Journal of the Cycad Society of South Africa

# ENCEPHALARTOS

Tydskrif van die Broodboom Vereniging van Suid-Afrika

No. 110 December 2012 ISSN 1012-9987

# CYCAD SOCIETY OF SOUTH AFRICA
# BROODBOOM VERENIGING VAN SUID-AFRIKA

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**On the cover:**

*Cycas pruinosa* in habitat in the East Kimberley Region in the far north of Western Australia. Photo by Joe Perner.

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**No. 110** **December 2012** **ISSN 1012-9987**

# FROM THE PRESIDENT / VAN DIE PRESIDENT

The year has almost come to an end but 2012 was a good year for the Society, in that most of the aims and objectives which the Board set in March were successfully achieved or completed. Outstanding aspects such as the Constitution and ENCEPHALARTOS DVD will be concluded early in the New Year.

The embargo on the export of plants to countries in the EU is still pending and the pressure SANBI is exerting to have the TOPS legislation implemented hangs like the sword of Damocles over cycad enthusiasts. The decision to implement these regulations presently lies with the relevant cabinet minister.

The regional branches of the Society are functioning well and the interaction between these branches, like garden and habitat visits as well as annual plant sales, is pleasing to note. Feedback I received reveals that more members are getting involved in regional meetings and the photos appearing in ENCEPHALARTOS substantiate that. Special word of thanks goes to the committee of the KZN regional branch who have made a special effort to get the branch functioning again.

I would also like to thank the Board members for their input, sacrifices and hard work over the past year as well as the interaction amongst one another. Their co-operation not only made my task easier but also enhanced the harmony amongst the Board members. I would especially like to thank Wynand van Eeden, the editor and Pieter van der Walt, the webmaster. Both indicated more than a year ago that they wished to stand down but continued to perform their respective duties with enthusiasm and in a responsible manner.

Notices of renewal of membership fees for 2013 were included in the September issue of ENCEPHALARTOS and members are asked to effect payment by the end of January, 2013. Thank you very much to those who have paid early. Furthermore I would again like to encourage members to make use of the Debit Order facility. Not only does this method ensure continued membership of the Society, but it also facilitates administrative procedures.

Finally, my family and I would like to wish all members who celebrate Christmas, to have a blessed one and, to one and all, everything of the best for 2013. May all your cycad ideals be realised and I hope that one of your new year's resolutions will be to get more involved with your nearest regional branch of the Society.

Dirk van der Walt

Hierdie jaar is byna iets van die verlede en vir die Vereniging was 2012 'n goeie jaar. Die meeste van die aksies en doelwitte wat die Raad aan die begin van die jaar beplan het, is suksesvol afgehandel. Uitstaande aspekte soos die Grondwet en die ENCEPHALARTOS DVD sal vroeg in die nuwe jaar afgehandel word.

Die verbod op die uitvoer van plante na die EU lande is nog steeds hangende en die druk wat SANBI uitoefen om die TOPS wetgewing geimplimenteer te kry, hang steeds soos 'n swaard oor die broodboom publiek. Die besluit vir die inwerking stelling daarvan lê huidiglik by die betrokke minister.

Die Streekstakke funksioneer goed en die interaksie en wisselwerking tussen die takke is kern gesond met aktiwiteite soos byvoorbeeld tuin en habitat besoeke en plantverkopings. Terugvoering wat ek ontvang dui daarop dat meer lede betrokke raak en die foto's in ENCEPHALARTOS getuig daarvan. 'n Spesiale dank gaan aan die KZN streekstak se kommitee wat met 'n hernieude poging begin het om die streekstak weer funksioneel te maak.

Vir die Raadslede wil ek bedank vir al julle insette, opofferings en harde werk gedurende die jaar. Die interaksie met mekaar en die wyse waarmee ek julle samewerking ontvang het, het nie net my taak vergemaklik nie maar dit het die harmonie wat ons verlede jaar gevestig het nog verder versterk. 'n Spesiale dank aan Wynand van Eden, die Redakteur en Pieter van der Walt, die Webmeester, wat beide verlede jaar reeds laat blyk het dat hulle die tuig wil neerlê. Hulle het egter voortgegaan en met ywer en entoesiasme hulle verantwoordelikhede nagekom.

'n Kennisgewing vir die hernuwing van lidmaatskap vir 2013 behoort julle alreeds bereik het, asook die verskeie metodes van betaling. Ek wil lede versoek om betallings voor einde Januarie 2013 te maak en bedank diegene wat alreeds daarop gereageer het. Verder wil ek julle aanmoedig om veral van die Debiet Order fasiliteit gebruik te maak. Die voordeel hiervan is dat lidmaatskap fooie outomaties betaal word en dit vergemaklik die administrasie van die hernuwingsproses.

Laastens wens ek en my gesin vir julle 'n geseënde Kersfees en 'n wonderlike 2013 toe. Mag julle broodboom ideale realiseer en maak dit 'n nuwejaarsvoorneme om betrokke te raak by die aktiwiteite van julle naaste streekstak.

Dirk van der Walt.

## SUKSESVOLLE OPEDAG TEN BATE VAN BROODBOOMVERENIGING / SUCCESSFUL OPEN DAY HELD BY THE CYCAD SOCIETY

Die Wes-Kaap Streekstak van die Broodboom Vereniging van Suid-Afrika het 'n baie suksesvolle opedag op Saterdag, 17 November 2012 gehou. Verskeie broodbome en ander skaars plante is te koop aangebied. Heelwat tuiskwekers het hul plante teen uiters billike pryse te koop aangebied. Die dag is goed deur die publiek ondersteun en ongeveer 500 mense het die opedag besoek. Baie inligting en kennis is uitgeruil. Dit het gewissel van plantspesies, siektes en gifstowwe tot grondmengsels. Nuwe lede het by die vereniging aangesluit en groot belangstelling en opgewondenheid het geheers.

Die bewusmakingsvelgtog van die bestaan van die vereniging sowel as die beskikbaarstelling van broodbome is reeds geruime tyd deel van Kirstenbosch se jaarlikse plantverkoping. Op versoek van die publiek gaan ons nou ook in die noordelike voorstede 'n jaarlikse verkoping hou wat oor twee dae sal plaasvind.

Broodboome word streng volgens wet beskerm en beheer. Slegs permithouers met die nodige dokumentasie in plek, is toegelaat om broodbome te verkoop. Die doel van die vereniging is om broodbome te bewaar en beskerm, voortplanting te bevorder en inligting oor broodbome te versprei. Die grootste persentasie *Encephalarthos* spesies is inheems aan Suid-Afrika. Sommige spesies is alreeds in die natuur uitgewis. Dit is van kritiese belang om tuiskwekers aan te moedig om broodbome te kweek om hierdie baie unieke plante van uitwissing te red. Vir die rede wil ons die publiek uitnooi om enige navrae te rig aan Johan Kotze, 021 919 2434, Andy Naude, 082 900 8624, Frikkie Conradie, 084 951 0550 of Michael Koopman, 084 408 2189.

The Western Cape regional Branch of the Cycad Society of South Africa held a very successful open day on Saturday, 17th November, 2012. A number of home growers made various cycads and other rare plants available for sale at very reasonable prices. The event was well supported by the public and approximately 500 persons put in an appearance at the venue. Information was available about the various species, diseases and poisons and soil mixtures. A number of new members joined the Society and the event elicited a lot of interest and excitement. Requests have been received from the residents of the northern suburbs of Cape Town to make the sale an annual event and we are thinking of spreading it over two days in future.

An awareness campaign surrounding the existence of the Society as well as the availability of cycads for purchase have long been part of the annual Kirstenbosch plant sale.

Cycads are strictly controlled in terms of legislation, with the result that only permit holders with the necessary documentation in place were allowed to sell cycads.

Some of the aims of the Society are to preserve and protect, to encourage reproduction and to provide information about the *Encephalartos* species, the greater number of which are indigenous to South Africa. Some species are already extinct in the wild and it is therefore of critical importance to encourage home growers to cultivate these unique plants. It is for this reason that the public are encouraged to address any enquiries about cycads to any one of the following: Johan Kotze, tel 021 919 2434; Andy Naude, cell 082 900 8624; Frikkie Conradie, cell 084 951 0550 or Michael Koopman, cell 084 408 2189.

'n Tevrede Hans Viljoen het sy broodboom gekry / A satisfied Hans Viljoen with his cycad purchase.

## IN MEMORIAM
## Heinrich Edgar Wohlberg: 19 July 1928 to 10 August 2012

Edgar was born in Piet Retief on 19th July 1928. His father, Otto, and mother, Irene, lived in Moolman and owned a trading store. He grew up with some African friends and learnt to speak fluent Zulu at an early age. His knowledge of four languages; German, English, Afrikaans and Zulu, stood him in good stead throughout his life. Edgar schooled in Moolman and later at Piet Retief High School. He surprised his parents by moving far away to Stellenbosch University to study where he earned a degree in Electrical Engineering.

His love of tennis started at University. After the War when commodities were short, Otto, his father, sent him a big box of new tennis balls. He was befriended by all the team tennis players who wanted him as a hitting partner. His tennis improved remarkably. He went on to achieve Natal tennis colours playing with some of his lifelong friends. He was also the Westville Men's and Mixed Doubles Champion for many years.

Edgar has always been an avid gardener. His plant collections started with *Lithops* and then moved onto cycads and orchids. Edgar was member number 8 and was very involved in the Cycad Society of South Africa and the relocation of endangered species to safe locations. Everyone who has been to his home in Westville has been given a guided tour of his nursery and cycad collection. He shared this passion and knowledge of plants with many people. While travelling, he met good, lasting friends around the world as a result of his hobby.

During his retirement years, Edgar & Dot travelled extensively to Malawi, South America, India, Thailand, Tibet, China, Singapore, Italy, Mozambique and Egypt.

Edgar's pride and joy was his family. Edgar had 3 daughters; Lynne, Jenny and Glenys and he was extremely proud of his granddaughters; Lisa, Kim, Taryn, Simone, Jessica and Hayley. He recently returned from Canada where he saw his eldest granddaughter, Lisa, graduate.

He lived by the motto "Live every day as if it is your last". He lived 84 wonderful years and his family was so privileged to share so many of these special years with him. He will be dearly missed by his family and friends and remembered always.

## NEW MEMBERS

The Society welcomes the following new members, who joined between September and November, 2012.

| | | |
|---|---|---|
| 3948 K | AYSEN, Dr. G | SYDENHAM, 4091 |
| 3949 | CONSERVATOIRE et JARDIN BOTANIQUES de la VILLE de GENèVE BIBLIOTHèQUE | Case Postale 60, CHAMBèSY – GENèVE, SWITZERLAND |
| 3950 W | GELDENHUYS, Mnr. D W | Posbus 614, KLEINMOND, 7195 |
| 3951 G | JUDEEL, Mnr. G dT | WILROPARK, 1724 |
| 3952 M | STRYDOM, Mnr. R | BRONKHORSTSPRUIT, 1020 |
| 3953 L | VENTER, Ds. L J E | Posbus 594, HOEDSPRUIT, 1380 |
| 3954 G | VAN ZYL, Mnr. F J | Posbus 31178, WONDERBOOM-POORT, 0033 |
| 3955 N | VAN DER WALT, Mnr. A J | Posbus 373, ORKNEY, 2620 |
| 3956 G | GROBLER, Me E H | Posbus 32197, TOTIUSDAL, 0134 |
| 3957 G | BE BEER, Mnr. B | Posbus 25745, GEZINA, 0031 |
| 3958 G | RAMUTLOA, Mr. T T | MABOPANE, 0190 |
| 2959 G | MOSTERT, Mr. H | MEYERSPARK, 0184 |

# *MACROZAMIA FRASERI* MIQ.

Roy Osborne *

## Introduction

It is generally held that three *Macrozamia* species occur in Western Australia, although the possibility of this number being extended remains a project for further research. The subject of this article, *Macrozamia fraseri* Miq., was described in 1842, while the species publications of *M. riedlei* (Fisch. ex Gaudich.) C.A. Gardner and *M. dyeri* (F. Muell.) C.A. Gardner followed only in 1930. In a previous issue of this magazine we featured *M. dyeri*, the species from the southernmost area of Western Australia; at the same time including a synopsis of the discovery of the various Western Australian macrozamias (Osborne 2006). In this issue we turn our attention to the northernmost cycad of the current trio, *M. fraseri*.

## Discovery

In past times, cycads were well known to the Nyoongar people of southwestern Australia, who used terms variously recorded as *baian*, *baio*, *biana*, *boy*, *boya*, *boyoo, by-yu*, *djiriji*, *dyergee*, *gigijee*, *girijee*, *jeerajee*, *jeerja*, *jeerli*, *koondagoor*, *kundagur*, *kwinin*, *queen-een*, *quinine* or *quinning* in reference to local macrozamias (Bonta & Osborne 2007, Ken Macintyre & Barbara Dobson pers. comm.). The indigenous people did not of course distinguish plant species according to the Linnean system but, like other hunter-gatherer peoples throughout the world, evolved their own utilitarian means of distinguishing important plant types; traditional Nyoongar plant nomenclature consisted of functional descriptors (Ken Macintyre & Barbara Dobson pers. comm.)

Australian cycads were first brought to the attention of European botanists when in January 1697 the Dutchman Willem Hesselsz de Vlamingh, master of the vessel "Geelvink", made a landing in a wide estuarine basin of the territory of Nova Hollandia, now identified as the Swan River in the Perth area. The ship's crew, noting cycad seed residues lying around Aboriginal bivouacs and concluding that the natives used cycads as a food source, gathered and ate the seeds—but without first treating the material to remove the toxins. As a result, many of the crew were taken violently ill, including de Vlamingh himself. Seeds of a local cycad (*Macrozamia fraseri* or *M. riedlei*) were taken back to Holland and presented to the mayor of Amsterdam, Nicolaas Witsen, but their subsequent fate is unknown (Forster 2004, Osborne 2006).

The next recorded botanical collection in Australia arose from James Stirling's pre-settlement expedition to the Swan River area of [then] New Holland in 1827. Captain James Stirling, master of H.M.S. "Success" [later Admiral Sir James Stirling, 1791–1865, first Governor of the Swan River Colony] was accompanied by New South Wales colonial botanist Charles Fraser [sometimes given as Frazer or Frazier, 1788–1831] who collected material of a cycad that Dutch botanist Friedrich Miquel (1842) subsequently named in his honour. In his report of the expedition, Fraser (1830) mentioned cycads at several points during their exploration of the upper reaches of the Swan River, e.g. "… I caught sight of a plant with an arborescent habit, which, on examination, proved to be a species of *Zamia*, with spiral fruit differing only from *Z. spiralis* in habit", and "The *Zamia* … was here observed to attain a height of thirty feet". W.C. Gilbert, Sterling's clerk on the expedition wrote that, as the expedition proceeding towards the source of the Swan River,"… there is a material change observable in the botany … the *Zamia* is seen attaining the height of 30 feet, its beautifully pinnate leaves, associated with the superb *Xanthorrhoeas,* so abundant there, imparts to the forest an appearance perfectly tropical" (Gilbert 1906). The 30 feet height cited in both these reports suggests strongly that *Macrozamia fraseri* may be distinguished from the acaulescent *M. riedlei* that is found to the east and the south. Interestingly, a painting by Assistant Government Surveyor Robert Dale (1810–1856), now housed at the Australian National Gallery, shows a representation an arborescent macrozamia in the Swan River Valley (Figure 1).

I have not been able to find out where the type specimen is filed, or indeed, if it can be located at all. It is possible that the holotype is amongst Miquel's vouchers in Leiden (L) or Utrecht (U) (Dennis Stevenson pers. comm.).

Subsequent to its 1842 publication, *Macrozamia fraseri* was also, and confusingly, referred to as *Macrozamia preissii* Lehm. (1844), *Encephalartos preissii* (Lehm.) F. Muell. (1859), *Encephalartos oldfieldii* Miq. (1863), *Encephalartos fraseri* (Miq.) Miq. (1863) and *Macrozamia oldfieldii* (Miq.) A.DC. (1868). A further complication was that Gardner & Bennetts (1956) lumped all Western Australian cycads into the single species *M. riedlei*, a decision accepted (but with reservation) by Johnson (1959). David Jones (1993) listed as separate entity *Macrozamia* sp. "Enneabba" (more correctly "Eneabba"). Some resolution was achieved

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[1] Hill & Osborne (2001) erroneously credited the epithet of *Macrozamia fraseri* to Western Australian surveyor and pastoralist Charles Fitzgerald Fraser (1883–1951).

[2] Despite its name, *M. fraseri* must not be confused with the cycad endemic to Fraser Island on Australia's eastern seaboard, *M. douglasii*.

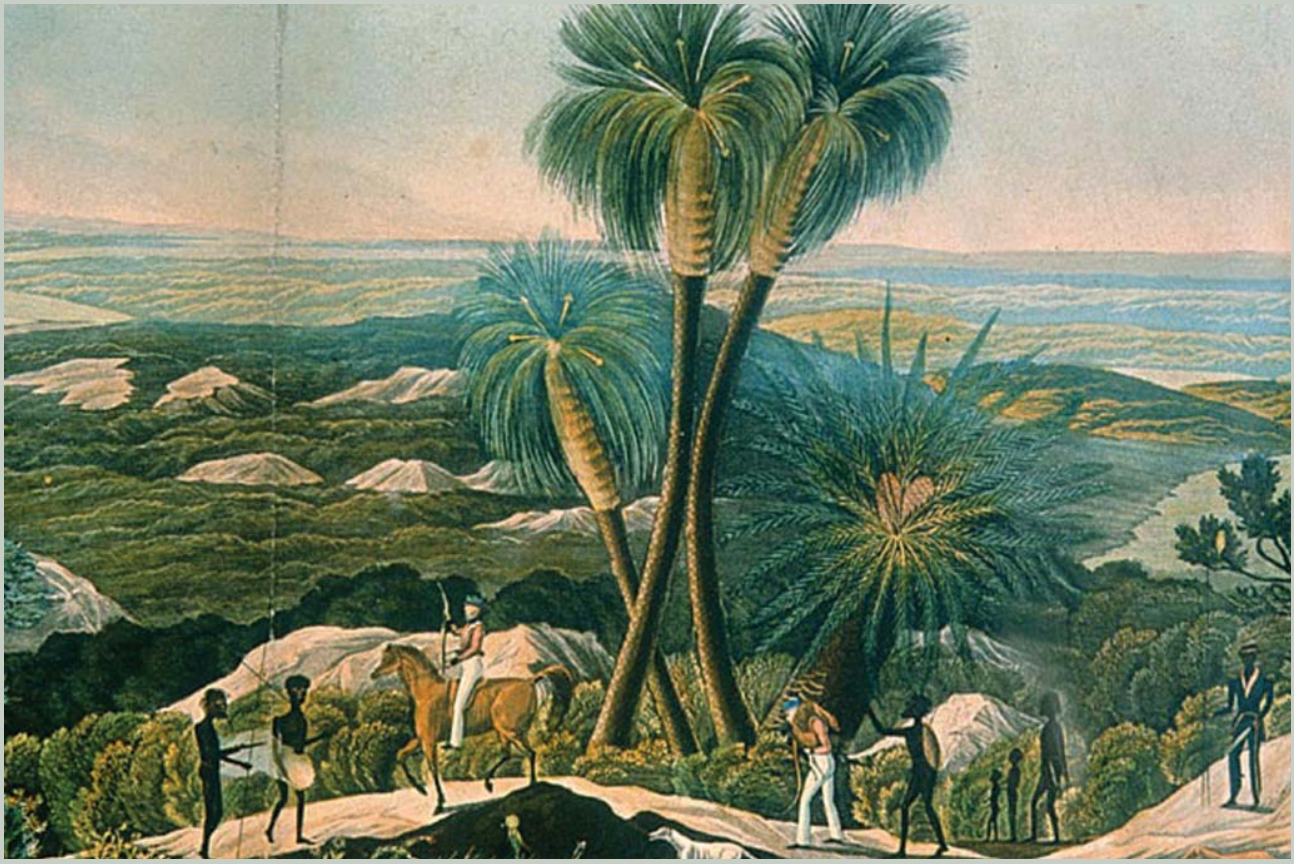

Figure 1.—Section of a painting by Government Assistant Surveyor Robert Dale (1810–1856) entitled "Panoramic view of King George's sound, part of the colony of Swan River", hand-coloured aquatint and etching, on three joined sheets 17.7 cm x 27.5 cm, Australian National Gallery, Canberra. The cycad in the centre is an obvious representation of an arborescent *M. fraseri*.

in 1998 when Ken Hill sensibly re-instated Miquel's *M. fraseri* and included therein Jones' concept of the Eneabba plants.

## Distribution, habitat and ecology

*Macrozamia fraseri* is locally abundant in a broad coastal zone of south-western Western Australia, extending from near Dongara in the north to the suburbs of Perth in the south (Figure 2). This distributional area is roughly 100 km wide and 300 km in length. Large populations are known from the Badgingarra and Lesueur National Parks while a smaller population is conveniently accessible at the Coomalloo Nature Reserve. Many other small-sized populations are scattered throughout the area, both within and without protected zones. Plants in the southern half of the distributional area are consistently smaller in stature that those in the north, the southern and south-eastern sites. These areas approach and overlap *M. riedlei* localities; hence the populations here may represent some degree of intergrading between the two species (Hill & Osborne 2001). In particular, there appears to be intergradation between with the fairly robust *M. fraseri* plants on the Perth sandplains with the small-statured *M. riedlei* plants in the foothills of eastern Perth (Mike Huff pers. comm.)

The general region for *Macrozamia fraseri* is home to a unique vegetation known as the *kwongan*, a name meaning "sandplain" in the Nyoongar language (Bates 1913). The *kwongan* vegetation comprises floristically rich heath with dense thickets of sclerophyllous shrubs and isolated small trees. From a distance, this dense heath with isolated small trees appears almost monotonous,

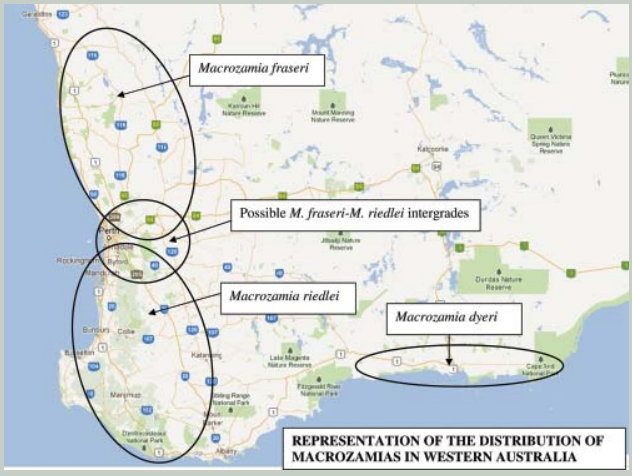


Figure 2.—Approximate distribution of the various *Macrozamia* species in Western Australia known to the author.

but closer inspection soon reveals an extraordinary diversity in species, which provide a spectacular display of wildflowers in spring. The *kwongan* has similarities to the Mediterranean *maquis,* the Californian *chaparral*, the Chilean *matorral* and the *fynbos* of South Africa. Major plants families represented are the Ericaceae, Fabaceae, Myrtaceae and Proteaceae.

The climate is strictly Mediterranean, with a modest rainfall of 650–750 mm occurring mostly during the winter months, but apparently slightly higher in past decades. In summer the average minimum/maximum temperatures are 18°C to 38°C while in winter the minimum/maximum range is 2°C to 18°C. In the northern

**Notes on pollination which follow were kindly supplied by Rolf Oberprieler, CSIRO Ecosystem Sciences, Canberra, Australia, and Thomas Wallenius, Research School of Biology, Australian National University, Canberra, Australia.**

The pollination of *Macrozamia fraseri* has not been studied in detail, but it is likely that it is effected by weevils of the genus *Tranes* (Coleoptera: Curculionidae: Molytinae), which live on most species of *Macrozamia* and have been shown or implicated in the pollination of several cycads in eastern Australia, such as *M. communis*, *M. machinii*, *Lepidozamia peroffskyana* and *L. hopei* (respectively Terry 2001; Terry et al. 2004, 2005; Hall et al. 2004; Wilson & Rowles 1997). Two species of *Tranes* have been found on *M. fraseri*. The larger one is similar to the big *T. vigorsii* Boheman that occurs widely on *M. riedlei* to the south, but it is smaller and differs slightly in some characters and probably represents a distinct, undescribed species. The smaller species is more similar to the eastern *T. lyterioides* (Pascoe) and related species, which pollinate *M. communis* and other species there, and is apparently also undescribed. Both species have been found in dehiscing male cones and among the cataphylls deep in the crown of *M. fraseri* at Eneabba and have also been collected from elsewhere in its distribution range. Whether only one or both species are involved in the pollination of *M. fraseri* is unknown, but it is likely that, as in other *Macrozamia* species, the production of strong odour and heat by the male cones in the later stages of their dehiscence plays a crucial role in enticing the weevils to visit receptive female cones and pollinate their ovules. The larvae of both *Tranes* species, like those of all others, probably also develop in the sporophylls and rachis of the male cones but cannot do so in female cones or in cycad stems, so they are "good" weevils as the plants depend on them for their pollination.

A similar but stockier and darker weevil, *Melanotranes roei* (Boheman), bores in the trunks and caudices of *Macrozamia riedlei* and *M. dyeri* but has apparently not yet been recorded from *M. fraseri*. Like its eastern relative, *Melanotranes internatus* (Pascoe), this weevil probably also attacks mainly diseased and stressed plants but can then kill them off rapidly, especially under artificial and suboptimal conditions in gardens, nurseries and parks.

Thrips of the genus *Cycadothrips* are also involved in the pollination of *Macrozamia* species but have apparently not yet been recorded from *M. fraseri*. One species, *C. emmaliami* Mound, is common in the male cones of *M. riedlei*, but its role in pollination has not been studied.

parts of the distributional area, day temperatures can occasionally reach as much as 45°C. Plant populations are confined to the coastal plain and generally occur at altitudes of less than 150 m.

The soils are nutrient-poor and sandy, overlaying granite, dolerite or laterite. The vegetation is highly flammable and subject to irregular and sometimes intense fires. These fires sometimes promote a massive synchronous coning, a so-called "mast" event, occurring throughout the affected cycad population some two years after the fire. This phenomenon was seen to occur at Badgingarra National Park in October 2004 (Forster 2004) and in Lesueur National Park in September 2012 (Osborne pers. obs.).

Little is known of the animals involved in seed dispersal of *M. fraseri*. It may be that birds such as the emu and parrots (especially cockatoos) are implicated in seed transport over distances, not to forget the more recent dispersal by humans. Short-distance dispersers may include kangaroos, wallabies, the chuditch (native cat), the Southern brown bandicoot, various possums and native rats (Ken Macintyre & Barbara Dobson pers. comm.).

## Description, vegetative structures

[Details from Hill (1998), Forster (2004), modified as per the author's observations. See Figures 3–10].

*Macrozamia fraseri* has unbranched stems varying in height from ground level to 3 m, bulbous when less that 1 m tall, cylindrical in arborescent specimens, 40–90

Figure 3.—*Macrozamia fraseri* in *kwongan* heathland on coastal sandplain in Lesueur Nation Park, showing a fire-blackened trunk and surrounded by the flowering smokebushes (*Conospermum* sp., Proteaceae). Photo: Roy Osborne.

Figure 4.—*Macrozamia fraseri* in *kwongan* heathland in the South Eneabba Nature Reserve, on the Coorow–Green Head Road. Photo: Roy Osborne.

Figure 5.—The author with *Macrozamia fraseri* at Coomalloo Nature Reserve, 23 km north of Badgingarra on the Brand Highway. The extensive "skirt" of old leaves indicates that this area has not been burnt for many years. Photo: Angela Osborne.

Figure 6.—*Macrozamia fraseri* at Coomalloo Nature Reserve. The procumbent trunk of the plant in the foreground was 3.5 m long and 90 cm in diameter. Photo: Roy Osborne.

cm in diameter, bearing a crown of 30–100 leaves, and with a densely woolly apex. Charles Fraser's "30 feet" (over 9 m) appears to be something of an exaggeration, even if the crown of foliage is included (although it is likely that significant numbers of tall specimens were present in the Swan River Valley area in the early 1800s).

The grey-green, semi-glossy leaves are 60–270 cm long and distinctly keeled. Median leaflets have a pinna-to-pinna angle of 90–150°, a pinna to rachis angle of 45° and overlap with a shield angle of about 45° (terminology as per Grobbelaar 2002). The rachis is straight with the basal leaflets reducing to a few spinescent pinnacanths and the petiole is 18–55 cm long and flattened-cylindrical. Each leaf bears 110–174

Figure 7.—*Macrozamia fraseri* showing a blackened bulbous trunk, immediately after a bushfire, in the Toodyay area, 85 Km northeast of Perth. Photo: Barbara Dobson.

Figure 8.—*Macrozamia fraseri* preserved in a rocky outcrop containing a sacred site in the hills of West Toodyay. Arborescent specimens are now uncommon in the area, most having been removed by livestock farmers. Photo: Ken Macintyre.

Figure 9.—*Macrozamia* plants in Jarrah woodland at Wireless Hill Park, Fremantle. This area is at the extreme southern end of the *M. fraseri* distributional area. The plants are less robust than their northern counterparts and consistently acaulescent. They may better be ascribed to *M. riedlei* or an intergrade. Photo: Roy Osborne.

Figure 10.—*Macrozamia fraseri*, leaf detail, from a plant in Lesueur National Park. Median leaflets have a pinna-to-pinna angle of 120°, a pinna to rachis angle of 45° and overlap incubously with a shield angle of about 45° (terminology as per Grobbelaar 2002). Photo: Roy Osborne.

Figure 11.—Nine near-mature pollen cones on a *Macrozamia fraseri* specimen in a part of the Lesueur National Park that had been burnt about 2 years previously. Specimens in an adjacent unburnt section showed no evidence of any coning. Note also the extensive and characteristic "wool" at the stem apex. Photo: Roy Osborne, September 2012.

leaflets that are concolorous to weakly discolorous, with flat margins, terminating in a spinescent apex, and with a yellowish callus base at the point of insertion onto the rachis. Median leaflets are 18–34 cm long by 7–14 mm wide and have stomata on both surfaces.

## Description, reproductive structures

[Details from Hill (1998), Forster (2004), modified as per the author's observations. See Figures 11–14].

Pollen cones of *Macrozamia fraseri* are fusiform, dull yellow in colour, 5–17 in number, 30–48 cm long, 8–14 cm in diameter, with microsporophylls 25–50 mm long, 17–26 mm wide, and subtending an apical spine 15–90 mm long.

Seed cones of *Macrozamia fraseri* are ovoid, pale green in colour, 2–7 in number, 35–45 cm long, 15–17 cm in diameter, the megasporophylls having an expanded peltate apex 45–60 mm wide, 25–35 mm long, and bearing an apical spine 5–60 mm long.

Seeds are ovoid, 40–50 mm long, 25–30 mm wide, with a dark red sarcotesta.

## Distinguishing features

The three Western Australian *Macrozamia* species form a closely related group characterised by cylindrical petioles with only a few spinescent pinnacanths.

Figure 12.—One of two near-receptive female cones on a *Macrozamia fraseri* specimen in Lesueur National Park. Note also the extensive and characteristic "wool" at the stem apex. Photo: Roy Osborne.

Figure 13.—An acaulescent *Macrozamia fraseri* with one of two female cones at the seed-shedding stage, Bold Park, 7 km west of Perth. Photo: Barbara Dobson.

Figure 14.—*Macrozamia fraseri* seedlings at Coomalloo Nature Reserve. As with many macrozamias, the juvenile leaves have a very different appearance to those of the adult plants. Photo: Roy Osborne.

*M. fraseri*, in the sense used in this article, is distinguished from the others by its robust habit, keeled leaves, densely woolly crowns and large cones. The ongoing DNA analysis of cycad taxa will undoubtedly assist with a more rigorous and quantifiable assessment of intrageneric relationships in these taxa and in the genus as a whole (Dennis Steveson pers. comm.).

## Ethnobotany

The Nyoongar Aboriginal people of south-western Australia used the fleshy oil-rich sarcotesta of *Macrozamia fraseri* and *M. riedlei* seeds as a foodstuff–after the material was detoxified by being soaked and buried in an anaerobic environment for several weeks, the ultimate product being called *by-yu* or *kwineen* (Thieret 1958; Cornish 2010, citing work by anthropologists Macintyre & Dobson). This is in contrast to other documented Aboriginal uses of cycads in the central and eastern parts of Australia where it is the starch-rich megagametophyte that has been the material of choice. Signage at the Coomalloo Nature Reserve (Fig 15) contains misleading information about the Aboriginal usage of local cycads (Barbara Dobson & Ken Macintyre pers. comm., see insert).

It is also recorded that the early colonists in the Swan Valley Colony used the stems of local cycads to provide starch for eating and for laundry use (Thieret 1958), thus also contributing to the demise of arborescent specimens in the southern part of the distribution area.


Figure 15.—Signage at Coomalloo Nature Reserve, claiming incorrectly that the local Aboriginal people ate the starch-rich megagametophyte of cycad seeds. Photo: Roy Osborne (see inserted notes by Barbara Dobson & Ken Macintyre).

**Notes on Aboriginal usage of Macrozamia fraseri and M. riedlei by the Nyoongar people of south-western Australia, kindly supplied by Ken Macintyre and Barbara Dobson, research anthropologists, PO Box 1560, Toodyay, WA 6566, Australia, E-mail kmac01.iinet.net.au].**

The signage at Coomalloo Nature Reserve (Fig 15), claiming that the local Aboriginal people ate the starch-rich megagametophyte of the cycad seeds, is incorrect and misleading. It demonstrates how traditional Nyoongar knowledge has been lost and distorted, relying upon information from Eastern Australia which itself has in many cases been sourced from the internet. When Nyoongar informants are asked for information for such purposes as interpretive signage along heritage trails and in national parks, this often puts pressure on them to provide information that they may not have.

There is no reliable ethnohistorical source which refers to Nyoongars in any part of south-western Australia consuming cycad kernels (gametophytes). Major ethnohistorical sources such as Grey (1840), Moore (1842) and Drummond (1842) state that only the outer red flesh (sarcotesta) was eaten (after processing). Colonial botanist Drummond (1842) states that "The nuts, when deprived of their red covering, are not used by the natives as food...". We confirmed this when interviewing Nyoongar informants in 1992, 1993 and 1997. All the Elders claimed that the red outer skin was the only part of the cycad that was traditionally consumed after soaking and then burying the seeds under the ground for about a month. They were adamant that the kernel (megagametophyte) was not consumed. Their information derived was derived from pivotal grandparents and other ancestral relatives.

The Nyoongar name for the *Macrozamia* seed (or "palm nut" as the colonials called it) is *boya* (Drummond 1842) or *by-yu* (Grey 1840; Moore 1842). Grey (1840) points out that when the seed is "enveloped with pulp" it is known as *by-yu*. However, when the seed is deprived of its outer coat and is no longer of use as a food, it is referred to as *buoyer queaja*. The term *queaja* literally translates as "bones" The metaphor here is that a bone is inedible and discarded once the flesh has been consumed. It was these discarded seeds, found scattered around Aboriginal camps in the vicinity of the Swan River, which tempted the early Dutch, French and English sailors to eat them. It is probable also that these seeds, discarded near the various Aboriginal bivouacs, also impacted the present distribution of the cycad.

## Conservation status

*Macrozamia fraseri* is still relatively common in protected areas, and is not regarded as threatened. In the southern parts of its distribution area, many large plants were cut down by the early Swan River colonists who extracted starch from the cycads' trunks. In addition, large numbers of specimens were lost where land was cleared for urban and agricultural development. Ken Hill (2003) estimated the population number as 2 500–10 000, although the author believes that the total number exceeds 10 000. This cycad is listed on the current World List of Cycads (Osborne et al. 2012) and on the IUCN Red List (2012) as being of Least Concern (LC).

## Cultivation

*Macrozamia fraseri* is uncommon in cultivation. The author knows only of a few specimens growing in California that have been successfully grown from seed collected in Australia several year ago (Fig 16). Based on its habitat environment, one would expect this species to grow best in a sunny, moist, well-drained position in winter rainfall zones in sandy soil, and to be tolerant of light to moderate frosts. David Jones (1993, 2002) cautions that this cycad is particularly sensitive to root-rotting fungi.

## Acknowledgments

I am indebted to Barbara Dobson, Mike Huff, James Ingham, Ken Macintyre, Rolf Oberprieler, Angela Osborne, Lou Randall, Jeremy Spath and Thomas Wallenius for their interest and assistance in the preparation of this article.

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# Stimulation by fire of certain South African *Encephalartos* species.

Andre Cilliers

Figure 1.—*Encephalartos lanatus* seedling in a crevice of a rock, Middelburg South Africa.

## Introduction

There has been a lot of speculation among cycad enthusiasts and botanists on the effect of fire on the stimulation of cycads in the wild. Many reports suggest that burning stimulates the emergence of new leaves and cones. This certainly seems to be the case in many reports throughout the world. Seedlings, however, are largely destroyed by fires, and often only seedlings that grow in crevices of rocks are able to survive (Figure 1: *Encephalartos lanatus* in habitat).

In Australia the effort to conserve their cycads is looking at the effect of fire: "Most cycads are both fire-dependant for successful reproduction and fire-sensitive for mortality of seeds and seedlings. Understanding the effects of fire frequency, intensity and time of burn on the reproductive capacity of each species and its pollinators is essential for long-term management of populations." (1)

In South Africa it has been reported that fire does indeed stimulate new leaf growth and coning under veld conditions: "The general vegetation is described

Figure 2.—Severely burned stems of *E. lanatus*, Middelburg South Africa.

as sparsely wooded sourveld, with veld fires commonly occurring in winter. The fires may indeed be necessary for stimulating new leaf growth and coning in these cycads. Records indicate that *E. lanatus* has been collected in the Lowveld at Sabie, Pilgrim's Rest, Nelspruit and Kaapsehoop, but this is undoubtedly incorrect. It is probably due to the early confusion between *E. laevifolius, E. humilis* and *E. lanatus*." (2). Figure 2 shows *E. lanatus* stems which were severely burned in habitat in the winter of 2012.

*In another account, the same is claimed for Encephalartos cycadifolius: "Encephalartos cycadifolius* is frost and drought tolerant and well adapted to fire which stimulates formation of cones and leaves. Porcupines and baboons break off both male and female cones for food." (3)

*Encephalartos ghellinckii* is known as the "Fire and Ice" cycad because of the habitat in which it occurs. "Its preferred habitat lying within grassveld, it has developed resistance to veldfires, and also the intense cold brought on by snow and frost. Plants from the high-altitude areas are more robust and usually have a fire-scarred base. The low altitude plants, such as those near the Umkomaas River, are stunted or dwarf-like and may have up to five trunks, often blackened by grass fires, which are thought to stimulate leaf and cone production. The plants growing in tall grassveld are usually spindly with tall stems, and have a tendency to lean over, often becoming quite procumbent." (4)

In South Africa, work done by Brown, Jamieson and Botha (1994) showed that smoke may be one of a number of germination cues, which include heat, and possibly alternating high and low incubation temperatures (6). Even though this work was conducted on Fynbos species, it may be true for *Encephalartos* as well, even though no data seems to be available for *Encephalartos* seeds.

## What causes veld fires?

The most common cause of wildfires varies throughout the world. In Mexico, Central America, South America, Africa, Southeast Asia, Fiji, and New Zealand, wildfires can be attributed to human activities such as animal husbandry, agriculture, and land-conversion burning. In the United States and Australia, the source of wildfires can be traced to both lightning strikes and human activities such as machinery sparks and cast-away cigarette butts. (5)

Wildfires occur when all of the necessary elements of a fire triangle come together in a susceptible area: an ignition source is brought into contact with a combustible material such as vegetation that is subjected to sufficient heat and has an adequate supply of oxygen from the ambient air. High moisture content usually prevents ignition and slows propagation, because higher temperatures are required to evaporate any water within the material and heat the material to its fire point. Dense forests usually provide more shade, resulting in lower ambient temperatures and greater humidity, and are therefore less susceptible to wildfires. Less dense material such as grasses and leaves are easier to ignite because they contain less water than denser material such as branches and trunks. Plants continuously lose water by evapotranspiration, but water loss is usually balanced by water absorbed from the soil, humidity, or rain. When this balance is not maintained, plants dry out and are therefore more flammable, often a consequence of droughts (5). In South Africa, the winter season is typically characterized by dry, windy conditions and veld fires are extremely common, especially on the Highveld.

## The Effect of weather on the occurrence of veld fires

Heat waves, droughts, cyclical climate changes such as El Niño, and regional weather patterns such as high-pressure ridges can increase the risk and alter the behavior of wildfires dramatically. The intensity also increases during daytime hours. Burn rates of smoldering logs are up to five times greater during the day due to lower humidity, increased temperatures, and increased wind speeds (5).

Wildfires are common in climates that are sufficiently moist to allow the growth of vegetation but feature extended dry, hot periods. Such places include the vegetated areas of Australia and Southeast Asia, the veld in southern Africa, the fynbos in the Western Cape of South Africa, the forested areas of the United States and Canada, and the Mediterranean Basin. Fires can be particularly intense during days of strong winds, periods of drought, and during warm summer months. Global warming may increase the intensity and frequency of droughts in many areas, creating more intense and frequent wildfires.

## Plant adaptation to regular fires

Plants in wildfire-prone ecosystems often survive through adaptations. Such adaptations include physical protection against heat, increased growth after a fire event, and flammable materials that encourage fire and may eliminate competition. For example, plants of the genus *Eucalyptus* contain flammable oils that encourage fire and hard sclerophyll leaves to resist heat and drought, ensuring their dominance over less fire-tolerant species. Since African cycads tend to grow in colonies, this may be a strategy employed by *Encephalartos*.

The Caribbean Pine has adapted to and rely on low-intensity, surface fires for survival and growth. An optimum fire frequency for growth is every 3 to 10 years. Too frequent fires favor herbaceous plants, and infrequent fires favor species typical of Bahamian dry forests.

## Burning *Encephalartos* species under garden conditions

As a collector, the question always seems to come up: should one burn certain cycad species to stimulate leafing or coning, even under garden conditions which are more conducive to growth? I have heard stories of collectors burning species such as *E. lanatus* with anything from gas torches, newspapers and veld grass. Stories vary regarding the intensity of the burning and the best materials to use. I have heard, for instance, that newspaper should not be used. Veld grass is better. Looking at the work of Brown, Jamieson and Botha

Figure 3.—New cones emerging from a severely burned *E. lanatus* plant.

Figure 4.—*E. ghellinckii* plant before artificial burning (29 July 2012).

Figure 6.—The same *E. ghellinckii* as in Figures 4 and 5 on 25 October 2012 with 16 new leaves emerging.

Figure 5.—The same *E. ghellinckii* plant as in Figure 4, directly after burning (29 July 2012).

Figure 7.—*E. lanatus* plant directly after burning (29 July 2012).

Figure 8.—The same *E. lanatus* as in Figure 7, on 29 October with new leaves just emerging.

(1994), this may be true, since the smoke seems to be implicated in the stimulation also, and not just the heat.

It is surely a painful experience to wilfully subject a cycad to such conditions, and I have always avoided doing this. A recent visit to the habitat of *E. lanatus* showed many cycads with new growth emerging from charred stems (Figure 3). During the 2012 winter season, I decided to burn *E. ghellinckii* and *E. lanatus* specimens in my garden which had dead leaves after the 2011 growing season and had also been transplanted. Veld grass was used, and the plants were burned on 29 July 2012. Figures 4 to 8 below show the effect observed on *E. ghellinckii* and *E. lanatus*. Both plants have been grown under garden conditions for at least the past 7 years. Neither of the plants had ever been burnt before. Both plants began to produce new leaf flushes mid to end October.

From what was observed here, I believe that it is safe to burn garden cycads of certain species. It would be most advisable to burn species that are usually subjected to veld fires in their natural habitat, such *as E. lanatus, E. cycadifolius, E. humilis* and *E. ghellinckii*, to mention just four. Most of the fine-leaf species are subjected to wildfires annually, and these are also mostly almost deciduous. Burning should possibly also only be conducted on plants without leaves in garden conditions, even if this is not the reality in the habitat. This may reduce the risk of damaging the plant unnecessarily.

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# A molecular systematic study of the African endemic cycads

Philip Rousseau[1*a], Piet J. Vorster[2], Damon P. Little[3] and Michelle Van der Bank[1]

## Introduction

This MSc. project was started in December of 2009 (Rousseau 2010a, b) and has been concluded (Rousseau 2012). The work still has minor corrections to be made and will then be available from the University of Johannesburg's library to the public after a 1 year embargo for publication to go out. At this time then I thought it good to share the main results from the study which will be published formally in three papers, the first dealing with the phylogeny and the second two with the DNA barcoding. The main aim of the project was to (1) determine the molecular (in this case based on DNA) relationships between all 65 species in the genus and (2) to determine if DNA barcoding could successfully be applied to *Encephalartos*.

## Phylogenetic tree

In the first case we were able to produce data for all but *E. relictus, E. mackenziei* and *E. tegulaneus* subsp. *powysii,* including two replicates for all species except 6 tropical African taxa. Our work also provides the first DNA sequence evidence for the phylogenetic placement of *E. friderici-guilielmi, E. brevifoliolatus, E. hirsutus, E. equatorialis*, *E. ituriensis, E. macrostrobilus, E. poggei, E. marunguensis, E. delucanus, E. schaijesii*, and *E. schmitzii*. The three chloroplast genes used all had very low genetic variability and contributed little to elucidating relationships between species. The only nuclear region we employed gave much better results dividing the genus into three clear large groupings (A, B, and C) with the largest of which again can be divided into three subgroups (I, II, and III). This was then also the case once all the genetic regions were combined with slightly higher resolution. The larger groupings found form geographic continuums with the first (A) being restricted to higher altitudes on the South African escarpment, the second (B) is restricted to South Africa, Swaziland and adjacent Mozambique, and the last (C) consisting of species from northern South Africa to the northern-most distribution of the genus. This last group can be subdivided into (C: I) species below the Manica province of Mozambique, (C: II) species along the Mozambican and northern neighbors coasts, and (C: III) species running along the longitude of the equator. Ten species groups were found in total, all agreeing very well with morphology, geography and some ecological aspects as found from literature. However the relationships between the species groups are still unclear as are the relationships between species within these groups. However based on previous results we have made major progress in resolving this puzzle and we have made some significant changes to the previous thinking on species groupings. A paper is currently in preparation on the subject where a species tree will be published as open access to the public.

## DNA Barcoding

Secondly the DNA barcoding initiative might need a slight introduction. So what is DNA barcoding? What is it not? What are its aims? What are its standards? And why is it applicable to cycads?

DNA barcoding is the use of a short region (gene) of the organism's entire genome (collection of genes) to identify material to species. This holds unbelievable potential should it be successful as the problems plaguing cycad identification is not unique and are even worse in some other plant and animal groups. This technology would allow amongst others custom officials, doctors, scientists, and law enforcers to accurately and quickly determine what it is they are dealing with. The applications are endless, and in terms of cycads almost tailor made. Not only will nature conservation be able to accurately identify stolen cycads (possibly even to locality), hybrids could be unearthed and by extension correct pollination will be ensured. A more controversial application of DNA barcoding is the uncovering of cryptic or hidden species or deciding what material should be recognised as species. Now the concept of a species is an often-misunderstood phenomenon, frankly there is no single scientific definition of a species and species lines are not applied equally among different biological groups. The species concept within cycads is uncertain but a consensus has been reached more or less, found in the proceedings of a workshop held on Cycad Classification Concepts (Walters & Osborne 2004). DNA barcoding can be applied to investigate whether what we consider at this moment to be separate species are in fact such. However this should always be used in conjunction with other evidence and viewed in a natural evolutionary sense as befitting good taxonomic practices. Thus for the barcoding concept to work a few concerns have to be addressed and it is these that the International Barcode of Life (IBOL) initiative is built around.

Firstly just like the barcode at a store, that selects for one and only one specific product, a DNA barcode should select for one and only one species. This then is the first and most important pillar in that a DNA barcoding gene must be informative (i.e. distinguish between species) and yet conserved enough to be species specific. However a major obstacle with very variable genes is working with such regions so that a single set of reagents and conditions in the lab may not be feasible for all plants. This poses a problem for

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the second pillar of DNA barcoding which is ease of workability. This means any lab (or eventually person), anywhere, with any material, should be able to use the same set of machinery and chemicals and get the same results. These two pillars when met are what allow DNA barcoding to be a successfully applied tool.

So where are we on our way to a DNA barcoder? At this stage the Consortium for the Barcode of Life's (CBOL) Plant Working Group has proposed, after extensive investigation, two DNA Barcodes and two optional testing regions for all plants. Also they have relaxed the second pillar in that group (e.g. cycad) specific reagents and circumstances may be designed. Progress on the current DNA barcoding of Africa's cycads has been met with several difficulties though our dataset consisted of 178 individuals representing 60 species with complete data for all four proposed genes is rather complete. The two proposed DNA barcodes (the genes *rbcLa* and *mat*K) have both not met CBOL standards as *rbcLa* shows almost no variation with *matK* only marginally more variable. The optional regions (nuclear ITS and *trnH-psbA*) have also been unsuccessful as *trnH-psbA* has shown little variation, while ITS has enough variation to identify samples to species groups but often not to individual species. This may indicate taxonomic oversplitting in that we are trying to distinguish between species that are in fact the same species. We can however distinguish 27 species (42.8%) (Table 1) with some taxa not analysed as of yet and some taxa where only a single replicate was included. The results may not be conclusive in these cases. Also the results presented here reflect a single technique (maximum parsimony) to determine the resolution power, so look out for our paper employing other techniques.

Should we employ DNA barcoding as it stands to the genus now, we would have to half the species we currently recognise. This however is premature as applying species delimitation with DNA in cycads would be poor taxonomy not recognising their evolutionary and life history traits which may influence this low genetic diversity. This however does not mean the end of the road for DNA barcoding of cycads. As CBOL is still testing these proposed barcodes, the addition of new genetic regions is still possible. To find such a region that is easy to work with and provides us with species specific information is thus the next step for DNA barcoding of cycads. In a recent scientific investigation Mexican and American scientists (Nicolalde-Morejón *et al.* 2010, 2011) working on *Ceratozamia*, *Zamia* and *Dioon* have found two and four gene combinations that achieve over 70% species identification. We have investigated 15 additional regions for 16 strategically chosen species but most failed in the data gathering phase (sequencing) as the chemicals and procedures were not tailored for cycads, and so these might still have good results. Of those that did work most also displayed very low genetic variation. A species specific DNA barcode for *Encephalartos* is thus out of reach at the moment but needs further investigation.

## Acknowledgements

To end off with I think all members of the society can appreciate the difficulty of obtaining trustworthy material of the multitude of very scarce species of *Encephalartos*. I would thus like to take the time to thank the institutions and individuals who have contributed to the concluded MSc. project. This work would not have been possible without the financial assistance of the following insitutions: National Research Fund of South Africa (NRF), Royal Society UK, University of Johannesburg, the National Science Foundation (EF-0629890), the Alfred P. Sloan Foundation at the Cullman Program for Molecular Systematics at the New York Botanical Garden. This project was also partly funded by the Government of Canada through Genome Canada and the Ontario Genomics Institute (2008-OGI-ICI-03).A special thanks goes to the Pretoria National Botanical Garden, the University of Johannesburg, the University of Pretoria and especially Susan Myburgh, the Lowveld National Botanical Garden and especially Karin van der Walt, André Cilliers and Robert Rousseau for access to their prized collections, Adolf Fanfoni for his multiple contributions to the project, and for the very rare samples donated by Dr. Xander de Kock and Prof. Nat Grobbelaar. Also for the various photographs of some of the rarest plants in the world a special thanks to the members of the cycad forum and Art Vogel and Anders Lindström. A special word of thanks is in order for Prof. Grobbelaar, whose opinion was sought and whose reference works were of undeniable value. To Prof. Dennis Stevenson, Dr. Roy Osborne and Prof. John Donaldson, whom I have had the privilege of communicating with on occasion, thanks for the advice and the motivation. This work would most certainly not be possible without the gracious help of Dr. Damon Little whose appreciation of the difficulties in doing molecular work on cycads was a welcome justification for the troubles endured and overcome with his help. At the University of Johannesburg numerous individuals have made significant contributions to the project, in particular I would like to thank Mr. Thinus Fourie for getting me started and all the administrative assistance, Mrs. Helen Long for administrative help, and Dr. Olivier Maurin for assistance with the numerous tasks demanded by the project. To my supervisor Prof. Michelle van der Bank, thank you for your patience and commitment even though there were easier more rewarding projects, thank you for indulging a student his passion. Also for the numerous opportunities you have entrusted to me, you have contributed so much to the scientist I am today. Lastly to my co-supervisor Dr. Piet Vorster, a giant in the field, thank you so much for your genuine concern, open and friendly sharing of your wealth of knowledge, and shared excitement surrounding these wonderful plants.

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Table 1 Resolution of Encephalartos species using proposed DNA barcoding genes. BP support high (85–100BP); moderate (75–84BP); and low (50–74BP).

| Encephalartos species | Gene providing resolution (bootstrap support/grouping) |
|---|---|
| *E. aemulans* | None (Groups with *E. senticosus*) |
| *E. altensteinii* | ITS (65BP) |
| *E. aplanatus* | None (Groups with *E. cerinus*) |
| *E. arenarius* | None (Groups with *E. latifrons, E. lehmanii, E. trispinosus*) |
| *E. brevifoliolatus* | None |
| *E. caffer* | ITS (63BP) |
| *E. cerinus* | None (Groups with *E. aplanatus*) |
| *E. cupidus* | *psbA-trnH* (Visual inspection) |
| *E. cycadifolius* | *matK* (86BP) |
| *E. dolomiticus* | None (Groups with *E. dyerianus*, *E. cupidus*) |
| *E. dyerianus* | None (Groups with *E. dolomiticus*, *E. cupidus*) |
| *E. eugene-maraisii* | ITS1 (78BP) |
| *E. ferox* | ITS1 (94BP) |
| *E. friderici-guilielmi* | ITS1 (53BP) |
| *E. ghellinckii* | ITS (88BP) |
| *E. heenanii* | None (Groups with *E. paucidentatus*) |
| *E. hirsutus* | ITS1 (100BP) |
| *E. horridus* | 4 gene combination (57BP) |
| *E. humilis* | None (Groups with some *E. laevifolius* forms) |
| *E. inopinus* | ITS1 (100BP) |
| *E. laevifolius* | None |
| *E. lanatus* | ITS1 (54BP) |
| *E. latifrons* | None (Groups with *E. arenarius, E. lehmannii, E. trispinosus*) |
| *E. lebomboensis* | 4 gene combination (66BP) |
| *E. lehmannii* | None (Groups with *E. arenarius, E. latifrons, E. trispinosus*) |
| *E. longifolius* | 4 gene combination (59BP) |
| *E. middelburgensis* | None (Groups with *E. nubimontanus*) |
| *E. msinganus* | None (Unresolved with *E. natalensis*) |
| *E. natalensis* | None (Unresolved with *E. msiganus*) |
| *E. ngoyanus* | *matK* (61BP) |
| *E. nubimontanus* | None (Groups with *E. middelburgensis*) |
| *E. paucidentatus* | None (Groups with *E. heenanii*) |
| *E. princeps* | 4 gene combination (94BP) |
| *E. relictus* | Not analysed |
| *E. senticosus* | None (None groups with *E. aemulans*) |
| *E. transvenosus* | ITS1 (63BP) |
| *E. trispinosus* | None (Groups with *E. lehmanii, E. arenarius, E. latifrons*) |
| *E. umbeluziensis* | None |
| *E. villosus* | ITS (95BP) |
| *E. woodii* | ITS (64BP) |
| *E. barteri* subsp. *barteri* | None (Groups with *E. barteri* subsp. *allochrous*) |
| *E. barteri* subsp. *allochrous* | None (Groups with *E. barteri* subsp. *barteri*) |
| E. bubalinus | None (Groups with *E. eqautorialis*) |
| E. chimanimaniensis | None (Groups with *E. manikensis, E. pterogonus, E. munchii*) |
| E. concinnus | ITS (87BP) |
| E. delucanus | None (Groups with *E. schmitzii*) |
| E. equatorialis | None (Groups with *E. bubalinus*) |
| E. gratus | ITS (85BP) |
| E. hildebrandtii | ITS (54 BP) |
| E. ituriensis | Single specimen analysed |
| E. kisambo | MatK (61BP) |
| E. laurentianus | ITS (62BP) |
| E. mackenziei | Not analysed |
| E. macrostrobilus | None (Groups with *E. septentrionalis, E. whitelockii*) |
| E. manikensis | None (Groups with *E. pterogonus, E. munchii*) |
| E. marunguensis | None (Groups with *E. poggei, E. schaijesii*) |
| E. munchii | None (Groups with *E. pterogonus, E. manikensis*) |
| E. poggei | None (Groups with *E. schaijesii*) |
| E. pterogonus | None (Groups with *E. manikensis, E. munchii*) |
| E. schaijesii | None (Groups with *E. poggei*) |
| E. schmitzii | None (Groups with *E. delucanus*) |
| E. sclavoi | All four genes (98BP) |
| E. septentrionalis | None (Groups with *E. macrostrobilus, E. whitelockii*) |
| *E. tegulaneus* subsp. *tegulaneus* | ITS (100BP) |
| *E. tegulaneus* subsp. *powysii* | Not analysed |
| E. turneri | ITS (77BP) |
| E. whitelockii | None (Groups with *E. septentrionalis, E. macrostrobilus*) |

# LETTERS TO THE EDITOR / BRIEWE AAN DIE REDAKTEUR

Figure 1.—Leaf detail of what is possibly *Zamia urep*.

Dear Editor,

I found this *Zamia* on a trip to South America in April 2012. It was about 2 km from Refugio Amazonas on trial to Lake Condenado, Tambopata Reserve, Madre de Dios Dept, Peru. This is one of the southernmost localities ever recorded for any zamia. This one (of the three specimens I could find) diagnosed as possibly being *Zamia urep*, but identification is uncertain in the absence of coning material.

Roy Osborne

Figure 2.—Roy Osborne with the zamia.

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## GROW CYCADS BY DONALDSON & WINTER

The Society has obtained a stock of the booklet 'Grow Cycads', written by Dr. John Donaldson and John Winter, and published by the South African National Biodiversity Institute (SANBI) under their Kirstenbosch Gardening series. Dr. Donaldson is well-known amongst cycadologists, either as the author of articles appearing in *ENCEPHALARTOS* or as a source of reference used by other authors.

The booklet is A5 in size, consists of 36 pages, is printed in colour and addresses various matters under the following headings:
Propagation from seed • Vegetative propagation • Cultivation • Container plants • Pests and diseases • Landscaping with cycads • Cycads and the law

What is of interest is the table listing the distribution, availability, features, and growing conditions for South African cycads, setting out their water and sunlight preferences, whether they are frost-hardy, their overall leaf colour and availability/scarcity. The booklet is written in layman terms and is ideal for the novice/beginner.

It sells for R60.00, excluding postage, from the SANBI bookshops. However, due to a discount passed on to the Society, we are able to provide it to members at the cost of **R60.00** inclusive of postage to South African addresses. It is available from the secretary/treasurer whose contact details appear elsewhere in this issue.

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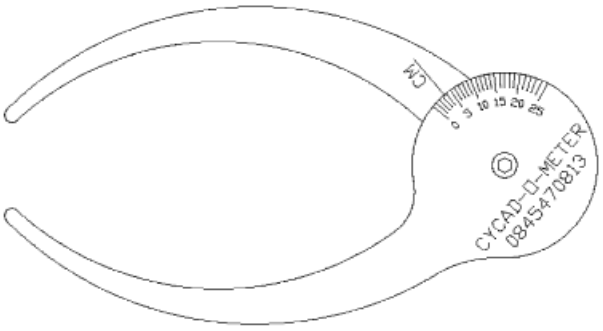


## GROW CLIVIAS BY GRAHAM DUNCAN

The Society has obtained the latest edition of Grow Clivias, also published by SANBI, under their Kirstenbosch Gardening Series, written by Graham Duncan.

This edition is a vast improvement over the previous one in that it has been expanded from 47 pages to 192 pages. It is also A5 in size, printed in colour and addresses, amongst others, the following:

A brief history • General information • Taxonomy • Hybrid, variegated & novelty clivias • Cultivation • Propagation • Pests and diseases

Apart from being a co-ordinator of the Kirstenbosch Gardening Series, Graham Duncan is a specialist horticulturist at Kirstenbosch Botanical Garden where he curates the collection of indigenous South African bulbs, and the displays inside the Kay Bergh Bulb House of the Botanical society Conservatory.

He has co-authored two major publications on indigenous bulbs, Spring and Winter Flowering Bulbs of the Cape with Barbara Jeppe, and Bulbous Plants of Southern Africa with Prof. Niel du Plessis.

The book is available at the cost of R140.00, postage included, to South African addresses.

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3. *To arrange the legal exchange of plants, seedlings, seed, and pollen of different cycad species between members.*
4. *To encourage scientific research on cycads.*
5. *To promote all aspects of cycad conservation.*
6. *To foster and maintain links with organizations having similar aims on an international basis.*

- Membership fee for **2013***

In addition to the membership fee I/We would like to make the following donations

- Cycad Society research fund
- General donation

**Total** (Membership fee and other donations)

| YES | NO |
|---|---|

By ticking YES I/We hereby give permission to the Society to publish my/our contact and address details in the member list of the society to other members.

**Signature** _____ **Date** _____

### *MEMBERSHIP FEES FOR 2013:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Local members (residents of South Africa) | **R 220** | | | | | | |
| Southern African members (Namibia, Swaziland, Zimbabwe, etc.) ***Air mail delivery*** | **R 340** | Southern African members (Namibia, Swaziland, Zimbabwe, etc.) ***Surface mail delivery*** | **R 300** | Foreign members ***Air mail delivery*** | **R 370**<br>**US$ 56**<br>**AU$ 55**<br>**€ 40**<br>**£ 34** | Foreign members ***Surface mail delivery*** | **R 330**<br>**US$ 49**<br>**AU$ 48**<br>**€ 38**<br>**£ 29** |

Local members must send their dues together with this form to IanBassingthwaighte, and all cheques andpostal orders are to be made out to: *Cycad Society of South Africa*. American and Australian membersmust send their dues in Americanor Australian dollars respectively together with this form to the appropriate address listed below. Foreign Members of other countries may send their dues together with this form eitherin South African Rand by international money order or SWIFT, in favour of the *Cycad Society of South Africa*, and not by apersonal cheque, to IanBassingthwaighte; or in American dollar to WillieTang; or in Australian dollar to PaulKennedy.

The appropriate addresses are:

- **IanBassingthwaighte:** P.O. Box 176, 0159 MontanaPark (Pretoria), South Africa.
- **PaulKennedy:** 21 Sierra Road, Engadine, NSW 2233, Australia.
- **WillieTang:** 65 Corydon Dr., Miami Springs, Florida, 33166, U.S.A.

**Payments in South African Rand can be made at:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bank** | Standard Bank | **Branch** | Hatfield | **Branch code** | 01-15-45 | **Account number** | 011943300 |
| **SWIFT** | SBZAZAJJ | | | | | | |

**Reference of payment**: Name of member and membership number.
**Proof of payment must be sent to**: Fax: +27 086678 9807 (fax to e-mail)
**e-mail**: cycad@cycadsociety.org

New members receive all issues of *ENCEPHALARTOS* magazine for the year in which they join provided that issues are still in stock.

# CYCAD SOCIETY OF SOUTH AFRICA

**www.cycadsociety.org**


Posbus 176
0159 Montanapark
Pretoria, Suid Afrika

Tel/Faks: +27 12 548 1152
E-pos: cycad@cycadsociety.org

P.O.Box 176
0159 Montana Park
Pretoria, South Africa

Tel/Fax: +27 12 548 1152
Email: cycad@cycadsociety.org


## DEBIT ORDER FORM

| **PERSONAL DETAILS OF CLIENT** | | | | | | |
|---|---|---|---|---|---|---|
| Surname / Company Name: | | | | | | |
| Full names / Trading Name: | | | | | | |
| ID number / Registration Number: | | | | | | |
| Physical Address: | | | | | | |
| Postal Address: | | | | | | |
| Contact details: | HOME | WORK | MOBILE | e-MAIL | FAX | |

| Client reference number: | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| **BANK DETAILS OF CLIENT** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Name of Account Holder: | | | | | | | | | | | |
| Account Type: | CHEQUE | TRANSMISSION | SAVINGS | OTHER | | | | | | | |
| Name of Bank: | | | | | | | | | | | |
| Account Number: | | | | | | | | | | | |
| Branch Name: | | | | | | | | | | | |
| Branch Code: | | | | | | | | | | | |
| Credit Card type: | MASTER | VISA | | | | | | | | | |
| Last 3 digits of credit card: | | | | | | | | | | | |

| **COLLECTION INSTRUCTION - please tick the applicable** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **R** | Annual Deductions | X | Complete only date of 1st deduction | d | d | m | m | y | y |
| Annual escalation thereof | **See no. 7 below** | | | | | | | | | |

I/We, the client or the duly authorised representative thereof ("the CLIENT"), hereby authorise the entity mentioned below ("**Cycad Society of SA** "), STRATCOL LTD and/or its agents, to collect by means of electronic debit from the above account in the name of the CLIENT at the same or any other bank, all or any monies due by the CLIENT to **Cycad Society of SA** , as principal debtor or for any other reason, and to pay same to **Cycad Society of SA** . The authority so given is restricted to the amount mentioned above and may be deducted on any mentioned 7 working days hereafter.
I accept the following to be applicable hereto:

1. This authorisation may only be withdrawn with 30 (thirty) days written notice to **Cycad Society of SA** at its physical address.
2. I and/or the CLIENT, individually and collectivity hold harmless **Cycad Society of SA** , STRATCOL LTD and/or its agents against any claim of any nature arising from the electronic debit or transfer or from any other cause following this authorisation and irrespective whether such authorisation had been withdrawn or not;
3. In the event of the relevant account not having sufficient cleared funds to meet any debit, I am aware that a unpaid fee will be debited against the CLIENTS account by its bank and an additional unpaid fee of **R50** will be charged by **Cycad Society of SA** relating to the return of the debit. I accept the responsibility to ensure sufficient cleared and available funds to the minimum of the limit above (or as amended from time to time).
4. Any reference to the entities above includes a reference to any successor in title or in appointment;
5. This authorisation is not an amendment to any specific arrangement regarding payment of accounts and serves merely as an arrangement as the method of payment, in part or in full and any account with **Cycad Society of SA** will only to be credited once actual payment is received by the **Cycad Society of SA** , and
6. Should any dispute arise about **Cycad Society of SA** 's right to collect any amount in terms hereof, the CLIENT shall have the onus to instruct his bank to refuse or return any debit as unpaid.
7. Annual fee to be advised in *Encephalartos* prior to the annual collection date.

DATE: _____ SIGNATURE: _____

**STRATCOL REF:** 0 0 0 0

# BROODBOOM VERENIGING VAN SUID-AFRIKA

**www.cycadsociety.org**

## NUWE LIDMAATSKAP AANSOEK - LIDMAATSKAPHERNUWING 2013

Ek/Ons _____ _____

Titel, voorletters en van, asook noemnaam van persoon of naam van inrigting in BLOKLETTERS — Lidmaatskapnommer van bestaande lid vir lidmaatskaphernuwing

van posadres _____

_____

_____ Poskode _____

E-pos _____ Tel _____ Fax _____

doen hiermee aansoek om lidmaatskap van die **Broodboom Vereniging van Suid-Afrika** en verklaar dat ek/ons die doelstellings van die Vereniging soos dit hieronder gelys is, heelhartig onderskryf:

1. *Om die kweek en vermeerdering van broodbome aan te moedig.*
2. *Om inligting oor broodbome op verskillende wyses te versprei, onder andere deur die gereëlde publisering van 'n tydskrif.*
3. *Om die wettige uitruil van plante, saailinge, saad en stuifmeel van broodbome tussen lede te reël.*
4. *Om wetenskaplike navorsing oor broodbome aan te moedig.*
5. *Om alle aspekte van die bewaring van broodbome te bevorder.*
6. *Om bande met organisasies wat soortgelyke doelstellings het op 'n internasionale basis te smee en te handhaaf.*

- Ledegeldvir**2013***

  Addisioneel tot die ledegeld wil ek/ons ook graag die volgende bydraes maak:
  - BroodboomverenigingNavorsingsfonds
  - Algemenedonasie

  **Totaal** (Ledegeld en donasiesingesluit)

| JA | NEE |
|---|---|

Deur JA teselekteer, gee ek/onstoestemmingaan die Verenigingom my/onskontak en adresbesonderhede op die Vereniging se ledelysaananderledetepubliseer.

**Handtekening** _____ **Datum** _____

### *LEDEGELD VIR2013

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Plaaslike lede (inwoners van Suid-Afrika) | **R 220** | | | | | | |
| Suider-Afrikalede (Namibië, Swaziland, Zimbabwe, ens) ***Lugposaflewering*** | **R 340** | Suider-Afrikalede (Namibië, Swaziland, Zimbabwe, ens) ***Landposversending*** | **R 300** | Oorseselede ***Lugposaflewering*** | **R 370**<br>**US$ 56**<br>**AU$ 55**<br>**€ 40**<br>**£ 34** | Oorseselede ***Landposversending*** | **R 330**<br>**US$ 49**<br>**AU$ 48**<br>**€ 38**<br>**£ 29** |

Lede ontvang 'n kwartaalikse kopie van die vereniging se tydskrif *ENCEPHALARTOS*.Plaaslike lede moet hulle ledegeld en die voltooide vorm stuur aan Ian Bassingthwaighte en alle tjeks of poswissels moet uitgemaak word aan die "Broodboomvereniging van Suid-Afrika".

**IanBassingthwaighte, Posbus 176, 0159 Montanapark, Pretoria, Suid-Afrika.**

Betaling in Suid-Afrikaanse Rand kanook gemaak word by:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bank** | Standard Bank | **Tak** | Hatfield | **Takkode** | 01-15-45 | **Rekeningnommer** | 011943300 |
| **SWIFT** | SBZAZAJJ | | | | | | |

**Betalingverwysing**: Lidnaam en lidnommer.
**Bewys van betaling asook aansoekvorms moet gestuur word aan**: Faks: +27 086678 9807 (faks na e-pos)
**e-pos**: cycad@cycadsociety.org

Nuwe lede ontvang 'n eksemplaar van al die uitgawes van *ENCEPHALARTOS* vir die jaar waarin hulle aansluit op die veronderstelling dat daar voorraad is.

# CYCAD SOCIETY OF SOUTH AFRICA

**www.cycadsociety.org**


Posbus 176
0159 Montanapark
Pretoria, Suid Afrika

Tel/Faks: +27 12 548 1152
E-pos: cycad@cycadsociety.org

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0159 Montana Park
Pretoria, South Africa

Tel/Fax: +27 12 548 1152
Email: cycad@cycadsociety.org


## DEBIETORDERVORM

| **PERSOONLIKE BESONDERHEDE VAN KLIëNT** | | | | | |
|---|---|---|---|---|---|
| Van / Besigheid naam: | | | | | |
| Volle name / Trading Name: | | | | | |
| ID nommer / Registrasie nommer: | | | | | |
| Fisiese Adres: | | | | | |
| Pos Adres: | | | | | |
| Kontak nommers: | HUIS | WERK | SELFOON | e-POS | FAKS |
| | | | | | |
| Kliëntverwysings nommer: | | | | | |

| **BANKBESONDERHEDE VAN KLIëNT** | | | | |
|---|---|---|---|---|
| Naam van rekeninghouer: | | | | |
| Rekening tipe: | TJEK | TRANSAKSIE | SPAAR | ANDER |
| Naam van Bank: | | | | |
| Rekening Nommer: | | | | |
| Taknaam: | | | | |
| Takkode: | | | | |
| Kredietkaart: | MASTER | | VISA | |
| Laaste 3 syfers van Kredietkaart: | | | | |

| **TREKKINGS INSTRUKSIE - merk as van toepassing** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **R** | Jaarlikse aftrekkings | X | Voltooi alleenlik datum van 1ste aftrekking | d | d | m | m | j | j | | |
| Verhoogings | Sien nr. 7 onderaan | | | | | | | | | | |

Ek/Ons, die kliënt of behoorlike gemagtigde verteenwoordiger daarvan ("die kliënt"), gee hiermee goedkeuring aan die entiteit hieronder genoem **Broodboom Vereniging van SA** , STRATCOL BPK en/of sy agente, om d.m.v. 'n Elektroniese Debietorder van die bogenoemde rekening te vorder, en om genoemde gelde oor te betaal aan **Broodboom Vereniging van SA** . Die goedkeuring gegee is beperk tot enige maksimum bedrag en trekkingsdatum gestel of binne 7 dae daarna.

Ek aanvaar die volgende om van toepassing te wees hiertoe:

1. Hierdie goedkeuring mag net teruggetrek word met 30 (dertig) dae skriftelike kennis aan die gebruiker by sy/haar fisiese adres;
2. Ek en/of die KLIëNT, afsonderlik en/of gesamentlik, vrywaar **Broodboom Vereniging van SA** en STRATCOL BPK en/of sy agente teen enige eise van enige aard wat kan ontstaan a.g.v. die elektroniese debiet of oordragte d.m.v. hierdie goedkeuring hetsy reeds teruggetrek of nie;
3. In die geval waar die relevante rekening nie genoegsame beskikbare fondse het om enige debiet te dek nie, is ek bewus dat 'n addisionele fooi van **R50** gehef sal word teen die KLIëNT se rekening deur **Broodboom Vereniging van SA** vir hierdie terugsending, asook 'n onbetaalde fooi deur die KLIENT se eie bank. Ek aanvaar die verantwoordelikheid om genoegsame en beskikbare fondse gelykstaande aan die minimum bedrag soos hierbo genoem, te verseker (of soos aangepas van tyd tot tyd)
4. Enige verwysing na die entiteite soos hierbo genoem sluit in 'n verwysing na enige opvolger in titel of in aanstelling;
5. Hierdie goedkeuring is nie 'n verwysing van 'n spesifieke betalingsooreenkoms van rekeninge nie en dit dien slegs as 'n ooreenkoms vir die manier van betaling, gedeeltelik of ten volle en enige rekening met die gebruiker sal net gekrediteer word wanneer die werklike betaling deur **Broodboom Vereniging van SA** ontvang is;
6. Sou enige dispuut ontstaan insake **Broodboom Vereniging van SA** se regte om gelde te vorder in terme hiervan, is die onnus op die KLIëNT om sy bank die instruksie te gee om enige debiete terug te stuur as onbetaald.
7. Jaarlikse fooi sal aangekondig word in *Encephalartos* alvorens die jaarlikse kolleksie datum.

DATUM: _____ HANDTEKENING: _____

**STRATCOL VERW.** 0 0 0 0

# ENCEPHALARTOS

## INSTRUCTIONS TO AUTHORS

Contributions may be written in English or Afrikaans. Manuscripts must be typed. Short communications and letters to the editor may either be typed or in legible handwriting. All pages of a manuscript must be numbered consecutively. Photographs should be of excellent quality with clear details and adequate contrast. Authors are welcome to send illustrations in electronic format with the following requirements:

- Scan at 300 dpi.
- Save as jpeg, using maximum file size (i.e. minimum compression).
- Send by e-mail to **wynand@ananzi.co.za** and mark 'For Encephalartos'.

The tables and figures/photographs of a manuscript should be numbered and all tables should have a heading. All figures and photographs should have a legend. All figures/photographs should bear written on the reverse the name of the author, figure number and the top of the figure or photograph.

Formal descriptions of new cycad taxa and new name combinations may be published in ENCEPHALARTOS. Authors are however, advised to rather publish such articles in the journal *Novon* which has been established especially for such articles. Articles on potential new cycad taxa, without formally describing them as new taxa, may also be published in ENCEPHALARTOS. To avoid any possible confusion of names of such taxa in future, they should be designated for example by terms such as Species A or Species 99. Do not ascribe provisional names to potential new cycad taxa.

### Contributions should reach the editor not later than:

| | |
|---|---|
| March issue | : First week of January |
| June issue | : First week of April |
| September issue | : First week of July |
| December issue | : Last week of September |

One copy of the ENCEPHALARTOS issue in which a contribution appears, will be supplied gratis to all non-member authors.

**Note:** If applicable, all figures and photographs will be reduced or enlarged to fit over either one, two or three columns when printed.

**Tariffs for advertising in ENCEPHALARTOS:**

| Page size | Black and white | Colour |
|---|---|---|
| **Quarter page** | R175 | R250 |
| **Half page** | R350 | R500 |
| **Full page** | R700 | R1000 |

Members: up to quarter page free of charge—black and white only.

To advertise in ENCEPHALARTOS, contact the Secretary Treasurer and/or Editor.

## VOORSKRIFTE AAN OUTEURS

Bydraes kan in Afrikaans of Engels geskryf word. Manuskripte moet getik wees. Kort mededelings en briewe aan die redakteur mag getik of in duidelik leesbare handskrif wees. Nommer alle bladsye van 'n manuskrip opeenvolgend. Foto's moet van goeie gehalte wees, voldoende kontras besit en besonderhede duidelik toon. Skrywers is welkom om illustrasies in elektroniese formaat te stuur, met die volgende vereistes:

- Skandeer teen 300 dpi.
- Stoor as jpeg, maksimum lêergrootte (d.w.s. minimum kompressie).
- Stuur per e-pos na **wynand@ananzi.co.za** en merk 'Vir Encephalartos'.

Die tabelle en figure/foto's van 'n manuskrip moet genommer wees en elke tabel moet 'n opskrif hê. Alle figure en foto's moet 'n onderskrif hê. Agter op elke figuur/foto moet die naam van die outeur en die nommer van die figuur/foto geskryf word en die bopunt van die figuur of foto moet aangedui word.

Alhoewel die formele beskrywing van nuwe broodboom taksons en nuwe naamkombinasies in ENCEPHALARTOS opgeneem kan word, word daar aanbeveel dat sodanige artikels eerder in die tydskrif *Novon*, wat spesiaal vir sodanige artikels in die lewe geroep is, gepubliseer word. Artikels oor potensiële nuwe broodboomtaksons kan ook opgeneem word in ENCEPHALARTOS sonder dat die artikels die nuwe takson formeel beskryf. Om latere moontlike naamsverwarring van sodanige taksons tot die minimum te beperk, moet die potensiële nuwe takson in die artikel deur terme soos byvoorbeeld Spesie A of Spesie 99 aangedui word.

### Bydraes moet die redakteur voor of op die volgende datums bereik:

| | |
|---|---|
| Maart-uitgawe | : Eerste week van Januarie |
| Junie-uitgawe | : Eerste week van April |
| September-uitgawe | : Eerste week van Julie |
| Desember-uitgawe | : Eerste week van September |

Een eksemplaar van die ENCEPHALARTOS uitgawe waarin 'n bydrae verskyn, sal gratis aan alle nie-lid outeurs voorsien word.

**Nota:** Waar van toepassing, sal alle finaal gedrukte figure en foto's verklein of vergroot word om oor óf een, twee óf drie kolomme te pas.

**Tariewe om in ENCEPHALARTOS te adverteer:**

| Bladsy grootte | Swart en wit | Kleur |
|---|---|---|
| **Kwart blad** | R175 | R250 |
| **Half blad** | R350 | R500 |
| **Vol blad** | R700 | R1000 |

Lede: tot 'n maksimum van 'n kwartblad gratis—slegs swart en wit.

Om in ENCEPHALARTOS te adverteer, kontak die Sekretaris-tesourier en/of Redakteur.