Blue leaf form of *Brahea dulcis*.

The elevation was 1440 metres and typical *Dioon* country. A steep rocky slope sparsely covered with oak and thorn trees. Beautiful blue leafed *Brahea* were an unexpected bonus at this superb locality. The cycads known as *Dioon edule* 'Queretaro' (Figure 4) were growing in good numbers, in various sizes to about one metre. The leaves are held in an upright manner in this form and are blue green on emergence. At the higher levels of the 160 metre slope grew silver leafed *Hechtea* and tall *Yuccas*. *Ceratozamia sabatoii* was also seen growing on the slope, a cycad of small stature with leaves to 80 cm and lanceolate leaflets, it was described in 1993.

By noon it was time to head north and back into the state of San Luis Potosi. The road followed the Rio Santa Maria with huge *Taxodiums* hugging the riverbanks for miles. We were heading for Rio Verde for the night, a large town situated on a high plateau. It was quite unlike the towns and villages we had visited further south, and the surrounding countryside had different species of *Agave*, *Yucca* and *Cacti* (Figure 3), and no palms were seen. During a brief stop the only wildlife noted was a small brown scorpion sheltering under some discarded cardboard.

The next locality was to be the most northerly of the tour and special in having all 3 genera of Mexican cycad in close proximity, *Dioon edule* Rio Verde, *Ceratozamia microstrobila* and *Zamia vazquezii*. The *Dioon* were the first to be seen being the largest and most abundant, some having ripe cones and trunks of up to 1 metre. Once again



Figure 3 *Hectea*, *Agave* and Cacti.

the habitat was rocky and under a thin canopy of oak, but on fairly level ground. *Zamia vazquezii* proved very elusive but eventually a few were found in an area less rocky and with a thicker canopy. Each plant only had one leaf up to 30 cm long, the caudex of *Zamia vazquezii* is subterranean. Several *Ceratozamia microstrobila* were located a very short distance away on level forest floor. We had the very good fortune to find a female plant with a ripe cone (Figure 8) intact, this is a very rare sight as *Ceratozamia* cones collapse and disperse seed very quickly on ripening. Eighty-five seeds were counted before they were scattered in the forest.

We drove on through Cd Valles to the next cycad locality and one of great significance, a plant popular in cultivation, but critically endangered and seldom seen in the wild. *Ceratozamia hildae* was originally collected in the fifties and became widespread and abundant in cultivation. It wasn't described until 1979 using plants in cultivation. However, from what I can gather there was an error in the original notes pertaining to the altitude of the locality, 3600 km! This along with their rarity made them difficult to relocate in the wild. So there are very few records of *Ceratozamia hildae* in the wild since the 1950's. The drive to the plants took us off the main road and along miles of dirt track through picturesque villages with rivers and lush green fields. Jeff managed to locate a guide in the village to take us on foot the remainder of the way. The cycads (Figure 6) were growing in dense secondary forest among cracks in the limestone outcrops, most had four or more leaves up to 2.4 metres in height. Less than a dozen plants were seen none of which were coning, the elevation was around 360 metres.

After *Ceratozamia hildae* we had a long drive south stopping overnight at Alamo and continuing back through Veracruz to the dune locality of *Zamia furfuracea*. This is the most likely type locality for the species however it is under review at the moment. The plants at the dune locality have long narrow leaves whilst the coastal plants have rounded leaves. The coastal *Zamia* grows on sea cliffs further south and is the more common type in cultivation, it may be renamed *Zamia maritima*. One particular *Zamia furfuracea* covered two metres by two metres and had many mature cones, this was a common sight in the past, however due to over-collecting most of the large plants are long

gone. It was noted that in January the same plant also had ripe cones. The dunes are sandwiched between the Gulf of Mexico and Laguna Alvarado.

By the evening of the 5th day we were in the Plaza at Santiago Tuxtla admiring a colossal Olmec head that was carved out of granite over 2000 years ago. The Olmec civilisation thrived long before the rise of the Maya. The Plaza was also home to some fine looking *Dioon spinulosum* (Figure 9) and *Cycas revoluta*.

We had a 6 am start the next day to see *Ceratozamia robusta*, just out of town growing on a steep heavily wooded slope. *Ceratozamia robusta* is widely distributed and presently under review, the plants in this locality were the largest I'd seen with trunks up to 1.5 metres and leaves 2.5 metres long.

After a good breakfast we headed south towards the *Dioon spinulosum* locality through rich agricultural land. *Dioon spinulosum* is the tallest Mexican cycad and grows at a lower altitude in more humid conditions than many of its relations. This means growing in close proximity to the lowland farmers, however the cycads aren't under too much threat thanks to the steep rocky slopes and limestone outcrops in the area. There were many fine examples on an outcrop near to the road, a good number of which were over 10 metres tall with mature cones. There was ripe and germinating seed on the ground, we also found a sack full of sprouting seed in the undergrowth presumably dumped by a collector. Unfortunately the forest was mainly secondary growth and many of the *Dioon* had charred trunks from clearing fires. There are *Dioon spinulosum* localities in pristine forest but these are not so easy to reach.

From the Tuxtepec area we continued south through miles of wetlands, with endless varieties of colourful birds on view. We made a brief stop in the hills to look at *Ceratozamia whitelockiana* growing on wooded slopes, then climbed steeply into cloud forest. In a short space of time we had gone from tropical forest to temperate forest with swirling mists and tall tree ferns. The tree ferns appeared at around 1600 metres and as we continued to climb they gave way to pine forest then tropical tundra. The pass was at 3150 metres and we stopped to look down on the blanket of cloud covering the forest below and note the local plant life. The sun was setting and the temperature dropping as we identified various *Salvia* and *Bidens*, amongst the rocks. We drove down the other side of the mountain into Oaxaca arriving well after dark.

In the morning we left Oaxaca in a north-easterly direction and through another plant zone. For many miles we saw *Ipomoea arborea* and *Helianthemum* in flower, *Agave angustifolia*, *Dasyllirion*, tall thin *Yucca*, *Brahea*, Bromeliads and Cacti. We drove up into one of the canyons passed giant *Pachycereus* and *Opuntia* to the *Dioon purpusii* locality. The cycads were growing amongst thorn trees and blue leafed oaks, on the top of a ridge with spectacular views. Many of the plants were of a good size with trunks well over 2 metres (Figure 10). A strange looking mouse around three times the size of a house



Figure 4 *Dioon edule*, Queretaro.



Figure 5 *Ceratozamia latifolia*.



Figure 6 Julie with *Ceratozamia hildae*.



Figure 7 Cone and seed of *Dioon califanoi*.



Figure 8 Ripe female cone of *Ceratozamia microstrobila*.

mouse with large ears and strong hind legs was nesting in the crown of a large coning female. We found seed with half-eaten sarcotesta and it was clear that mice play a part in seed cleaning

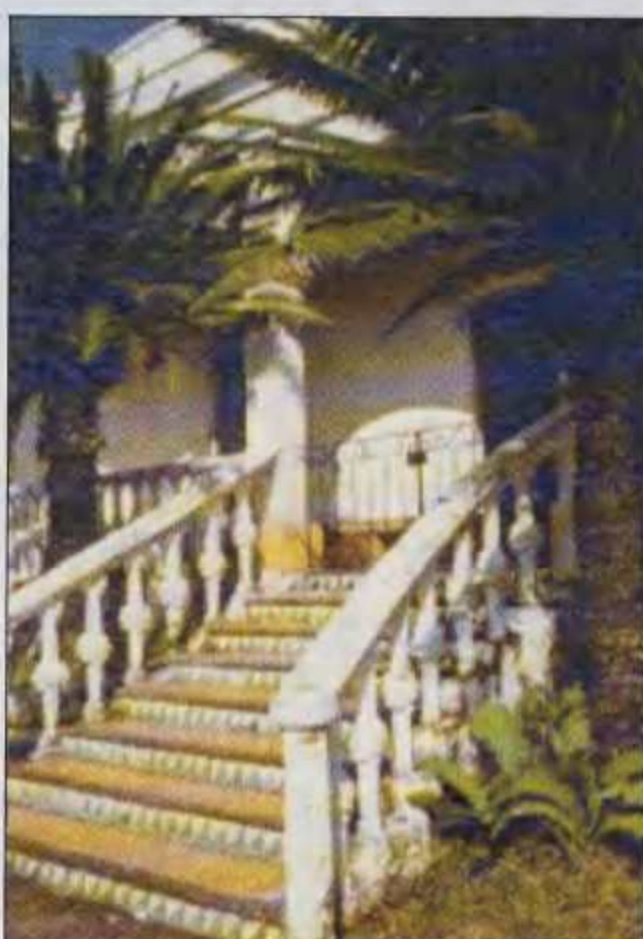


Figure 9 *Dioon spinulosum* in Santiago Tuxtla.

and distribution. Twelve female plants with cones were counted and each cone has approximately 150 seeds.

Dozens of seedlings were growing in



Figure 10 *Dioon purpusii*.

the area but the survival rate beyond three years seems to be zero in average years. The reason for this is not entirely clear, but it could be partly related to weather conditions and more specifically rainfall.



Figure 11 Corey with *Dioon caputoi*.



Figure 12 *Dioon caputoi* with Campesinos.



Figure 13 *Dioon holmgrenii*.



Figure 15 Oaxaca Botanic Garden.



Figure 14 *Dioon caputoi*.

It was a relatively short drive onto Teotitlan, where we would stay overnight, enabling us to visit the next locality at dawn. This was much preferred from the photographic point of view, though of course not always possible to arrange in the short time we had. The dirt road up to *Dioon califanoi* was good going and we were there before sunrise, elevation 2000 metres. The habitat is similar to *Dioon purpusii* with the cycads growing on or near the top of the ridge. The aromatic sagebrush was heavy with dew and low cloud would intermittently blow over the ridge. It was a beautiful sight watching



Figure 16 Jeff with cultivated *Dioon* from Rio Balsas drainage.

The sun rising over the peaks and casting light on the cycads. Epiphytic

cacti covered the trunks and tiger striped caterpillars were eating some of the leaves. Some of the *Dioon califanoi* had multiple trunks and cones of both sexes were noted (Figure 7). There are perhaps 2000 cycads at this particular locality, spread along the canyon amongst the oaks and thorn forest. We drove west towards Santiago Chamzuba passing through the high desert and hillsides covered in *Stenocereus*, *Pachycereus* and *Neobuxbaumia tetetzo*. Usually one species of cactus would dominate the landscape before gradually giving way to another as you

progressed. Another interesting plant in the area is *Agave karwinskii*, a large arborescent species that's very rare in cultivation.

Around noon we took a brief tour of a desert garden in the middle of the desert. The heat and light were intense, the surrounding hills covered in tall columnar cacti for as far as you could see. The garden contained a fine collection of plants and also displays of items made with cacti wood. The pride of the garden was a giant *Beaucarnea gracilis* with a base over 2 metres in diameter. The globose trunk topped by thin stems each terminating in a rosette of grassy leaves gave the plant a very dramatic appearance. We escaped the midday heat cooling off in a local restaurant before pressing on to see *Dioon caputoi*.

The *Dioon caputoi* locality was about three hours drive off the paved road to the village where permission then had to be sought before we could continue. Finally after much discussion with the officials and campesinos they finally agreed to take us to the cycads. For what seemed like miles we followed in their cloud of dust along a track then up a dry riverbed until we could drive no further. We then continued on foot, again at high speed as it was getting late in the day. Half way up the riverbed we came across a coral or milk snake but no-one knew for sure which it was, one being highly venomous the other a harmless mimic. It was beautifully marked with red, yellow and black bands.

The campesinos led us up the steep trail over a hill and to the cycads on the other side. The cycads (Figures 11, 12, 14) were grouped round the top of a horseshoe ridge with a rocky gully dividing them. *Dasyllirion* and *Agave* were clinging to the rockface in the gully. The surrounding hills were sparsely covered in cacti, oak and thorn trees.

Dioon caputoi is easily distinguished from other *Dioon* by its widely spaced leaflets, the leaves are held in an upright manner and are a glaucous blue green. Some had trunks up to 2 metres and male and female plants with cones were present.

The campesinos showed us 500 seedlings they had planted on the slope in deep planting pockets. It was clear that they are well aware of the importance and vulnerability of *Dioon caputoi* and have the foresight to do something about it. We thanked them for their time, made a contribution to the *Dioon* project and drove out of the canyon just as night was falling.

After spending the night in Santiago Chazumba we drove into western Oaxaca to see a *Dioon* in the Rio Balsas drainage. Passing through villages on route a *Dioon* was noticed in a front garden. Cycads are a relatively rare sight in gardens so it drew our attention. The plant was in prime condition with numerous upright glaucous leaves. Jeff identified it as a Rio Balsas plant (Figure 16), but unfortunately the owner wasn't around to question so we pressed on to the locality.

The approach was up a long winding dirt road. The locality differed from some of the others in so much as the general

area was at 1600 metres with the cycads growing in steep sided gullies, rather than on ridges with commanding views. Thorn scrub dominated the landscape with the occasional oak tree and *Pachycerus*, *Ferrocactus* and *Agave angustifolia* were growing in good numbers.

Thirty or so *Dioon* were counted in the area we visited with trunks up to two metres. The Balsas plants are in some ways similar to *Dioon caputoi*. The leaves are flat with stiff leaflets at right angles to the rachis and the cones are tapered. It's a fairly recent discovery awaiting description and significant because it's a Pacific drainage *Dioon* that's not *D. holmgrenii*, *D. merolae*, nor *D. tomasellii*. Only a few seedlings are in cultivation.

The time had come to decide which way to go for the remaining days. The group was divided between making the long drive to the pacific coast and *Dioon holmgrenii*, and going to a new *Dioon* locality and a Mezcal distillery. It was a close thing but as we had the time and it was on the itinerary we decided on the pacific coast. So we set off south through the mountains driving into the night to get some miles behind us, however the road was not as good as anticipated, progress was slow and we finally had to call it a day at Putla. We departed before dawn the next morning, as there were still many miles of winding mountain road to go. It was noon before we finally got to Puerto Escondido and sample the warm waters of the Pacific.

Dioon holmgrenii (Figure 13) is only a few miles up the road from Puerto Escondido on private land. We parked at the owner's property, where he greeted us then set off down the trail through very degraded habitat. A jungle of thorns and vines covered the steep site. The cycads, however, were of a spectacular size with trunks over two metres charred black from clearing fires and topped by leaves two metres long with deflexed leaflets. There was also a large female plant with a dehiscing cone, the sarcotesta was orange and it looked like the landowner had collected seed from the top of the cone. This is the type locality for *Dioon holmgrenii* and it was difficult to count how many there were, we saw around seven large plants.

One *Zamia paucijuga* was also seen by the trail. This is a small cycad with subterreanean stem and arching leaves up to one metre. A new *Dioon holmgrenii* locality has been found recently a few canyons away with in excess of 25000 plants, unfortunately there wasn't enough time to go there.

We drove north back into the mountains to see *Ceratozamia* sp. "Pacifica", however the area where the cycad was last seen had been completely destroyed by logging. It was a very depressing sight to look upon in the fading light and we still had ahead of us, the five-hour drive back through the mountains to Oaxaca.

Monday morning of the last day was spent in Oaxaca visiting one of its best-kept secrets, the botanical garden (Figure 15). Only two years in the making and already looking very impressive, the collection consists of plants from the state of Oaxaca. *Agave*, *Dasyllirion*, *Beaucarnea*, *Dioon*, Cacti, trees and succulents all beautifully arranged

in a magnificent historic walled garden. We were given a guided tour and shown many interesting plants. *Agave isthmensis*, *Agave marmorata* an arborescent species in flower, *Agave guiengola*, *Fouqueiria* in flower, *Carica mexicana* and many others including some unnamed species.

The last leg of the journey was through high desert giving us the opportunity to stop at points of interest and admire plants such as the rare *Fouqueiria purpusii* in flower. As we got closer to Veracruz a veil of black cloud swirled round the distant mountains giving us our final view on a most memorable tour.

November is an excellent time to visit Mexico. We had a couple of hour's rain on the first day after which there was nothing but blue skies. The temperature varied considerably from the heat of the desert at noon to the cold mountain air at over 3000 metres. Night temperatures were generally cool throughout.

One of the most abundant plants in flower was a *Helianthemum*, its warm yellow flowers stretched for miles alongside the road and on the fringes of deserts. On higher ground, blue and pink *Salvias*, *Penstemon* and *Dahlia* were commonplace. The African tree *Spathodea campanulata* is widely planted throughout Mexico and was at its peak, the bright orange red flowers standing out against its glossy green foliage. *Cochlospermum* and *Ipomoea arborea*, two small native trees, were also at their best.

Where there were flowers there were butterflies of all sizes and colours up to the impressive large blue ones from the genus *Morpho*, which floated effortlessly through the tropical forest. Mexico is also a hotspot for birds having over 1000 species, many with spectacular colouring. Of the invertebrates, tarantulas must be one of the most impressive, the two we saw were black, hairy and the size of saucers. One was crossing the road alongside dense forest, the other on the wall of the hotel room. Insects and their kin in general were not too much of a problem, the mosquitoes were a minor irritant in a few of the areas, so too the fire ants with their painful but short-lived sting. There was also a plant in the family Euphorbiaceae, with a sting like a nettle only much worse and longer lasting. This small tree, known locally as "mala mujer" (bad woman) appeared to be fairly widespread and opportunistic, as seedlings were quite common in secondary growth. At the Rio Balsas locality Jeff accidentally put his machete

through a bee's nest hanging in a thorn bush, fortunately for us he was the only one stung. Walking through the forest required some care, on at least three occasions I came face to face with giant spiders in the middle of a web slung between two trees.

The distance we travelled was huge, around 4500 km. Perhaps too many for comfort in such a space of time, but it wasn't by any means unbearable and looking back, well worth it. The vehicle was comfortable and the company good so the time passed effortlessly away. There was always something of interest to look at passing through the changing countryside. We had two flat tyres both coincidentally on the same day but it caused no great inconvenience and it was fascinating to see how the Mexicans dealt with puncture repair. One of the places where we changed tyres was by a steep sided gorge with a beautiful small *Agave* growing on the walls. Apparently this plant is not in cultivation, partly I would imagine because it's almost impossible to get to.

The cycads were looking superb. Most had a new flush of leaves and there were many cones to observe. The weight of a mature female *Dioon* cone is immense, some twenty plus kilos and contains around 150 seeds. Pollination is by a tiny weevil that is attracted to the cone by scent. When the cone is fully ripe it opens and starts to collapse, this degeneration is known as dehiscence. Rodents then move in to eat the sarcotesta and aid in dispersal. A particularly aggressive ant was nesting in one dehiscing cone.

All the cycad localities we visited were special for different reasons. A new locality, a species due to be separated out, a locality where all three genera grow, or quite simply a beautiful location with other plants of interest, and not forgetting of course the rediscovered *Ceratozamia hildae* locality. On the subject of cycad localities its worth mentioning that many of them are in areas so remote that in some instances even Jeff had trouble finding them, and some in such small populations that you could drive or even walk by them without noticing they are there.

The diversity of plant life in Mexico is quite staggering and it would take more than a lifetime to see it all. I could happily spend many more weeks exploring the canyons, forests and deserts. Visiting for a second time has given me an even greater affection for the country and a desire to return again one day.

THE VIETNAM CYCAD EXPEDITION

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Directly after the Cycad Biology conference on which we briefly reported in the previous issue, a small party set off

for Vietnam to have a look at its cycads. Our leaders were Ken Hill of the Royal Botanic Gardens in Sydney, New

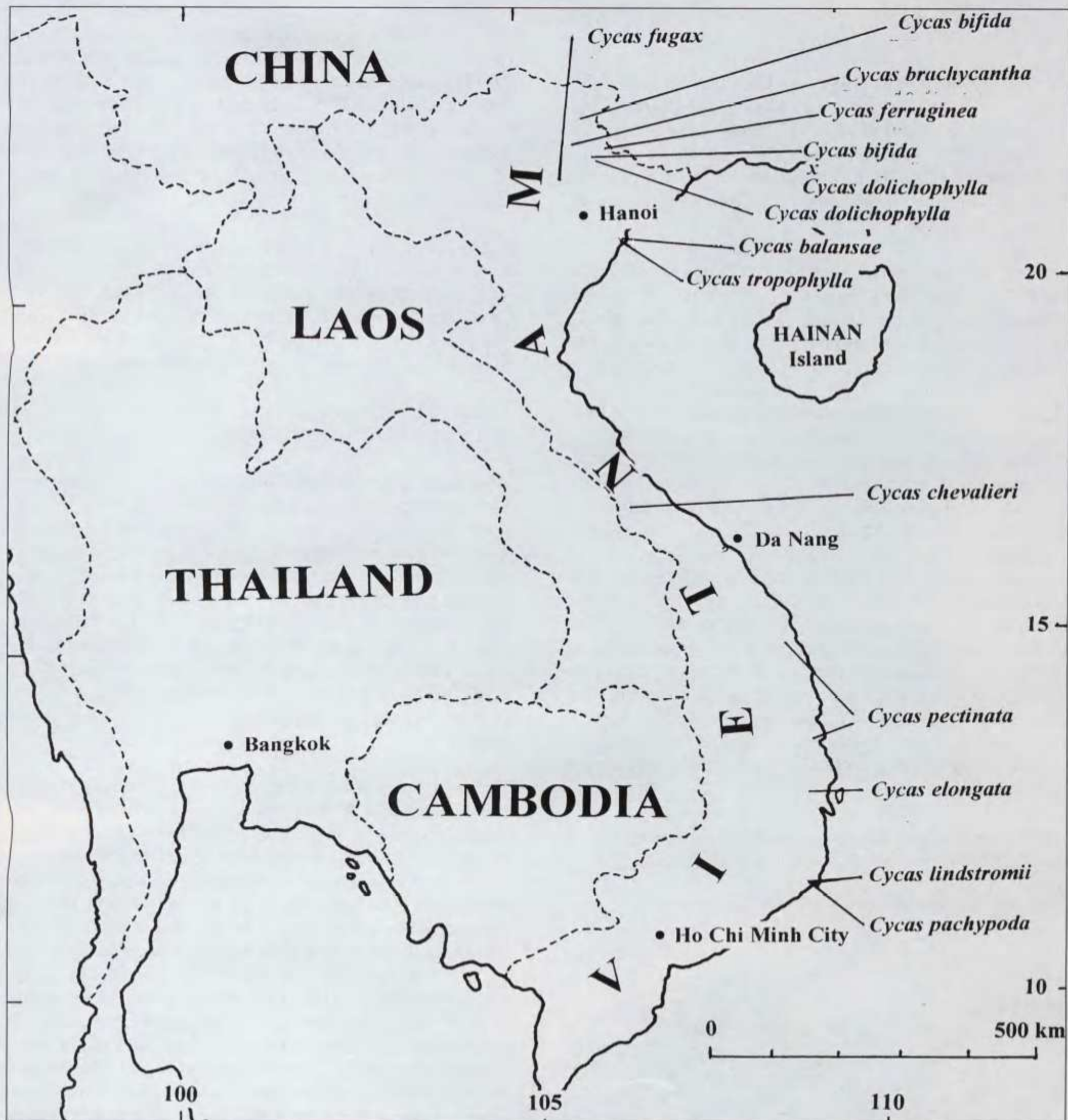


Figure 1 Map showing position of Vietnam relative to neighbouring countries, the positions of the main centres, and the approximate locations of cycad species.

South Wales who had previously done extensive fieldwork on *Cycas* in Vietnam, and Nguyen Tien Hiep of the Vietnamese Institute of Ecology and Biological Resources – a connection which opened numerous doors which otherwise would have remained firmly shut. Other members of the expedition were Jeff Chemnick from California, Leslie Greenwood (Hill) who acted as minister of finance, Virginia Hayes of the Lotusland Botanical Garden in Florida, Li Nan from the Fairy Lake Botanical Garden in China, Roy Osborne from Queensland who acted

as recorder, Harvey Ottley of the Northern Territory Wildlife Service, Lou Randall from Queensland, Willie Tang from Florida, Stan Walkley from Queensland, and Elsa and myself. Most of them are members of our Society, and most were old friends from previous meetings as well as our Mexican expedition of 1999.

Vietnam is a narrow country on the western shore of the South China Sea, some 1700 km long from north to south but in places only 25 km wide. In the southwest it borders

on Cambodia, in the northwest on Laos, and in the north on China (Figure 1).

Cycadologically Vietnam has only been explored since the 1990's, and at the time of writing the names and descriptions of a third of its cycad species have not validly been published. These include *Cycas brachycantha*, *C. dolichophylla*, *C. fugax*, *C. pachypoda*, and *C. tropophylla*, due to be published in *Memoirs of the New York Botanical Garden* later this year.

On day one we entered Vietnam by flying into Ho Chi Minh City (previously Saigon). This city sits on the extensive delta of the Mekong River, and while this is visible from the air, it was not evident in those parts of the city which we traversed.

Our botanical exploration started in earnest on day two. We had a small bus with which we travelled northwards on the main and only road traversing the length of the country, our aim being Ca Na via Phan Thiet. On the map it does not look far, a mere 280 km., but it is almost a full day's travel from Ho Chi Minh City to Ca Na. This road is elevated above the surrounding swampy rice fields. By our standards it is rather narrow, and we shared it with uncountable bicycles and motorcycles. This traffic set the tune for what we experienced throughout the trip. The landscape along the road lacked the dense green jungle of the movies, consisting mainly of level marshy land now turned into rice paddies wherever it was not too dry. In fact, that whole day we saw no undisturbed natural vegetation but almost continuous human habitation, a pattern which repeated itself with regular monotony on the following days.

Just before reaching Ca Na we encountered our first wild cycads, *C. lindstromii* and *C. pachypoda* (Figure 2).



Figure 2 Habitat of *Cycas lindstromii* on the flats, and *C. pachypoda* on the granite hills near Ca Na. Note the close proximity of the South China Sea in the background.

Cycas lindstromii is a recent discovery, having been described in 1997 only, which is surprising in view of the American presence in the area during the Vietnam War. It grows close to the sea on deep and loose granite sand with granules up to 2 or 3 mm across. The vegetation has been described as dry open dipterocarp forest; but where we saw

it, it consisted of rather sparsely spaced little trees or bushes not more than 3 m tall. The cycads grew in open, sunny places, and were restricted to the level coastal plain (Figure 2). The combination of ample sunshine and well-drained sand certainly made a fairly arid habitat. However, this habitat is very much degraded by human presence, and certainly far from natural. It looked very much like the sort of place where one might expect to encounter *Encephalartos ferox*.

Cycas lindstromii is a dwarf species, in growth form like *Encephalartos caffer* or *Zamia furfuracea* (Figure 3). Its stem is more or less completely underground, but often considerably branched, an unique characteristic in *Cycas*. The leaves (Figure 4) are 50 to (exceptionally) 100 cm long, and conspicuously bright glossy green.

Perhaps it was not coning season, but we could find only a single dried male cone (Figure 5).

Also at this place we encountered *Cycas pachypoda*, one of those species which were discovered so recently that the description had not even been validly published at the time of our expedition. However, while *Cycas lindstromii* grows on the flats, *Cycas pachypoda* grows on an extensive series of steep granite hills directly landwards of the flats and still within sight of the sea (Figure 2). The associated vegetation is the same as on the flats but even lower, and the cycads grow wedged between huge rounded granite boulders, more or less in direct sunlight. Not for the last time on this trip, we yearned to have one such hill in the backyard.

In this species the stem is at most 1.5 m tall, with a conspicuous and abruptly swollen base to the stem (Figure 9). Instead of a chain mail of old leaf bases which is such a conspicuous feature of most other cycad species, the stem of *Cycas pachypoda* has a thick corky and deeply fissured bark (Figure 10) which shows much sign of past fires. A corky fire insulation has advantages in that cork is a very good heat insulator, and if the outer layer gets burn of it can be renewed from inside by the cork cambium. The leaves (Figure 6) are up to 1.3 m long, bluish green and less glossy than in *Cycas lindstromii*, and the leaflets conspicuously point towards the apex of the leaf. Again we could find no female cones, but Elsa found a fresh male cone (Figure 11). This we picked for Willie Tang who collects information on insects associated with cycads, and to everyone's delight found the lower part of the cone to be swarming with snout beetles.

It is surprising that we found no sign of hybridization between *Cycas lindstromii* and *Cycas pachypoda*, given that they grow so close together. True, when two potentially hybridizing species grow close together in nature there are usually mechanisms in place to ensure that each retains its integrity, but on occasion it does break down as we found later on with a hybrid swarm of *Cycas bifida* and *Cycas dolichophylla*. It would be fascinating indeed to be able to investigate this phenomenon.

We overnighted at Ca Na, where we first saw first-hand the



Figure 3 *Cycas lindstromii*: a plant in habitat.



Figure 4 *Cycas lindstromii*: leaf detail. Note the high gloss.



Figure 5 *Cycas lindstromii*: a dried male cone, about 20 cm long.



Figure 7 *Cycas elongata*: leaf detail.



Figure 6 *Cycas pachypoda*: leaf detail.



Figure 8 *Cycas elongata*: a dense planting in front of a hotel in Nha Trang. Note the irregular and gnarled stems, suggesting that these ancient field collected plants which previously survived countless natural setbacks.



Figure 9 *Cycas pachypoda* in habitat.



Figure 10 *Cycas pachypoda*: the stem, showing deeply fissured corky bark with some char marks from past fires.

most serious threat with which the Vietnamese cycads have to contend. On both sides of the road was what looked exactly like a South African "informal settlement". On the roadside these people were selling corals and shells from the sea, but also substantial numbers of uprooted *Cycas pachypoda*



Figure 11 *Cycas pachypoda*: a male cone, about 30 cm long.



Figure 12 *Cycas elongata*: a fine specimen in habitat which consists of dense secondary scrub forest.

(Figure 15)

Day 3 entailed the sector Ca Na to Nha Trang, a distance of 342 km, and an appointment with *Cycas elongata*. Soon after commencement of our



Figure 13 *Cycas elongata*: a mega-sporophyll cluster.



Figure 14 *Cycas elongata*: a male cone, some 40 cm long.

journey northwards of Ca Na, tall granite hills started flanking the road, and Ken Hill told us to keep our eyes



Figure 15 *Cycas pachypoda*: wild collected plants being offered for sale on the roadside.



Figure 16 *Cycas elongata*: a load of wild collected plants on its way to some city market, being inspected by members of the Vietnam Cycad Expedition. Note land clearing in the background.

open as those hills harboured *Cycas elongata*. Soon enough we saw a physical manifestation of this, but not in the way expected: ahead of us in the road appeared something which at first we could not identify, then it resolved into something like a clump of cycads on the move, and then finally we comprehended that it was a 3-wheeled motorcycle grotesquely laden with plants of *Cycas elongata* (Figure 16), undoubtedly on its way to a market in some city.

Surprisingly the real status symbol in Vietnam is none of the indigenous *Cycas* species, but rather the Japanese *Cycas revoluta*. Only people unable to afford *Cycas revoluta* turn to the local species. Our bus driver obligingly screeched to a halt in front of the motorcyclist. After inspecting the freight and interrogating him (the poor man must have thought that the American Devils had returned in the form of something akin to the Gestapo), our journey continued, and soon we started spotting cultivated *Cycas elongata* in roadside gardens. While we were delighted at the opportunity to see and photograph cones on these garden plants, our real quest was to see them in nature. Here we got a rude shock. Almost all the plants which we found, were in cleared areas where the cycads were left standing for some or other reason (Figure 17). On the other hand, plants in previously cleared areas which are now occupied



Figure 17 *Cycas elongata*: charred trunks left standing in areas cleared for agriculture. Many more can be discerned in the background.

by impenetrable secondary forest, were not at all easy to find. We were rather upset by the sight of lone, fire-charred stems remaining standing in cleared land, often showing signs that their tops had previously been lopped off, probably to serve as some ephemeral decoration. Nevertheless Ken Hill, who had previously done extensive fieldwork in the area, assured us that the local hills extend quite far towards the border with Cambodia, and that *Cycas elongata* is probably in no pressing danger of eradication.

Cycas elongata was described in 1931, as a variety of *Cycas pectinata*. The Second World War, the Vietnamese War, and the aftermath ensured that it remained poorly known; but Ken Hill's research proved that it is a distinct species. It is another of those species in which the stem surface is corky rather than covered in old leaf bases, suggesting that it has been surviving in a fire-prone habitat for a long time during its evolution. It grows quite big, with stems up to 5 m tall (Figure 12). Its leaves are 90 to 140 cm long, and the grey-green leaflets are relatively wide (8 to 11 mm) (Figure 7). Characteristically the female sporophylls have a distinct apical spine 30 to 55 mm long (Figure 13). The male cone (Figure 14) is a splendid cream-coloured structure, more than 40 cm long, with a very short erect spine on each microsporophyll.

As is so often the case on expeditions such as this, one has to be thrifty with time, and all too soon we had to press on to Nha Trang, a sizable city, where we were to overnight in a really smart hotel. And, at this hotel the destination of some of those *Cycas elongata* like the ones which we earlier saw on the 3-wheeled motorcycle, became clear: in front of the hotel, in two groups flanking the hotel entrance, was a dense planting of enormous *Cycas elongata* – we counted 47 plants (Colour Figure 8).

On Day 4 we travelled from Nha Trang to Qui Non, again a considerable distance of some 274 km over indifferent roads, a mere 5-hour journey. We found, indeed, that *Cycas elongata* was common on slopes of granite hills close to the sea. However, in contrast to the plants seen on the previous day, these had spiny petioles, suggesting that spininess of the petiole is not a reliable taxonomic characteristic in this species. **(to be continued)**

GROWING CYCADS AT 34° S (2)

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In the last issue we looked at landscaping, and at the factors shaping landscaping and growing cycads in Stellenbosch at 34° S. Let us now look at some of the plants which we grow, and to what degree we are successful. Be warned, that with our short summers and few hot days we cannot compete with growers further north.

“You must have spent a respectable amount to get all these plants together.” Not at all. Most, though not all, of these plants were grown from seed. The most expensive commodities in this process were patience and sweat. Let us look at just a few plants which did particularly well for us.

The star performers, by far, are the *Cycas* species. This was unexpected, because in general *Cycas* is a tropical genus with a high heat requirement which is lacking in Stellenbosch. With “star performer” I mean a plant that is easy to grow, tolerant of a range of conditions, and growing fast enough to develop into a cone-bearing plant within a reasonable time and rapidly replacing foliage damaged by storms. *Cycas revoluta*, perhaps the least tropical of the *Cycas* species, proved to be particularly fast-growing. We have a two headed plant (not illustrated) with a stem which is a metre long, grown from seed. This plant is the progeny of a female on the campus of Pretoria University, pollinated in 1967 by our own Guillaume Theron with pollen brought from a private owner. Those *Cycas thouarsii*-like plants also grow well: the one on the left is an unidentified species grown from seed sent to us in 1972 from the Fairchild Tropical Garden. It took two years to germinate, but afterwards never looked back and now has a trunk more than a metre tall and cones regularly (it is a female). The one on the right is a true *Cycas thouarsii*, grown from seed sent to us from the Comores in 1976. In about 25 years it put on 70 cm of sturdy stem, and has already several years ago proved its masculinity. However, these growth rates pale next to those in more tropical climates: towards the end of 1996 we sent some seeds of *Cycas thouarsii* to the Fairy Lake Botanical Garden in Shenzhen, China, just over the border from Hong Kong. We have just heard that they produced their first cones at the end of 2001.

Not all our seedlings grow so fast. This *Encephalartos senticosus*, for instance, was the first cycad which we ever grew from seed, and it is now 35 years old (Figure 1). Admittedly it spent far too long in a 25 litre tin, and one given to a friend who planted it directly in the open ground grew much faster. Other seedlings of which we are proud, is that *Encephalartos transvenosus* (Figure 2), grown from a seed picked up in 1972, those *Encephalartos natalensis* x *E woodii* (Figures 3, 4) which grow fast and steadily but

Has so far not coned, the *Macrozamia miquellii* (germinated 1972), the *Macrozamia moorei* (germinated 1976), the *Encephalartos hildebrandtii*, and the *Encephalartos dyerianus* (Figure 7).

The oldest seedling in this garden is this *Encephalartos cycadifolius*, now 42 years old (Figure 5). Those of you who are lucky enough to have a copy of Dr. Dyer’s pioneering monograph of 1965, would know the photograph of a seedbed full of small *Encephalartos cycadifolius* seedlings on page 417 (our Figure 6). Dr. Dyer gave us some, and this clump represents two of them – they have multiplied so much that we can no longer see where one ends and the other begins. They have yet to cone. It would be interesting to know whether the National Botanic Garden in Pretoria still has any of these plants, and how they have fared there.



Figure 6 *Encephalartos cycadifolius*: two of these seedlings, photographed in 1963, eventually grew into the clump shown in Figure 5. From *Bothalia* 8: 417 (1965).

By contrast, this *Encephalartos lanatus* (Figure 8) was grown from seed collected in 1968. We have three of them – all three grow agonizingly slowly, they don’t sucker, but they have been coning regularly for several years now. To our minds this is one species which is unsuitable for gardens, at least in Stellenbosch. It looks pretty directly after having produced new leaves, but within a few months these become really ugly, with a nasty dull grey colour and dead patches. Also, it has the bad habit (shared with *Encephalartos humilis* and some forms of *E. laevifolius*) of shedding all its leaves for no apparent reason.

Having said that, I have to say that *Encephalartos laevifolius* does not do badly for us. This plant (Figure 9) is the Mariepskop form with dark green keeled leaves. The Kaapse Hoop form, with flat grey leaves, does as well here. One reason for their success here is probably that both forms occur in cool mountainous habitats, with



Figure 1 *Encephalartos senticosus*: a 35-year old seedling.



Figure 2 *Encephalartos transvenosus*: a 30-year old seedling.



Figure 3 *Encephalartos natalensis* x *Encephalartos woodii*.



Figure 4 *Encephalartos natalensis* x *Encephalartos woodii*: leaf detail.



Figure 5 *Encephalartos cycadifolius*: a clump consisting of two 42-year old seedlings.



Figure 7 *Encephalartos dyerianus*: a 30-year old seedling, with *E. eugene-maraisii* in foreground.



Figure 8 *Encephalartos lanatus*: a 35-year old seedling.

temperatures probably not unlike those in Stellenbosch.

“Does that mean that you can easily grow *Encephalartos ghellinckii*?” Yes our experience suggests that we can. This plant (Figure 10) is of the Drakensberg form. Though slow and though it has not yet coned, it never appears stressed. We also have the coastal form, which grows as well, and we have grown it quite satisfactorily from seed. However, if you want to see real beauties, I suggest that



Figure 9 *Encephalartos laevifolius*: two healthy plants of the Mariepskop form.



Figure 10 *Encephalartos ghellinckii*: a small but carefree plant of the Drakensberg form.

you visit Kirstenbosch. Note that all their plants, barring one from the Drakensberg which we gave them, are of the coastal form.

“I suppose that your real problem is to grow tropical African species?” Indeed, one would think so. Yet, the tropical species grow for us at least as well as the Eastern Cape species, and sometimes better. *Encephalartos ferox* should, like most cycads, be grown in full sunlight here, but ours grow beautifully in quite dense shade. We suspect, though, that it would not have been easy to establish them now in these dark places – when we planted them, it was still full sunlight all day long. Still, they don’t show signs of light stress: the leaves are not etiolated, they are stiff and straight, and they cone regularly. Another tropical species which is an unexpected success in direct sunlight, is *Encephalartos kisambo*. With us it grows very fast, and is really a beauty. The only problem is its enormous size, meaning that it takes up a huge amount of space. Likewise

both *Encephalartos hildebrandtii* and *Encephalartos gratus* grow well in the open ground, but their soft foliage gets broken by the wind. *Encephalartos tegulaneus* we so far only has in the nursery, but it does not seem to have problems. Other tropical species which we only have in the nursery and which don't seem to like our climate too much, are *Encephalartos*

sclavoi, *Encephalartos laurentianus*, *Encephalartos macrostrobilis*, and that thing from Uganda distributed as *Encephalartos septentrionalis*.

(to be continued)

COLLECTIONS DEVELOPMENT: MEXICAN RENDEZVOUS

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On January 9, 2001, Virginia Hayes and Jeff Chemnick, representing California's Ganna Walska Lotusland, Dr. Andrew Vovides, representing Mexico's Instituto de Ecología in Xalapa, Veracruz, and Dr. Tim Gregory and I, representing Montgomery Botanical Center, met for a late dinner at a restaurant in downtown Xalapa. This meeting had been a long time in the making. In fact, it took three years of planning to arrange this rendezvous.

In the summer of 1997, Dr. Vovides, the Director of the El Jardín Botánico Clavijero, which maintains the National Cycad Collection of Mexico, Dr. Steven Timbrook, the Director of Lotusland, and I began discussions on a cooperative expedition to Mexico to document, study, and when appropriate, obtain population-based samples of native cycads. Our purpose was to enhance the research potential of our existing *ex situ* cycad collections and, in so doing, ensure the conservation of these rare species. MBC and Lotusland agreed to fund the expedition. All data, herbarium specimens, and seeds would be divided equally among the three cycad gardens. Between the numerous difficulties associated with obtaining the required permits through Mexico and the U.S.A., and the logistics involved in finding a time frame when all three gardens would have representatives available for the expedition, it was truly amazing that the dinner on January 9, 2001 ever happened. As we sat together on that late night, over chips and salsa and bottles of Corona, I reflected back over all the problems we had overcome during the past three years. Tomorrow, I thought, the MBC-Lotusland-Clavijero 2001 Expedition would finally begin; the expedition team had arrived and we were ready to search for the amazingly diverse and often elusive cycads of eastern and central Mexico.

On January 10, the expedition team packed up our rented SUV, finished our plates of huevos rancheros and tortillas and our last cup of rich Xalapa coffee, and pulled out of town. This day was the first of ten very long field days through three states in search of wild populations of *Ceratozamia*, *Dioon*, and *Zamia*. The first leg of the expedition included the support team of Antonio Vazquez Blanco and Victor Luna Monterrojo from the Clavijero Garden. The second leg of the trip included Carlos Iglesias

Delfin from Clavijero and two graduate students associated with the Instituto de Ecología. Sergio Avendano Reyes, who is undertaking a morphological systematic study on *Ceratozamia* for his graduate studies, took advantage of the trip and its focus on *Ceratozamia* to collect leaf material for his research. With financial support from MBC, Miguel Angel Pérez-Farrera is undertaking a systematic study on two *Ceratozamia* species complexes in southern Mexico for his dissertation research.



Tim Gregory and Jeff with *Ceratozamia hildae*. Tim (left) is holding a unique leaf type from the *C. hildae* population, while Jeff is holding a typical leaf form. About 10% of the plants in the population had the atypical leaf form.

Virginia and I felt extremely fortunate to be traveling with Andrew, Jeff, and Tim, who are recognized as three of the foremost systematists on the cycads of Mexico. Jeff and Tim, with tremendous support from MBC Member Loran Whitelock, spent a year prior to the expedition developing the arduous, intensive, and sometimes unrealistic 10-day itinerary. Much to my surprise, the expedition team remained committed to the itinerary, which meant that each field day typically lasted 12 hours. Jeff and Tim worked diligently day-in and day-out ensuring that the team



Victor Monterrojo (left) and Jeff Chemnick (front right) in the village of Tampemoche, San Luis Potosi, asking the locals for directions to sites of *Ceratozamia hildae*.



Part of the expedition team (from left to right) – Virginia, Andrew, Carlos, Tim, and Jeff.



Virginia Hayes with an unidentified species of *Ceratozamia*. This picture was taken near the village of Ahucatlan in San Luis Potosi.



Jeff taking notes on the extremely rare cycad *Ceratozamia zaragosae*, which is on the rock below (see arrow). This species is the only *Ceratozamia* known from an arid habitat.



In our search for cycads, we came across Edward James' unusual sculpture garden near the mountain village of Xilitla, San Luis Potosi. James, a surrealist architect, called his 40 hectare estate "Las Posas" after the name of the waterfall and pool adjacent to the property. Shown here is one of a large number of cast concrete sculptures in the garden.

completed each day's objectives. They shared driving and navigational responsibilities, while Jeff was the translator for the expedition. To ensure efficiency and productivity at the cycad locality sites, each member of the team was assigned a suite of duties. Virginia oversaw herbarium specimen collecting and general photography. I was in charge of documenting, via images, the individual plants and cones at each site. I also recorded field data and helped Virginia with collecting herbarium specimens. When we arrived at a cycad site, Jeff and Tim would scout the area for plants, male cones, female cones, and seeds. When they located any of these, they informed Virginia and me via hand-held radio. The four radios we carried allowed each

of us to work independently on our assigned tasks, and yet keep in close contact. Once the site was canvassed, herbarium specimens collected, and field notes taken, the team, when appropriate, obtained propagation material for each of the three institutions.

It was a thrill to see and enjoy the native cycad species of Mexico in the wild with individuals who also appreciated these unique moments. And, everyday we were blessed with fantastic scenery. When I reflect back on the MBC-Lotusland-Clavijero 2001 Expedition, though, I have to admit that the high point of the trip was locating a wild population of the beautiful and unique *Ceratozamia hildae*.

Plants of this species are distinguished from other ceratozamia by papery leaflets that are arranged in spiral clusters along the rachis. Prior to our expedition, many scientists believed that this was a high elevation species and that no plants still existed in the wild. Our expedition proved that both of these assumptions were false. This species occurs at rather low elevations, and the population we located was healthy and reproducing well. What wonderful news for the cycad world!

On January 22, the expedition team reminisced as we

enjoyed our last dinner together before flying home. We had succeeded with the intensive itinerary of fieldwork, we had survived some nerve-wrenching and rather disheartening events, and we had obtained data and specimens that would be invaluable for future studies on Mexican cycads. And, we had become close friends – of course, expeditions will do that. I knew that we had succeeded as a team when, during dinner over enchiladas, rice, and beans, the discussion turned to planning the next MBC-Lotusland-Clavijero expedition.

THE MANY FACES OF *ENCEPHALARTOS SENTICOSUS* IN HABITAT ON THE LEBOMBO MOUNTAINS, SWAZILAND.

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INTRODUCTION

Reading the "Focus On" article in *Encephalartos* No. 55 (Vorster), moved me to invite two cycad friends (Rudo Lötter and Alan Tait) to Swaziland to view and inspect these plants in habitat and at different localities along the Lebombo Mountains. Having visited one specific small population of plants on previous occasions, we decided to investigate other populations along the Lebombo Mountains. Apart from the obvious pleasures of general exploration and being outdoors, we really wanted to survey the extent of the species' occurrence along the mountain and also to look for differences in characteristics among different distributed populations. We also knew that this was the time of year when most flowering plants would be dormant, but the cycads would be coning.

CENTRAL AND SOUTHERN SECTION OF THE MOUNTAIN

Our first outing took us along a river gorge carving through the middle to lower reaches of the mountains near the KwaZulu Natal border. Although this area showed promise in landscape with aloes, *Stapelias*, *Pachypodium* and *Cyrtanthus* species abound, we could not locate any cycads. We returned to camp with some degree of disappointment. The following day we decided to survey the mountain even further south right up to the KZN border. We headed straight up to the mountain top where sheer rock faces could be seen from below. A strenuous walk-climb took us close to the rock face and we could see plants growing exclusively on rock faces (Figure 1 on p. 29), balancing precariously from the small ledges they were growing on. We eventually reached the plants, but had to be very careful not to get too close to the edge. We were happy to see these plants and managed to take good photographs (Figures 2–6 on p. 29). It was clear that more than 90% of all seed pro-

duced by these plants would roll down the vertical rock face settling far below into a small forest at its base. No mature plants were evident there. We realized that seeds not destroyed by rodents, would germinate and not reach adulthood for some reason that we later speculated on for some time. We expected to find many plants on the larger flat summit of the mountain as we moved further up, but amazingly none could be located there. Substantial subsistence farming took place here, with goats and cattle browsing freely in the area. Interesting plants found on the summit included the orchid, *Eulophia petersii*, and the aloes *Aloe suprafoliata*, *A. bainesii* and *A. marlothii*. The number of cycads did not meet our initial expectations and we decided to head north.

NORTHERN SECTION OF THE MOUNTAIN

We travelled quite some distance north, along the mountains, and eventually found what we could only have hoped for. Here we found hundreds of plants growing on the escarpment, in grassland, between rocky outcrops, well all around. These plants were coning prolific as we had anticipated for that time of the year.

FIRE AND THE DISINTEGRATION OF CONES

An interesting observation was that quite a few of the cones had already disintegrated. The freshly fallen seeds were already showing indications of dispersal by rodents/baboons. From previous experience we knew that the normal time for disintegration was around October. Most of the disintegrating cones had had some exposure to veld fires and we speculated on the role of such fires in accelerating cones to become mature in a shorter period of time. The cones were definitely mature and seeds of normal size, mass and shape. In the field the fertility of

seeds from these cones could only be done with float-testing using a small bucket of water. Leaving us with no drinking water!. Although not a sure indicator of fertility on fresh seeds, we had 90% of seeds sinking immediately. One specific young lady had four enormous disintegrating cones with seed lying at her base, ankle deep. Another grandma with 3.5 m stem showed proudly her four cones still intact.

VARIATION IN LEAF CHARACTERISTICS AND NATURAL BONSAIS

Perhaps the most interesting observation was the variation in leaves of different plants in the same area. Not just normal variation between plants found in semi-shade and full sun, but between plants in full sun, growing side by side. Some have a neat stiff leaf arrangement with pinnae neatly packed (Figure 3). Others with robust, twisted leaves with apices having a trispinosus-type curling (Figures 2, 5). One specific plant could easily have been misidentified as *E. paucidentatus* in its sheltered position (Figure 4).

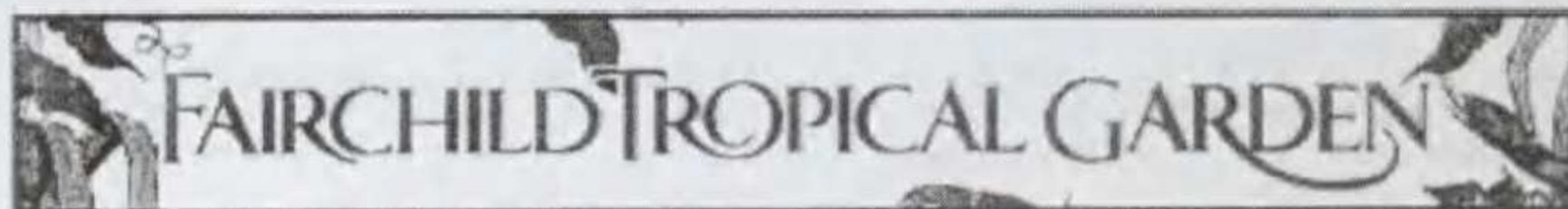
Many plants grow on sloping areas, where seeds easily roll down towards the forest below. Although mature specimens are found right up to the forest fringe, only seed-

lings can be found inside the first few metres of the forest floor. These have a strange appearance, almost mimicking *Encephalartos aplanatus* in stature with few and exceptionally long leaves. These are likely not to grow to adulthood, as mature specimens are not found here. We speculated that the lack of sufficient light levels was the major factor for this. Perhaps the most beautiful specimens to be found were natural bonsai specimens growing on one rocky outcrop (Figure 6). These plants literally grow on scraps and we could only wonder at the age of a 10 cm diameter, 1 m tall stem with 40 cm leaves peering out between four boulders.

I also realized that these plants do not necessarily prefer growing on east facing slopes, as I previously thought, but any suitable habitat with sufficient nutrition and sunlight.

FUTURE OF *E. SENTICOSUS* ON THE LEBOMBO MOUNTAINS

Fortunately, no collector activity was present at the northern population and I doubt whether poachers will easily find these plants. On returning home, we were filled with awe. I realized once again that there are very few things in life that can provide you with the delight of seeing these plants in a free and wild state.



Rare Cycads Stolen in South Florida

On four separate occasions over the past few months, one or more individuals broke into Fairchild Tropical Garden (FTG) in Coral Gables, Florida, and stole at least 40 rare cycads worth a minimum of \$10,000.00. Below are the dates of the robberies and the species and numbers of plants that were stolen. These cycads were either taken from the conservatory (which is also affectionately known as the "rare plant house"), or were dug up out of the ground. The plants of the larger growing species were all rather small and immature, averaging 4-6" caudexes. The *Zamia pseudoparasitica* plants were quite large; in fact, one of them had 8-foot leaves and a huge female cone. The smaller *Zamia* species and the *Stangeria* plants were all of coning size. Some of the species taken are quite rare -- such as *Encephalartos laurentianus* and *Zamia dressleri* -- and at least two species -- *Zamia amplifolia* and *Z. prasina* -- are virtually unknown in cultivation in the U.S. Therefore, if plants of these species are being offered for sale in the sizes described above -- particularly here in south Florida -- they may be suspect. Fairchild Tropical Garden is offering a \$25,000.00 reward for information leading to the arrest and conviction of the persons involved in the theft.

Fairchild Tropical Garden press release of September 18, 2002

If you have any information about the thefts, the perpetrators, or the stolen plants, please contact Jody Haynes at webmaster@plantapalm.com. Jody is working with FTG and the Coral Gables Police Department (CGPD) to try to recover the plants and bring these criminals to justice. If you would prefer to contact the CGPD directly, feel free to call Detective Claughton at (305) 460-5436.



Figure 1 *Encephalartos senticosus* growing on rock faces (south-habitat).



Figure 4 Part of a leaf of an *E. senticosus* growing in a shady position. This plant could easily have been misidentified as an *E. paucidentatus* because of its drooping leaflets.



Figure 5 *Encephalartos senticosus*: twisted leaf with trispinosus-type curling apex.



Figure 2 A robust *Encephalartos senticosus* specimen.



Figure 3 A nice *Encephalartos senticosus* specimen.



Figure 6 *Encephalartos senticosus*: bonsai specimen growing on a rocky outcrop.

CYCADS STOLEN IN FAIRCHILD TROPICAL GARDEN



Zamia pseudoparasitica.



Right: *Stangeria eriopus.*



Zamia skinneri.



Leaf of *Zamia skinneri.*



Zamia soconuscensis.



Zamia inermis.



Encephalartos whitelockii.



Encephalartos whitelockii.



Zamia spartea.



Zamia pseudoparasitica.

<u>Date of Theft</u>	<u>Species</u> (Click on underlined names to see photos of the plants)	<u>No of plants taken</u>
March 2002?	<i>Encephalartos laurentianus</i> <u><i>Zamia spartea</i></u>	3 1
May 26, 2002?	<i>Zamia dressleri</i> <u><i>Zamia pseudoparasitica</i></u>	1 1
July 21, 2002	<i>Dioon califanoi</i> <u><i>Stangeria eriopus</i></u> <i>Zamia amplifolia</i> <i>Zamia lecointei</i> <i>Zamia prasina</i> <u><i>Zamia pseudoparasitica</i></u> <u><i>Zamia skinneri</i></u> <u><i>Zamia soconuscensis</i></u> <i>Zamia splendens</i>	1 3 1 3 2 1 1 3 2
August 4, 2002	<i>Dioon</i> sp. <i>Encephalartos ghellinckii</i> <i>Encephalartos ngoyanus</i> <u><i>Encephalartos whitelockii</i></u> <i>Stangeria eriopus</i> <u><i>Zamia inermis</i></u> <i>Zamia lacandona</i> <u><i>Zamia pseudoparasitica</i></u> <i>Zamia soconuscensis</i> <i>Zamia standleyi</i>	1 1 1 2 1 2 5 1 2 1
Date unknown	<i>Zamia cremnophila</i>	3
Total No. Plants Taken		43

CYCAD 2002

SIXTH CONFERENCE ON CYCAD BIOLOGY



It was with great expectations that we arrived in Bangkok on Saturday, 26th of August, after a 12 hours on a plane and a stop in Dubai. As South Africans living in Ireland, we could not wait for the warm weather and sunshine and looked forward to experiencing the Thai culture, food and scenery. I was armed with a rucksack full of camera equipment and 7 rolls of film! This was our first conference and opportunity to meet cycad enthusiasts from all over the world. There were many new faces and names to get to

know and our first introduction was to Alvaro Colonje from Columbia and Hiep Nguyen from Vietnam.

Sunday was used to explore Bangkok. A boat ride on the river and canals (or klongs) gave us a glimpse into everyday Thai life. Wooden houses are built on stilts in the water and almost all have potted plants to add some colour. The Thai people are very friendly and kids swimming, paused to wave as we passed by. Swimming in the canals is not for tourists though! If the bacteria don't get you, the wild life will. We passed a meter long crocodile, lazily making his way across the canal, not long after seeing the kids. They must be well trained in croc wrestling.

The Grand Palace was the next stop. The scale and detail are incredible and well worth a visit. Remember to wear trousers/skirt and shoes or sandals, covering the legs and heels, or you would not be let in. Afterwards we had an interesting Chinese lunch with Peking Duck. The green tea was turned down in favour of bottled water, to replace fluids lost in the heat and humidity of Bangkok. With the energy levels restored, we headed for a Jewelry Store. Thailand has a considerable industry polishing semi-precious stones and manufacturing jewelry.

The best part of Bangkok was the weekend market. It is packed with stalls, selling anything from a pair of jeans to baby crocodiles! The walkways are narrow and packed with a continuously flowing stream of people. The plant sellers have a huge variety of plants for sale, anything from cacti to orchids. Some cycad plants were for sale but due to all the paperwork involved no purchases were made! That evening we had the welcoming dinner and a delightful talk by Alvaro Colonje about the cycads in Colombia.





Early Monday morning we left for Kanchanaburi to see the Bridge over the River Kwae. The film was not made in Thailand and the story is entirely fictional, although the bridge was built by prisoners of war, as part of the so-called Death Railway. Lunch was once again a spectacular affair aboard a floating restaurant, towed down the river, and eventually stopping at our hotel. A highlight was the visit to a beautiful *cycas siamensis* population that

afternoon. This population has a striking grey-white indumentum on the leaves, giving it a silvery appearance. Once let loose at the site all started climbing the hill to see more plants and take pictures. The landscape is mostly open and flat and cultivated to produce rice. The wide valleys as you get closer to the mountains are also cultivated and the limestone hills are the only wild places left, where the cycads can grow undisturbed. We spent an enjoyable afternoon, trying to get the perfect photo. Back at the hotel all could soon be found in the pool, trying to cool down before the evening activities and a talk by Dennis Stevenson.

Tuesday morning we went back to Bangkok and on to Pattaya, for the remainder of the conference. We visited Nong Nooch Tropical Garden and were treated to a very warm welcome by the staff at the Garden. The Garden is beautifully laid out and the "sky walk" provides a breathtaking view. We had the privilege to visit the "Hortus Botanicus" where a collection of plants from around the world is maintained. The remainder of the talks was presented in the conference facilities at Nong Nooch Tropical Gardens. Some of the people not interested in that could walk around the garden, see the animals and even ride an elephant. The standard of the scientific presentations were good and not too technical. Peter Lindblad's presentation on coralloid roots and how they function was one of the best, as well as Irene Terry's talk on insect pollinators.



Cycads were of course the main topic of discussion most of the time, but with people from the USA, Colombia, Mexico, Vietnam, China, Australia, Holland, France, Sweden, South Africa and Portugal, we never ran out of things to talk about.

Since I became interested in cycads three years ago, I have met many people, commercial growers, enthusiasts, botanists and conservationists and always found them to be friendly and helpful. The people at the conference were no different and we had a great time talking to all. Putting a face to the names I have seen in books, read about and exchanged e-mails with, was the highlight for me. I made some friends (I hope) and will hopefully see them again in future. All that remains to be said is: I hope to see you all in Mexico in 2005!!

Contributed by: Wynand & TC van Eeden

NEW LIFE:

Encephalartos altensteinii: the removal of branches that developed after the crown rotted

Marius Helm

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Branches are generally the result of damage to the cycad stem and develop from adventitious buds. This relative *E. altensteinii* plant is planted in a municipal hothouse that has been under-utilized for the past 8 years.



Figure 1 The damaged *E. altensteinii*, in the municipal hothouse, after the leaves of the branches were cut off with the exception of those on the largest branch. Photo: Z. Coyte King.

Left: Figure 2 (at top of column): The damaged trunk of the *E. altensteinii*: note the large hole encircled by numerous branches. Photo: Z. Coyte King.

Figure 3 (at bottom of column): All the branches that were removed. Photo: Z. Coyte King.

I discovered the plant after I have befriended the local chief horticulturist for the small town of Queenstown and asked him whether they remove suckers from the 30–40 adult plants in the municipal gardens, and sell them as I was interested in obtaining some plants. He replied that they



have not done it before but that it was a good idea to expand their small cycad garden, but they are not interested in selling the plants. Even though I would not be able to

buy a plant or two we still decided to remove some of the suckers and branches and transplant them into pots. When they have established themselves they can be planted in the cycad garden or remain in pots as decorative plants.

This *E. altensteinii* of which the crown has died had produced a large number of branches. We cut off the leaves with the exception of those on the largest branch (Figure 1). Then we started with the removal of the branches, it would seem as if branches developed at all the

leaf bases around the crown over a period of years. We counted about 10-15 branches before we started to remove them but ended up with 30 (Figure 2). It was rather easy to remove the branches with a flat screwdriver. Although the hole into the stem was about 30cm deep (Figure 3) the outer area of the stem contained a lot of sap and was by no means dead at all. After we have removed all the branches, with the exception of the largest one, we dusted the mother plant with a fungicide and insecticide.

NEW CYCAD PUBLICATIONS

BROOM, T. 2002. **Collection and storage of cycad pollen.** *The Cycad Newsletter* 25: 3 & 7.

[Various bits of practical advice is provided concerning the harvesting and storage of cycad pollen, including the pollen of *Stangeria eriopus*, which is notoriously difficult to harvest in substantial amounts.]

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

GORELICK, R. & OSBORNE, R. 2002. **Inducing sex change and organogenesis from tissue culture in the endangered African cycad *Encephalartos woodii* (Cycadales, Zamiaceae).** *South African Journal of Science* 98: 114-117.

[If incipient sex chromosome differentiation is caused by differential methylation between females and males, then methylating or demethylating cytosine nucleotides may induce sex change. Methylation may also stimulate regeneration of roots and shoots from tissue culture callus and increase genetic variation via greater mutation. We propose using these methods for conserving *Encephalartos woodii*, for which only a single male clone exists, sex change has never been induced, and regeneration from callus tissue has not been accomplished.]

First author's address: Department of Biology, Arizona State University, Tempe, AZ 85287-1501, U.S.A.

SCHNEIDER, D., WINK, M. & SPORER, F. 2002. **Cycads, their evolution, toxins, herbivores and insect pollinators.** *Naturwissenschaften* 89: 281-294.

[Palaeobiological evidence indicates that gymnosperms were wind-pollinated and that insect pollination began in angiosperms in the Lower Cretaceous (ca. 135 mya) leading to close associations between higher

plants and their pollinators. Cycads, which were widespread and pervasive throughout the Mesozoic (250-65 mya) are amongst the most primitive living seedplants found today. Because pollination by beetles and by thrips has now been detected in several modern cycads, it is attractive to speculate that some insects and cycads had already developed similar mutualistic interactions in the Triassic (250-205 mya), long before the advent of angiosperms. We also draw attention to another key factor in this insect-plant relationship, namely secondary, defence plant substances which must always have controlled interspecific interactions. Cycads mainly produce toxic azoglucosides and neurotoxic non-protein amino acids (e.g. BMAA) which apparently are crucial elements in the development and maintenance of mutualism (pollination) and parasitism (herbivory) by cycad-linked herbivores. We now add new results on the uptake and storage of the main toxin, cycasin, of the Mexican cycad *Zamia furfuracea* by its pollinator, the weevil *Rhopalotria mollis*, and by a specialist herbivore of *Zamia integrifolia*, the aposematic Atala butterfly *Eumaeus atala*.]

First author's address: Max-Planck-Institut, 82319 Seewiesen/Starnberg, Germany.

WHITELOCK, L. 2002. ***Zamia inermis*.** *The Cycad Newsletter* 25: 10-11.

[This is the first of a series of horticultural vignettes of cycad species with additional comments by Tom Broome.]

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Mystery of the missing cycads disclosed

BY GEORGIA TASKER
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Wanted Alive: Forty priceless plants stolen from Fairchild Tropical Garden. Reward: \$25,000.

"It's a major loss for us. Some of the plants are almost irreplaceable," said Fairchild Director Julia Kornegay.

Thieves made off with some of Fairchild's rare cycads — primitive cone-bearing plants that first appeared on Earth more than 200 million years ago. With stiff leaves that at first glance seem like palm fronds, the plants are familiar to many South Floridians.

At Fairchild, a world-renowned collection of cycads has been building

▶ PLEASE SEE CYCADS, 2E



Garden thieves knew what they were doing

BY CYCADS, FROM 1E

since the garden was founded in 1936.

The theft occurred in August. Because Fairchild officials were working closely with Coral Gables Police to track thieves, the information has not been made public until now.

Thieves worked quickly, when the nighttime security guard was in another part of the garden. Since the theft, cameras have been installed, and security tightened, Kornegay said.

Among the stolen plants was *Zamia pseudoparasitica*, an enormous and graceful cycad that was mounted above a doorway in the conservatory. About nine feet long, its fronds cascaded from the doorway to the ground.

Thieves ripped the conservatory specimen from the wall, hacked off its leaves and left the fronds on the floor.

"They probably cut off the leaves with a machete because chunks of stem had been taken off as well," said Craig Allen, the conservatory manager.

"The garden brought it in from Panama in 1976, and it was a mature plant back then," Allen said. "The [stem] was almost two feet long. It had cones and was full of seeds."

Allen said he gave police a value of \$5,000. "But if you consider the cost of an expedition, plus a year's worth of paperwork to get permission to collect it again, it might be \$10,000," he said.

*Zamia*s are found from Florida to south of the Equator, but *Zamia pseudoparasitica* is the only truly epiphyte, or air plant, in the whole family. It grows on trees in Panama but doesn't take any nutrients from them (*pseudoparasitica* means false parasite).

Other stolen plants include: *Zamia dressleri*, named for Florida orchid taxonomist Bob Dressler, is one that many people have admired at the garden, Allen said. Its corrugated leaves are stiff and so shiny they appear lacquered.

Zamia amplifolia, ample-leaved as its name says, can have leaves five feet long, its native territory in Colombia has been logged. While some of the cycads survived, there are no juvenile plants following, putting it on the endangered species list.

Stangeria eriopus has "beautiful arching leaves," Allen said. "They have a soft, matte finish and are very slow growing." From South Africa, the plant bears cones that are called "bobbejaankes" or baboon food in Afrikaans, a Dutch-based colonial language of South Africa, said Loran Whitelock in *The Cycads* (Timber Press, \$39.95). The plant grows one leaf at a time, a total of two or three a year.

"The clump that was stolen was about 20 years old, and still wasn't three feet across," Allen said.

Zamia soconuscensis is



SUZANNE KORES FOR THE HERALD
MISSING: 'Stangeria eriopus' grows one leaf at a time.

Thieves worked quickly, when the nighttime security guard was in another part of the garden.

named for the Mexican mountain range where it is native. This cycad develops arching leaves in the rain forest and can become tall and tree-like. Its habitat is being cleared for corn and coffee, and it's endangered.

Encephalartos ghellinckii is a South African plant that can withstand cold and heat. Because it's so hard to transplant, it's not often seen in botanical gardens or private collections.

Encephalartos whitelockii, from Uganda, gets leaves up to 14 feet long when growing on cliffs and hillsides. It is named for author Whitelock.

Many of the stolen plants were young and inconspicuously placed within the rain forest.

"The garden had been scouted out, and the thieves knew where to get the plants even in the dark," Kornegay said.

Cycads are frequently smuggled into this country for collectors, says the U.S. Fish and Wildlife Service. In 2001, Fish and Wildlife agents broke up an international ring of cycad thieves in California in "Operation Botany." Fines were as much as \$25,000.

"The people who stole [them] are knowledgeable about cycads," Kornegay said. "Most likely, they act as brokers and will sell the plants to private collectors."

Says Allen, "If they wanted to hurt the garden, they couldn't have done it in any better way."

If you have any information, call Crime Stoppers at 305-471-8477 or contact Rick Echeverria at Fairchild Tropical Garden by calling 305-667-1651, ext. 3319.