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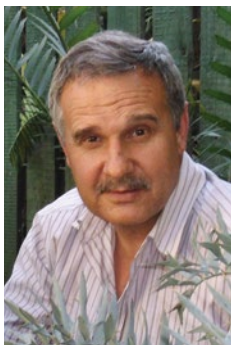

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ON THE COVER:

Front cover: A very old and huge clump of *Encephalartos horridus* in habitat near Uitenhage with new flushes of leaves. Note the bright blue colour compared to the older leaves that have lost the wax layer of the new leaves. This clump measures 1.5 meters across. Photograph: Wynand van Eeden

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FROM THE COUNCIL / VAN DIE RAAD

VAN DIE REDAKTEUR / FROM THE EDITOR

Hierdie uitgawe bereik lede baie laat, hoofsaaklik as gevolg van 'n tekort aan artikels om te druk. Ek probeer egter om te hou by die vier uitgawes soos in die verlede en hoop ons lede vind hierdie uitgawe interessant. In die verlede het ons boekpryse gehad vir goeie artikels maar dit het nie veel aftrek gekry nie. Indien jy lus voel om te skryf, en hulp of raad nodig het, kontak my gerus.

Met die konferensie van laasjaar het die vereniging heelwat uitgawes gehad maar ek is verheug om lede mee te deel dat ons nie 'n verlies gemaak het nie! In teendeel, met die ondersteuning wat ons gekry het, het ons 'n klein wins gemaak en R100 000 is weer terug in ons vaste belegging geplaas. Hierdie fondse help ons om steeds ENCEPHALARTOS gereeld te druk ten spyte van hoër druk en posgeld kostes.

Die slegte nuus is ons ledetal bly onder druk en ons moet meer lede werf. Lede moet asseblief met streeksverteenwoordigers skakel as hulle voorstelle het hoe ons die vereniging kan laat groei. Mense is geneig om hulle tot die internet te wend maar die inligting daar is nie noodwendig so goed soos dit lyk nie. Ons lede is 'n bron van baie kennis oor broodbome.

Beste groete
Wynand van Eeden

This issue reaches you very late, mostly because of a shortage of good articles to publish. I do my best to publish four issues of ENCEPHALARTOS as we have always done. I hope you find this one interesting as well. In the past we had book prized to encourage people to write but it had little effect. If you want to write and need help, please contact me for more information.

Hosting the conference last year incurred expenses for the society but I am glad to inform members that we did not make a loss! Due to the support we had, we made a little profit and R100 000 was re-invested with our reserves. These funds help us to continue to publish ENCEPHALARTOS on a regular basis in spite of increasing printing and postage costs.

The bad news is our membership number is still under pressure and we have to recruit new members or find old members that did not re-join. Any member with ideas how we can grow our membership is encouraged to contact the regional representatives. People tend to rely on the internet for information but what you can get is not always reliable. In fact our members are a much better source of information about cycads and many have grown them for a very long time.

Kind regards
Wynand van Eeden

CYCAS ANGULATA R.BR.

Roy Osborne[1], Bret & Yvonne Dalziel[2]

INTRODUCTION

Continuing our series on the Australian *Cycas* species, we now focus on one of the first two Australian cycads to be described, the tallest representative of the genus, and one that is abundant in several localities in two different states. Perhaps controversially, we take the view in this presentation that *Cycas brunnea* should be taken as synonymous with *C. angulata*.

DISCOVERY

The beginnings of the story are intriguing: enthusiastically accepting an invitation from Sir Joseph Banks, Scottish botanist Robert Brown (1773–1858) joined Matthew Flinders' voyage to circumnavigate Australia on the *Investigator* (incidentally climbing Table Mountain twice while the vessel called in at Cape Town *en route*). Brown spent the period between 1801–1805 collecting and ultimately naming some 3 900 botanical specimens in the western and eastern parts of Australia.

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Figure 1. Robert Brown (1773-1858), Scottish botanist who described the first two cycads (*Cycas angulata* and *C. media*) from Australia in 1810. From a lithograph by Rudolf Hoffmann in 1859 as sourced from the archives of the Australian National Herbarium.

After his return to Kew and the British Museum, Brown published in 1810 the first systematic account of the Australian flora in his *Prodromus Florae Novae Hollandiae et Insulae Van-Diemen*, where on page 348 he gave one-paragraph latinised descriptions of *Cycas media* and *C. angulata*. The latter species epithet is from the word *angulatus*, angled, and refers to the sharp V-insertion of the leaflets on the rachis. Although Brown's herbarium sheets do not record the detailed position for the type specimen, it is believed that it was collected in December 1802 from one of the two Bountiful Islands in the Gulf of Carpentaria, thus technically within the

Figure 2. *Cycas angulata* dominates the sparse grassland vegetation in this Wearyan River population near Borroloola in Australia's Northern Territory; the trunk on the leaning female plant is 6-7 m tall but will probably fall victim to the next cyclone passing through the area. Photo: Bret & Yvonne Dalziel.

Figure 3. Trunks of *Cycas angulata* typically reach 8 meters in height but specimens can sometimes reach 13 meters, such as this one near Wearyan River, shown in scale with Bret Dalziel. Photo: Yvonne Dalziel.

Figure 4. Intrepid cycad workers need a reliable vehicle for field work in remote areas, such as this site west of Robinson River in the Northern Territory. Photo: Bret & Yvonne Dalziel.

State of Queensland. The holotype voucher is filed in the British Museum with an isotype at Kew.

After extensive and much more recent surveys of the cycads in the Northern Territory Dale Dixon (2004) was unable to find clear differences to separate *Cycas angulata* from a species described by Ken Hill (1992) as *C. brunnea,* and thus believes that the latter should sunk in synonymity with the former, a view supported by the present authors. This is why Dixon did not include *C. brunnea* in his 2004 treatment of the gymnosperms of the Northern Territory.

DISTRIBUTION, HABITAT AND ECOLOGY

Cycas angulata occurs in large numbers but in a localized distribution pattern. In the Northern Territory, the main populations, with the tallest plants, are known from the lower reaches of the Wearyan, Foelsche and Robinson Rivers, east of the town of Borroloola. A second series of somewhat three or more smaller populations, with slightly shorter plants consistent with Ken Hill's concept of *C. brunnea*, is further to the southeast on Wollogorang Station. In Queensland, the species was originally known from one of the two Bountiful Islands in the Gulf of Carpentaria; when *C. brunnea* is included, then the Queensland distribution is extended to areas such as Running Waters at the headwaters of Lawn Hill Creek and along its tributaries.

Cycas angulata is often the dominant plant in sparse grassy woodland or grassland sites in the Borroloola area. These populations are found in sandy alluvium soils in flat country at altitudes from sea level to 30 m. The cycads further to the southeast are found in more rugged territory with soil substrates of siliceous sandstone, while across the border into Queensland the plants are more often on limestone ridges or near streams on limestone alluvium.

As we mentioned for **Cycas pruinosa** (Osborne et al. in print), the climate in these northern parts of Australia has distinct wet and dry seasons; the dry season is from April to September, a build-up season follows from

Figure 5. Leaves of *Cycas angulata* are characteristically deeply keeled with opposing leaflets inserted at 90-135° on the rachis and variable in colour from grey-green to blue-green to dark green. Photo: Bret & Yvonne Dalziel.

October to December with increasing heat and humidity and occasional oppressive and spectacular storms; this then followed by a summer monsoon period between January and March when days are intermittently overcast and hot, and heavy downpours are frequent. The average annual rainfall near Borroloola is 1 200–1 500 mm but reduces somewhat to the south and east. Summer temperatures vary from 25 to 38°C while in winter the range is between 15 and 30°C.

Little is known of the pollination agents of Australian *Cycas* species. Tang (1999) mentioned beetles of the genus *Tychiodes* may be implicated, and native bees may be incidental in pollen transfer. Male cones of all *Cycas* species exhibit a pronounced thermogenesis at the time of pollen release, with cone temperatures reaching significantly higher than ambient over several successive days.

Animals involved in seed dispersal probably include large birds, rodents and marsupials; there is no published record with respect to *Cycas angulata*.

DESCRIPTION, VEGETATIVE STRUCTURES

Data from Dixon (2004), Hill (1998), Hill & Osborne (2010) and Jones (2002) and based on the synonymity of *C. angulata* and *C. brunnea*.

Cycas angulata plants generally have unbranched *stems* to 8 m tall (sometimes up to 13 m), 40 cm in

Figure 6. Different populations of *Cycas angulata* have different degrees of spinescence on the petioles. This example of a plant in the Wearyan River area is 100% spinescent. Photo: Bret & Yvonne Dalziel.

Figure 7. A male cone of *Cycas angulata*. This specimen also shows the form where petioles are almost devoid of spinescence. Photo: Joe Perner.

diameter, often swollen at the base, with occasional suckers and offsets, and with a common rootstock supporting up to 6 stems. Stems may branch following damage to the apex, and trunks can become procumbent following cyclone damage. Young *leaves* are covered with a brownish tomentum fading to grey or light brown-orange and reducing in density with time. Mature *leaves* are numerous, erect to spreading in a rounded crown, 100–170 cm long, 20–28 cm wide, somewhat arched in profile, moderately to deeply keeled with opposing leaflets inserted at 90–135° on the rachis, variable in colour from grey-green to blue-green to dark green, slightly glossy, often twisted near the apex. The *petiole* is 27–52 cm long, 8–11 mm in diameter, swollen at the base, glabrous or with greyish hairs, variably unarmed or spinescent for 10–100% of its length. *Leaflets* are in 85–180 pairs, 12–27 cm long, 4.5–6.5 mm wide, narrowed to 3–5 mm at the base, slightly keeled in cross section, apex pungent, margins flat to slightly recurved, midrib flat above and raised below, inserted 6–9 mm apart, at 40–60° to the rachis, basal leaflets not reducing to spices. *Cataphylls* are hard, pungent, up to 13 cm long, and densely orange tomentose.

DESCRIPTION, REPRODUCTIVE STRUCTURES

Data from Dixon (2004), Hill (1998), Hill & Osborne (2010) and Jones (2002) and based on the synonymity of *C. angulata* and *C. brunnea*.

Figure 8. *Cycas angulata* has megasporophylls each bearing up to 12 seeds. This specimen in the Wearyan River locality had 6-8 seeds on each sporophyll in an abundant crop. Photo: Bret & Yvonne Dalziel.

FOCUS ON

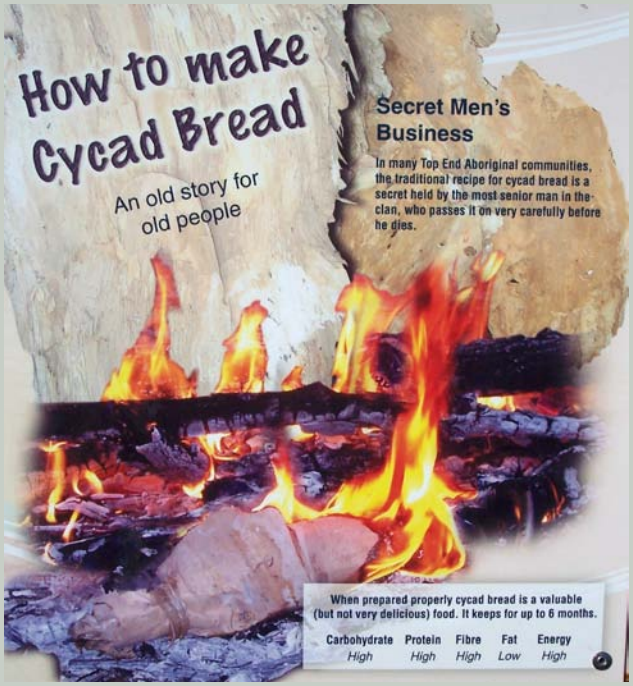

Figure 9. All species of *Cycas* in the northern parts of Australia have at times provided food for the Aboriginal people of past generations. This signage in the George Brown Darwin Botanical Garden provides information for visitors. Photo: Roy Osborne.

Male plants of *Cycas angulata* bear erect, solitary *pollen cones*, 20–25 cm long by 12–15 cm in diameter, spindle-shaped, yellowish-brown and tomentose, on a short peduncle. The *microsporophylls* are 45–60 mm long, with a face 15–20 mm wide, bearing an erect apical spine 20–30 mm long. Female plants bear clusters of *megasporophylls* 25–60 cm long, covered with grey to brown hairs, with 6–12 ovules, the lamina ovate-lanceolate, 50–83 mm long, 24–39 mm wide, regularly dentate with 6–50 lateral teeth 0.5–2 mm long, with an apical spine 26–38 mm long. Each sporophyll holds 4–12 *seeds* that are ovoid to globular, glaucous, 36–50 mm long by 30–45 mm in diameter, the sarcotesta yellow to brown.

Cycas angulata is distinguished from its relatives in the Northern Territory and Queensland by its very robust habit, its keeled leaves with long, narrow, greyish leaflets and its long megasporophylls each holding up to 12 large seeds. However, the species is variable both within and between localities, and especially when taking cognisance of the view that *C. brunnea* falls within the concept of *C. angulata*.

ETHNOBOTANY

The northern parts of Australia have been home to Aboriginal people for more than 50 000 years, and their knowledge and use of cycads is well-documented. Plants of *Cycas angulata* are called *ngathu* and the seeds are referred to as *munbuwa* (Bonta and Osborne 2007). The cycad seeds are detoxified by a combination of methods. One technique involves leaching the crushed gametophytes in running water for several days, another is by roasting the material in hot ashes for 30–60 minutes, and a third is by simply ageing the seeds for

Figure 10. This site shows a stand of *Cycas angulata* after a recent burn in the area. Most of the established plants will recover if the fuel load is not excessive and the fire is carefully controlled, but seed, seedlings, insect pollinators and animals that distribute the seeds may perish. Photo: Bret & Yvonne Dalziel.

Figure 11. A lone specimen of *Cycas angulata* stands relatively unscathed in the area west of the Robinson River after category four Cyclone Trevor crossed through the Gulf of Carpentaria in March 2019. Photo: Bret & Yvonne Dalziel.

several months; the bread ultimately produced being known as *rarrak-rarrak* (Beck 1993).

CONSERVATION STATUS

Because *Cycas angulata* is widespread over a large and remote area, it is considered of Least Concern (LC) in conservation terms. An assessment made by Ken Hill in 2009 recorded a conservative estimate of more than 50,000 mature individuals in stable populations (IUCN Red List 2018). Including *C. brunnea* in synonymity would increase that total population number. More recently, Liddle (2009) suggested the figure is much greater, even exceeding one million plants for the Northern Territory alone.

Fairly frequent planned or unplanned fires occur in the cycad habitats, as witnessed by the charred trunks on almost all of the older plants. Liddle (2009) maintains that controlled burning practices have minimised the impact of rampant fire and should be continued. However, it appears that burns in many areas are now more frequent than would have been carried out by the traditional landowners, and their intensity is greater because of the higher fuel loads from feral grasses. Unless the burns are carefully controlled and done at the right time of the year and under the correct conditions, it is probable that there is a risk to cycad seeds, seedlings, the insect pollinators and the animals that distribute the seeds.

All stands of *C. angulata* are on leasehold or pastoral lease land with the exception of some Queensland populations that fall within the protection of Lawn Hill National Park. Apart from the negative effect of fires that are too intense, the main damage to plants is from

Figure 12. Numerous chrysomelid beetles of the genus *Lilioceris* feeding on emerging foliage of this specimen of *Cycas angulata* in an area west of the Robinson River. Both the larvae and the adults feed on young soft fronds and can damage the foliage quite significantly. Photo: Bret & Yvonne Dalziel.

high winds often associated with cyclones. However, mortality from wind damage appears to be minimal as the cycads respond by branching and regenerating from old bases and rootstocks (Liddle 2009). Larvae and adult chrysomelid beetles of the genus *Lilioceris* sometimes feed on emerging foliage of cycads and can damage the foliage quite significantly (Rolf Oberprieler, pers. comm.), but this does not appear to be a widespread or systematic problem.

HORTICULTURE

Cycas angulata is best suited horticulturally to frost-free areas with a seasonally dry climate although they are fast growers even in cooler climates. Plants can be grown readily from seed but one needs to allow for a deep and rapidly-forming taproot. Larger plants should be set out in a sunny well-drained position and provided with occasional fertilized and mulch. Water should be restricted during winter but increased in summer. Propagation from sideshoots or offsets is also feasible.

Figure 13. A specimen of *Cycas angulata* growing along a public roadside in the town of Katherine, Northern Territory; this was habitat collected near Borroloola 1990 as a sucker the size of a grapefruit. Photo: Yvonne Dalzeil.

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LITERATURE CITED

Beck, W. *Cycas* use by Australian Aboriginal People. Proceedings of Cycad 90, eds D.W. Stevenson & K.J. Norstog. Palms & Cycad Societies of Australia, pp. 8–15.

Bonta, M.A & R. Osborne. 2007. Cycads in the vernacular – a compendium of local names. Proceedings of Cycad 2005, eds A.P. Vovides, D.W. Stevenson & R. Osborne. New York Botanical Press, pp.143–175.

Brown, R. 1810. *Prodromus Florae Novae Hollandiae et Insulae Van-Diemen*: 348. 1960 Facsimile by Englemen (J. Cramer) Wheldon & Wesley Ltd., London.

Calonje M., D.W. Stevenson & R. Osborne. The World List of Cycads, online edition. <http://www.cycadlist.org>.

Downloaded July 2019.

Dixon, D.J. 2004. A review of the gymnosperms on the Northern Territory. The Beagle, Records of the Museums and Art Galleries of the Northern Territory 20: 1–24.

Hill, K.D. 1992. A preliminary account of *Cycas* (Cycadaceae) in Queensland. Telopea 5: 177–206.

Hill, K.D. 1998. Cycadophyta. Flora of Australia 48: 597–661.

Hill, K.D. 1998–2012. The Cycad Pages. <http://plantnet.rbgsyd.nsw.gov.au/PlantNet/cycad>. Downloaded July 2019.

Hill, K.D. & R. Osborne. 2010. Cycads of Australia. Kangaroo Press, Sydney, Australia.

IUCN Red List of Threatened Species online Version 2018–2. <http://www.iucnredlist.org>. Downloaded July 2019.

Jones, D.L. 2002. Cycads of the World – Ancient Plants in Today's Landscape. Second Edition, Reed New Holland, Sydney, Australia.

Liddle, D.T. 2009. Management Program for Cycads in the Northern Territory of Australia 2009–2014. Northern Territory Department of Natural Resources, Environment, the Arts and Sport, Darwin.

Tang, W. 1999. Insect visitors and pollination of cycad cones: a global view. Encephalartos 60: 7–14.

MY CYCAD STORY / MY BROODBOOM-STORIE

Art Vogel

Since 1990, I was responsible for the scientific plant collection of the Hortus Botanicus at Leiden, Netherlands. The garden was founded in 1590 and is one of the oldest gardens in Europe. It is here I first got to know the old specimens of *Encephalartos altensteinii*.

My interest in these plants grew as I studied them in more detail. I researched the origins of these old plants, possibly some of the oldest in the collection (*Laburnum anagyroides* was planted in 1601) and a few others, equally old. For me it was about the oldest plants grown in pots, which makes them even more special.

It was suspected that these old plants came from King William 1, who, apparently had a huge plant collection. His successor had no interest in plants and held an auction which lasted three months, to sell the plants! According to the archives two important points came to light; firstly Prof Vriese, then scientific director of the Leiden garden, attended this auction and bought many plants. Secondly, it seems one or more representatives of the Hotus Botanicus, Amsterdam, also bought plants. This last fact is proved by an invoice for a specimen of *Encephalartos altensteinii*, dated 1851.

Figure 1. *Encephalartos altensteinii* at Hortus Botanicus, Leiden.

Vanaf 1990 was ek verantwoordelik vir die wetenskaplike plantversameling van die Hortus Botanicus te Leiden, Nederland. Die Hortus Botanicus, gestig in 1590, is bekend as een van die oudste tuine in Europa en dis daar waar ek die eerste maal in kontak gekom het met die ou eksemplare van *Encephalartos altensteinii*.

My belangstelling is aangewakker deurdat ek my steeds meer verdiep het in hierdie plante. Ek het stelsematig begin soek na die moontlike herkoms van hierdie besonderse ou plante, moontlik selfs een van die heel oudste in die versameling (*Laburnum anagyroides* geplant in 1601) en enkele ander van hoë leeftyd. Hier het dit vir my eintlik gegaan oor die oudste plante wat in ‘n pot gekweek is, wat dit natuurlik selfs nog meer besonders gemaak het

Die vermoede het bestaan dat hierdie plante afkomstig is uit die besit van Koning Willem 1, wie volgens oorvertelling ’n enorme plantversameling gehad het. Sy opvolger het helaas absoluut geen belangstelling in hierdie plante gehad nie en het ’n veiling georganiseer wat blykbaar ‘n volle 3 maande geduur het. Uit die argiewe het twee belangrike sake aan die lig gekom. Eerstens blyk dit dat Prof. Vriese, destyds die wetenskaplike direkteur van die Leidse Hortus, daardie veiling bygewoon het en dat hy ’n hele klomp plante gekoop het. Tweedens blyk dit dat daar ook een of meer verteenwoordigers van die Hortus Amsterdam was wat aankope gedoen het. Hierdie feit word gestaaf deur die aankoopbewys van ’n *Encephalartos altensteinii*, gedateer 1851.

Verdere uitgebreide speurtogte in Europa het daartoe gelei dat ek selfs nog meer eksemplare ontdek het van ongeveer dieselfde omvang en grootte, soos byvoorbeeld in die Nasionale plantetuin Meise, België. Hier was twee eksemplare wat oorspronklik uit die Koninklijke serres te Laken kom. Deur middel van die Internet het ek meer eksemplare tëegekom in Duitsland en Slowakye, almal met min of meer dieselfde afmetings.

Dit was eintlik toe ek Kew Gardens in Londen, Engeland besoek het en die vermeende oudste potplant van Europa - of miskien selfs van die wêreld - gesien en die meegaande verhaal gelees het, dat die vermoede by my posgevat het dat al die ou eksemplare wat in Europa gevind word, moontlik van dieselfde besending afkomstig sou kon wees.

Dit was rondom 1780 dat Francis Masson (Direkteur van die Royal Botanical Kew Gardens te Londen) en Carl Thunberg (leerling van Linnaeus) die Oos-Kaap van Suid-Afrika besoek het. Op die terugweg was daar skynbaar ‘n behoefte om meer gewig aan boord van hul seilboot te neem en, soos die toeval dit wou hê, was (is) daar ’n groot populasie *Encephalartos altensteinii* aan land,

Figure 2. *Encephalartoslongifolius* in habitat, Suurberg.

Further searches through Europe led to me finding more specimens of more or less the same size, for example those in the National Plant Garden, Meise, in Belgium. Here are two specimens from Laken. Using the internet, I found more specimens in Germany and Slovakia, all more or less the same size.

While visiting Kew Gardens in London, England, to see the supposedly oldest potplant in the world and reading the story about it, the idea dawned on me that met stamme wat moontlik tot 100kg swaar is. Hierdie plante het hulle as ballast saamgeneem, en vermoedelik later aan koningshuise in Europa verkoop. Die heel grootste eksemplaar het Masson waarskynlik vir homself gehou. Hierdie plant, steeds in goeie kondisie, is tans 'n besienswaardigheid in Kew Garden. Op hierdie manier is my belangstelling verder geprikkel in hierdie besonderse plantegroep.

Ek het later in kontak gekom met Anders Lindström, kurator van die omvangryke Botaniese Tuin van Nong Nooch in Thailand. Hier het ek kennis gemaak met 'n indrukwekkende versameling *Cycas* palms wat in terme van omvang geen gelyke op hierdie planeet ken nie. Honderde duisende plante word jaarliks sorgvuldig deur middel van kunsmatige bestuiwing daar gekweek. Baie van hierdie plantmateriaal word gebruik in enorme landskapsprojekte. Meer spesifiek selfs; in Thailand word daar meer *Zamia furfuracea* gekweek en gebruik as wat in die hele Mexico groei.

Ek het die Internasionale Cycad byeenkomste in onder andere Panama, China, Colombia en die laaste een in Suid-Afrika in 2018 besoek. Ek sal kortliks verslag lewer hieroor.

Ek was al verskeie kere in Suid-Afrika. Met een van my voorlaaste besoeke aan die Botaniese Tuin van Durban, het ek Chris Dalzell, die destydse kurator van die tuin, ontmoet. Ek het 'n gesprek met hom gevoer oor my groeiende belangstelling in hierdie plantegroep. Saam met my vrou en getroue resigenoot, Els, sou ons op ons tyd vanaf Durban langs die Ooskus reis na Port

Figure 3. *Encephalartos lehmannii* in habitat, Suurberg.

perhaps all these old specimens we have in Europe, originated from the same shipment!

It was around 1780 that Francis Masson (dierector of Royal Botanic Gardens, Kew) and Carl Thunberg (student of Linnaeus) visited the Eastern Cape Province of South Africa. For the jouney back, ballast was needed for their ship and it so happened that there was a conveniently located population of *Encephalartos altensteinii*, with stems about a 100kg, close to the ship's departure point. These plants were possibly later sold to royals in Europe. The biggest one Masson probably kept for himself and this might be the one still in healthy condition and in the Palm House at Kew. All this kept me interested in this group of plants.

Much later I met Anders Lindström, curator at Nong Nooch Tropical Garden in Thailand. Here I was introduced to the garden's collection of *Cycas* specimens that has no equal on earth. Hundreds of thousands of plants are cultivated annually by hand pollination methods. Many of these are used in huge landscaping projects and more *Zamia furfuracea* is cultivated in Thailand than grow naturally in Mexico!

I attended the international conferences in Panama, China, Colombia and the last one in South Africa in 2018. I'll give a short overview of this.

I have been to South Africa a number of times and on the last one I met Chris Dalzell, the previous curator of the Durban Botanical Garden. My wife and companion, Els, and I would have driven down from Durban along the east coast to Port Elizabeth, where we had family to visit. I can still hear Chris saying "Just follow the coast and you cannot miss them." Yea right! To my astonishment, and disappointment, we never saw a single cycad on the trip!

After the post conference tour of 2018, I now realise why we did not see any. To find *Encephalartos cycadifolius* without help, is almost impossible. They grow high in the mountains and sometimes can be covered in snow and it is difficult to reach the plants without a 4x4 vehicle. We stayed overnight at the beautiful Huntley Glen that is still farmed by decendants of the original settlers. In this mountainous landscape you find *E. cycadifolius*, of which we saw many, some very old and a number still with cones from summer.

We also visited *E. horridus* in the Uitenhage district, a beautiful habitat with *Strelitzia juncea*, *Haworthia* spp., *Gasteria* spp. and groups of *Aloe pluridens*. We also found *Cyrtanthus obliquus* in flower and it turned out to be a new record for the species. We aslo saw *Pachypodium bispinosum*, some very old with pretty caudiciform stems. What a beautiful place, one I never would have found travelling on my own!

We then visited the Zuurberg, part of Addo Elephant park. This is where you see *E. longifolius*, and judging by the size of the stems, probably about 150 years old. Next

Figure 4. *Encephalartos latifrons* in habitat, Port Alfred.

Elizabeth, waar ons familie sou besoek. Ek hoor steeds die woorde van Chris: "As jy bloot die kuslyn volg, kan jy hulle nie mis nie.." Ja, nê! Tot my groot verbasing (en spyt) het ons op die hele toer nie 'n enkele broodboom gesien nie!

Tog, na die uiters suksesvolle en perfek georganiseerde post-toer van 2018, begryp ek intussen hoekom ons hulle nie kon vind nie. Om die *Encephalartos cycadifolius* selfs net te vind sonder hulp, gaan nooit werk nie. Hulle groei eerstens op 'n hoogte waar hierdie plante in die winter deur sneeu bedek kan word. Dit is moeilik om die plante te bereik sonder 'n 4x4 voertuig. Ons het oorgeslaap by die pragtige, histories-ryk Huntley Glen, wat steeds bewoon word deur nasate van die eerstes wat hulself hier gevestig het. Hierdie omgewing is gestig in die periode van die "Groot Trek" rondom 1830. Hier, in 'n ongelooflike wye landskap, vind mens die *Encephalartos cycadifolius*, en tot ons blydskap selfs 'n paar enorme ou eksemplare, waarvan heelwat met keëls.

Later het ons die habitat besoek van die *Encephalartos horridus*, waar ons oorgebly het in die Uitenhage distrik van die Oos-Kaap - wat 'n fantastiese habitat met *Strelitzia juncea*, div. *Haworthia* ssp en *Gasteria* ssp. Daar is ook pragtige groepe *Aloe pluridens*, die unieke vonds van *Cyrtanthus obliquus* en 'n nuwe rekord in 'n kwarts-habitat. Verder het ons ook die *Pachypodium*

Figure 5. *Encephalartos princeps* in habitat, Kei River catchment.

Figure 6. *Encephalartos cycadifolius* in habitat, Bedford.

Figure 7. *Encephalartos altensteinii,* Kap River.

Figure 8. *Encephalartos friderici-guilielmi*, Stutterheim.

Figure 9. The author with *Encephalartos horridus*, *Aloe pluridens* and *Euphorbia* sp., Uitenhage.

stop was a difficult to find population of *E. lehmannii*. This is one of my favourite species, possibly because it is grown successfully at Leiden as a potplant for more than 100 years as part of the Cycadales collection. This habitat, like many in South Africa, once again surprised us with the huge diversity of plants.

The flowering specimens of *Aloe speciosa* were very pretty, while it seemed that thousands of flowering specimens of *A. striata*, invited us to follow the road to this wonderful place. Many specimens of *Senecio* cf. scaposa dotted the landscape as small shrubs.

For the next species we travelled to Stutterheim, a place you actually expect dinosaurs to come around the bend. *Encephalartos princeps*, probably very old, grow on the slopes next to a dry river bed.

Eventually we went towards the coast to see *E. altensteinii*. I was surprised to see them growing in a forest, in shady conditions. We saw one really old specimen and my thoughts went back to Masson and Thunberg, about 250 years ago, and the possibility that they might have walked here too. What a delightful idea!

Lastly I have to mention our visit to Colin Fletcher, as reported in the March 2019 edition of ENCEPHALARTOS. Three generations are working to ensure the coninued existence of *E. latifrons*, a truely wonderful project.

The post conference tour was very successful and many new friendships were made. Thank you very much for organising this memorable trip. The next conference will be held in Cuba in 2021 and we all are looking forward to this event.

bispinosum gesien, waaronder enorme oue eksemplare met 'n uiters fraaie caudex. Wat 'n ontsettende fassinerende plek. Ook hierdie sou ek nooit gevind het as ek alleen gereis het nie.

Verder het ons Zuurberg besoek as onderdeel van die groot Addo Nasionale Park. Hier sien ons pragtige eksemplare van *Encephalartos longifolius*, wat na raming meer as 150 jaar oud blyk te wees. Van hier af reis ons na 'n nuwe plek, weereens met 'n uitsonderlike lastige ligging, wat sonder 'n gids steeds nie gevind sou wees nie. Hier beleef ons die habitat van 'n pragtige populasie *Encephalartos lehmannii*, in die Uitenhage distrik, te Oos-Kaap. Hierdie bly een van my gunsteling soorte, moontlik omrede hierdie soort ook as potplant in die Leidse Hortus uiters suksesvol groei en ook hier vermoedelik al meer as 100 jaar deel uitmaak van die Cycadales versameling. Weereens het hierdie habitat, soos vele ander in Suid-Afrika, ons verras met die enorme diversiteit van plante.

Die vol-in-blom eksemplare van *Aloe speciosa* was onbeskryflik mooi, terwyl dit welliswaar wou voorkom of die derduisende bloeiende eksemplare van *Aloe striata* op pad daarnatoe ons wou begelei na hierdie pragtige plek. Ons sien ook fraai, groot eksemplare van *Senecio* cf. scaposa as klein struikies.

Die volgende soort kry ons te sien in Stutterheim. Hier beleef ons 'n pragtige habitat waar ons eintlik verwag dat daar enige oomblik 'n enorme Dinosaurus om die hoek gaan kom. *Encephalartos princeps* - ons loop deur 'n droë rivierbedding en verbaas ons oor die waarskynlik eeue-oue eksemplare van hierdie soort.

Uiteindelik, in die rigting van die kus, kom ons uit by die habitat van die eerder genoemde *Encephalartos altensteinii*. Natuurlik was ek verras-verbaas oor hoe hierdie in die bos groei, meerendeels onder skaduryke omstandighede. Hier sien ons ook enkele stokou ekesemplare, en eensklaps gaan my gedagtes weer terug na die periode van die here Masson en Thunberg so ongeveer 250 jaar gelede en die moontlikheid wat bestaan dat hulle ook hier geloop het – hoe besonders is dit nie!

Laastens moet ek ook ons besonderse besoek aan Colin Fletcher noem (daar is 'n breedvoerige verslag in die ENCEPHALARTOS van Maart 2019). Drie generasies gee intensief aandag aan die voortbestaan en behoud van *Encephalartos latifrons*, voorwaar 'n pragtige projek!

Hierdie Cycad 2018 konferensie en post-toer was 'n uiters suksevolle byeenkoms waar vele pragtige kontakte en vriendskappe gesmee is. Ontsettend baie dank aan die organisasie agter hierdie besonderse geleentheid met soveel onvergeetlike oomblikke.

Die volgende byeenkoms sal in Kuba gehou word. Ook daarna sien baie van ons gretig uit. Hierdie grootste Karibiese eiland sien sekerlik ook met baie belangstelling hierna uit.

A VISIT TO THE BOTANICAL GARDEN OF THE UNIVERSITY OF PADUA (ORTO BOTANICO DI PADOVA) IN NORTHERN ITALY

Roy Osborne[1] & Giovanni Zago[2]

Figure 1. The impressive state-of-the-art climate-controlled glasshouse complex at Orto Botanico di Padova, built in 2014, provides various specialized plant habitats. Photo: Roy Osborne.

We have so far featured in this magazine five interesting cycad-oriented gardens in Italy [Naples, Rome, Portici (Osborne 1992, 1994a, 1994b), Florence (Stainer 1995) and Sicily (Bruno & Osborne 2017)]. We continue this theme with a report on what proves to be the oldest botanical garden that is still in existence in the western world, the UNESCO World Heritage listed Botanical Garden of the University of Padua, the *Orto Botanico di Padova*, or the *Giardino dei Semplici*.

ORTO BOTANICO DI PADOVA: geography and climate

Surface area old garden:	approx. 22,000 m^2
Surface area new garden:	approx. 15,000 m^2
Altitude:	12 masl
Longitude:	11° 52' 54" E
Latitude:	45° 24' 00" N
Maximum temperature:	40,2° C
Minimum temperature:	-11.6° C
Mean temperature:	13.6°C
Mean precipitation:	887 mm p.a.

Founded in 1545 by an order of the Republic of Venice, the Padua Botanical Garden in many ways represents the birth of European botanical science, of scientific exchanges, and of the relationship between nature and mankind for which these gardens are created.

The Padua Garden preserves its original classical layout planned by the Venetian nobleman Daniele Barbaro and supervised by the architect Andrea Moroni. The central design comprises a large inscribed square subdivided into four quarters by orthogonal paths in the four cardinal orientations, this square set within a perfect circle, and that in turn surrounded by a ring of water representing the oceans. The entire area is surrounded by walls to prevent theft of the precious medicinal plants. Other features (such as a balustrade, gates, fountains and statues) were added each century, culminating in a recent ultramodern glasshouse complex, opened in 2014, providing specialized plant habitats. The garden

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Figure 2. Orto Botanico di Padova Curator Dr Roberto Tacchetto, Director Prof Barbara Baldan, and Roy Osborne with a *Macrozamia moorei* specimen. Photo: Angela Osborne.

resources also include laboratories, a library of more than 50,000 volumes and manuscripts, and the second-most extensive herbarium in Italy. There are over 6,000 plant species represented in the plant collections.

The system to provide hot water for the ponds is especially notable, being supplied from an aquifer 300 m below ground level, and at a temperature of about 23-24°C even in winter; thus many tropical waterplants like *Victoria cruziana* and *Cyperus papyrus* can be cultivated outside.

The garden has played the pioneering role of introducing many ornamental and medical plants such as *Asiminia triloba*, *Agave americana* and *Pseudosasa japonica*, now seen throughout Italy and elsewhere.

Many of the botanical specimens are of considerable age. Until 1984, the oldest plant in the garden was a *Vitex agnus-castus* known from 1550. At present, an iconic Chamaerops *humilis* planted in 1585 is the garden's oldest plant; it also has an association with the German philosopher von Goethe, who mentions this particular palm in his 1790 treatise *Versuch die Metamorphose der Pflanzen*. A giant and now hollow-trunked *Platanus orientalis* has been in the arboretum since 1680, while a *Ginkgo biloba* and a *Magnolia grandiflora* date back to the mid-1770s. Other significant trees are some swamp cypresses (*Taxodium distichum*) from Florida and two specimens of the very rare *Metasequoia glyptostroboides*.

Apart from these valuable trees, the garden also has an important collections of insectivorous plants preserved in the 18th-century greenhouses, a medicinal and poisonous garden, an area devoted specifically to endangered plants of the nearly Euganean Hills and the Triveneto Region, an alpine and peat plant collection, an awesome group of *Opuntia* cacti, and a small but important cycad collection.

The cycad collection comprises about 30 mature coning size plants in containers. These are kept in the glasshouse complex during the winter and moved to display areas in the garden during the summer. The species present include *Ceratozamia mexicana, Cycas chanjiangensis, C. deboaensis, C. panzihuaensis,*

Figure 3. A *Ceratozamia mexicana* specimen at Orto Botanico di Padova. Photo: Giovanni Zago.

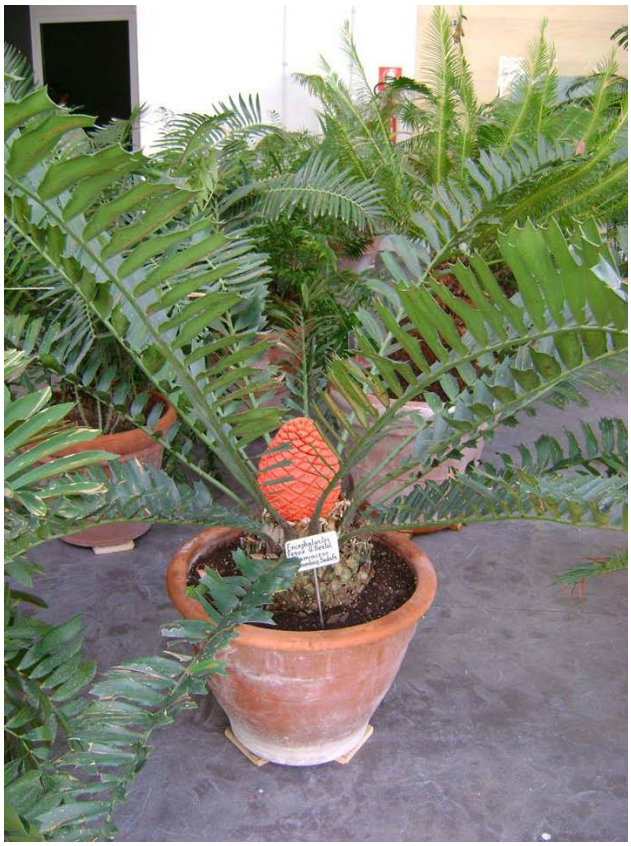

Figure 4. A coning *Encephalartos ferox* specimen at Orto Botanico di Padova. Photo: Giovanni Zago.

C. petraea, C. revoluta, C. rumphii, C. siamensis, C. taitungensis, C. thouarsii, Dioon edule, D. caputoi, D. spinulosum, Encephalartos altensteinii, E. arenarius, E. concinnus, E. ferox, E. gratus, E. munchii, E. pterogonus, E. sclavoi, Lepidozamia peroffskyana, Macrozamia moorei, M. mountperriensis, Zamia fischerii and *Z. furfuracea.*

Figure 5. A rare *Cycas petraea* specimen at Orto Botanico di Padova. Photo: Giovanni Zago.

The profound contribution of the Padua Botanical Garden to the fields of botany, medicine, chemistry ecology and pharmacy was recognized when Gardens were placed on the UNESCO World Heritage List in 1997. The Garden is the property of the Italian State, but is on permanent loan to the University of Padua, the university being responsible for the Garden's management and upkeep. The garden is open to the public daily except Mondays.

ACKNOWLEDGEMENTS

We thank Prof Aldo Moretti, Prof Barbara Baldan and Dr Roberto Tacchetto for facilitating our visit to the Padua Botanical Garden.

REFERENCES

Bruno, R. & R. Osborne. 2017. A cycad paradise in Sicily, southern Italy. Encephalartos 130: 5–8

Osborne, R. 1992. The cycad collection of the Naples Botanical Garden. Encephalartos 31: 18-20.

Osborne, R. 1994a. The Rome Botanical Garden. Encephalartos 39: 12–14.

Osborne, R. 1994b. The Portici Botanical Garden. Encephalartos 40: 8–10.

Stainer, O. 1995. The Botanical Garden of Florence. Encephalartos 44: 29–31.

Web-based references, searched January 2019:

1. Orto Botanico di Padova – Wikipedia, https://en.wikipedia.org/wiki/Orto_botanico_di_Padova.
2. Botanical Garden (Orto Botanico, Padua), UNESCO World Heritage List. https://whc.unesco.org/en/list/824.
3. Orto Botanico di Padova. http://www.ortobotanicopd.it

Figure 6. A vigorous *Zamia fischerii* specimen at Orto Botanico di Padova. Photo: Giovanni Zago.

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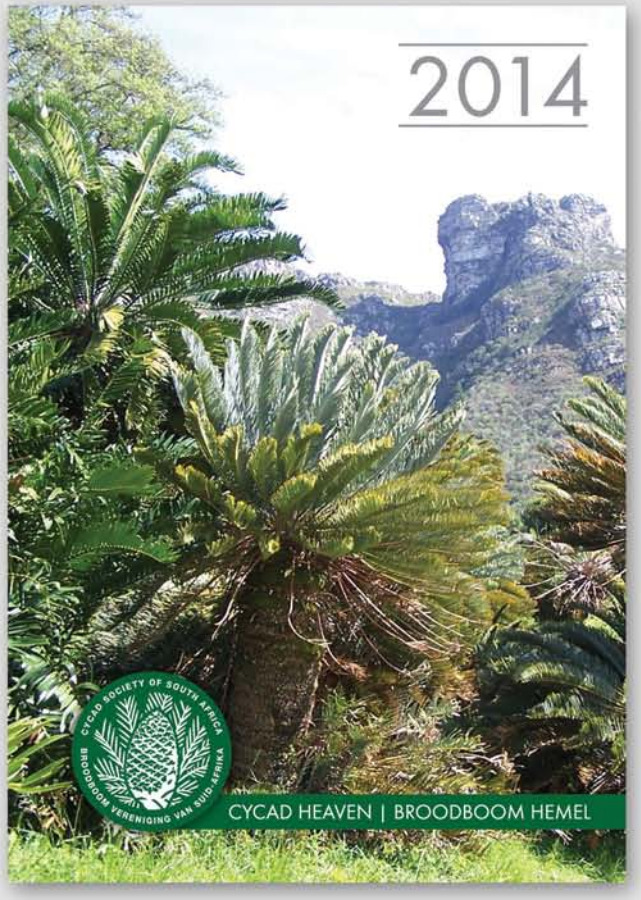

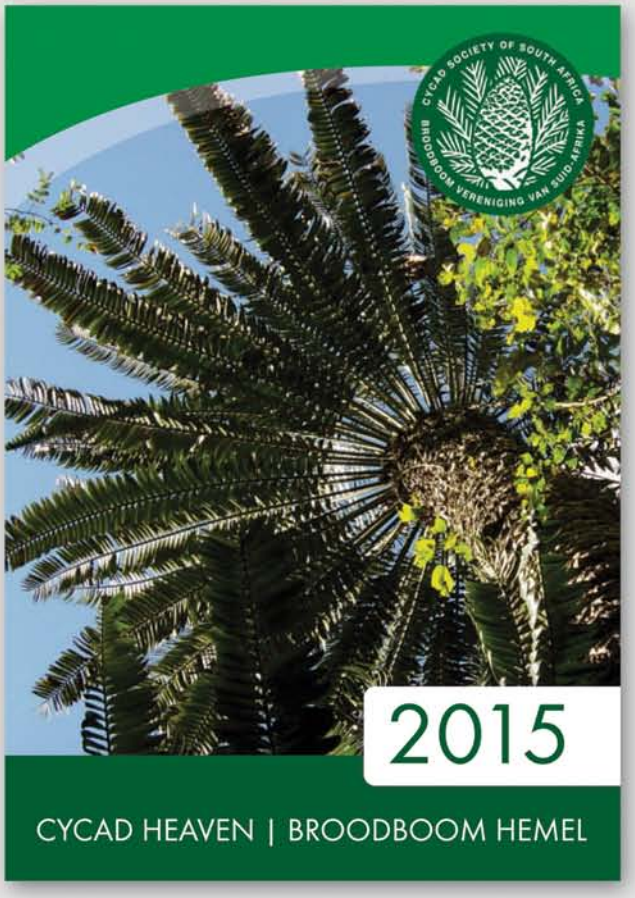

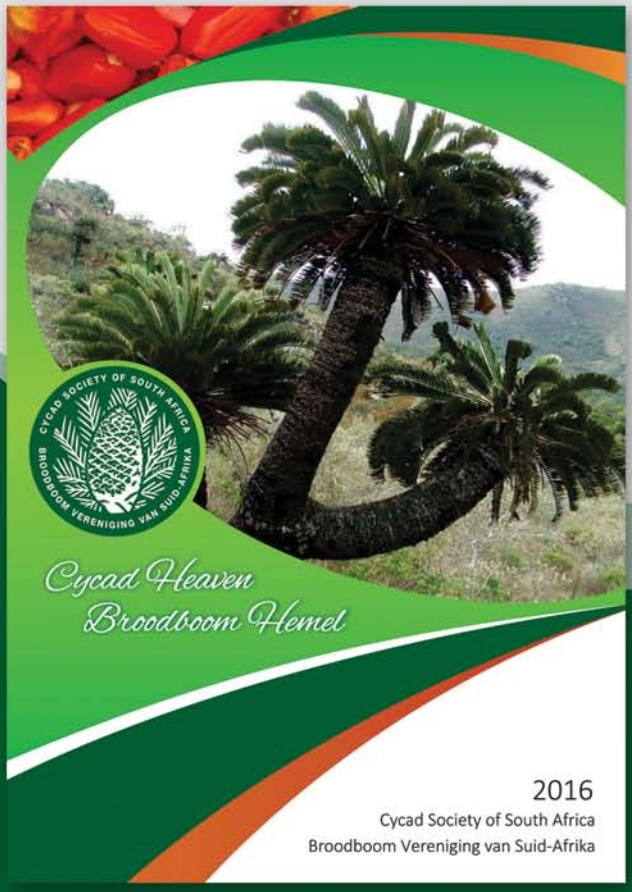

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