

CITES and Cycads *a user's guide*

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CITES and Cycads

Introduction

The aim of *CITES and Cycads: a user's guide* is to provide a 'user friendly' tool for training those who wish to know about CITES and its application to cycads.

This guide has expanded speaker's notes for many of the PowerPoint slides included to provide a comprehensive coverage of particular topics. Most importantly, based on feedback from users of previous guides, we have printed the guide in full colour and in larger format. We hope that this pack will allow users to tailor-make their own presentation on CITES and cycads and also form a concise but comprehensive reference. Please use this training tool and forward your comments to us so we can revise future editions to suit your needs.

Noel McGough
Head of the Conventions and Policy Section
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Manit Jaichagun

This guide is dedicated to the memory of Manit Jaichagun of CITES Thailand. Manit was a good friend and colleague who, with boundless enthusiasm, helped build the CITES system for plants in Thailand.



Image: CITES MA for Flora, Thailand

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HOW TO USE THIS PACK

This pack consists of slides and speaker's notes for a presentation on the Convention on International Trade in Endangered Species (CITES). The presentation is divided into four separate topic areas that can be used and adapted according to the background, interests and needs of your audience (Introduction to Cycads, CITES and Cycads, Implementing CITES for Cycads and Additional Slides). The slides have been drafted in general terms with the hope that they will remain current, and therefore of use, for the foreseeable future.

Suggested speaker's notes accompany each slide. These notes are more specific than the slides and reflect information current as of September 2013. We have written these for speakers to use verbatim, but not necessarily to use the full text for each slide. Of course, all speakers are encouraged to express their personal style and to use notes as closely or as loosely as they feel comfortable.

We hope that this pack will provide a useful starting point from which you can tailor the slides, and accompanying speaker's notes, to reflect the specific needs of your audience, the length of the presentation and your own personal style. For example, you could illustrate some slides with examples from your own region or institution, or supplement the slides with extra images, such as cartoons, photographs, or newspaper cuttings. Such measures will undoubtedly increase the impact of an individual presentation. In addition, the slides can be printed onto transparency sheets for use with an overhead projector, or printed as handouts from the Microsoft PowerPoint® file on the CD-ROM, and given to an audience for information.

CD-ROM

The CD-ROM contains the following files:

- 'CITESCycads.pptx', a Microsoft PowerPoint® presentation containing the slides and speaker's notes. You will need Microsoft PowerPoint 2007® (or a more recent version) installed on your computer to view and customise this file.
- 'CITESCycads.pdf', an Adobe Acrobat® presentation. You cannot modify this presentation but it can be viewed in "full screen" mode using Adobe Reader®. You will need Adobe Reader® installed on your computer to view this file (can be downloaded from www.adobe.com).
- 'CITESCycadsPack.pdf', this is a full copy of the text for the pack including the introduction, references and speaker's notes. This allows you to view the complete electronic document as well as print off part or all of the pack.

It also contains a series of training tools to support the implementation of CITES and the Convention on Biological Diversity (CBD).

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Slide 1: CITES and Cycads

The aim of this presentation is to introduce you to the different groups of cycad species covered by the Convention on International Trade in Endangered Species of wild fauna and flora – CITES – and to address some of the key issues concerning the implementation of the Convention for this important plant group. This is not an identification manual for cycads, but we will direct you to the most relevant and user-friendly work available. In all cases it is best to have contact with an expert on cycads to help you with identification issues. In this guide we will outline the most important groups in trade, their level of propagation and the likely demand for wild plants in trade. We will also try to help you to distinguish between wild-collected plants and artificially propagated plants. In day-to-day CITES enforcement this is more important than identifying specimens to species level.

What this Presentation will cover

- Introduction to Cycads
- Why they are important and how they are threatened
- Analysis of international trade
- Implementing CITES for Cycads



Slide 2: What this Presentation will cover

This presentation will cover the following topics:

- Introduction to cycads – what they are and where they come from.
- Why they are important and how they are threatened.
- Analysis of international trade.
- Implementing CITES for cycads.

[Image: Encephalartos villosus (Appendix I) in the Palm House at Kew.]

Introduction to Cycads



Slide 4: What are Cycads?

Cycads are plants that have stout, woody trunks and large, stiff evergreen leaves. Varying greatly in shape and size (ranging from 30cm to 13m tall) they grow in various climatic zones from rainforest to semi-desert. Some species can live for over 1,000 years.

Even more ancient than the dinosaurs, cycads appeared on earth about 300 million years ago and are the oldest group of seed plants living today. They were at their greatest diversity during the Triassic and Jurassic period (alongside the *Diplodocus* and *Tyrannosaurus rex*). Fossil cycads show that at this time they had a global distribution from Siberia to Antarctica and accounted for up to 20% of the world's plant life. Although they are nowhere near as widespread today and many surviving species are rare or threatened in the wild, cycad fossils can be found on every continent on earth.

[Illustration by John Rice, used with permission from Highlights for Children, Inc.]

Why are Cycads Important?



Slide 5: Why are Cycads Important?

The plant life on earth is dominated by two major plant groups: the conifers (Coniferophytina) and the flowering plants (Angiospermae), with the majority of the estimated 350,000 plant species belonging to the latter. Cycads, however, form a separate group, Cycadophytina, comprising of some 330 species. Cycads are a very isolated plant group, unrelated to any other group of living plants and are scientifically important because they may represent a link in the evolution from ferns to flowering plants.

Cycads are used by people all over the world. In Africa, they are used as famine food, but in parts of Asia and South and Central America they form a regular part of people's diets. Their leaves are also frequently harvested for cultural events and for floral arrangements.

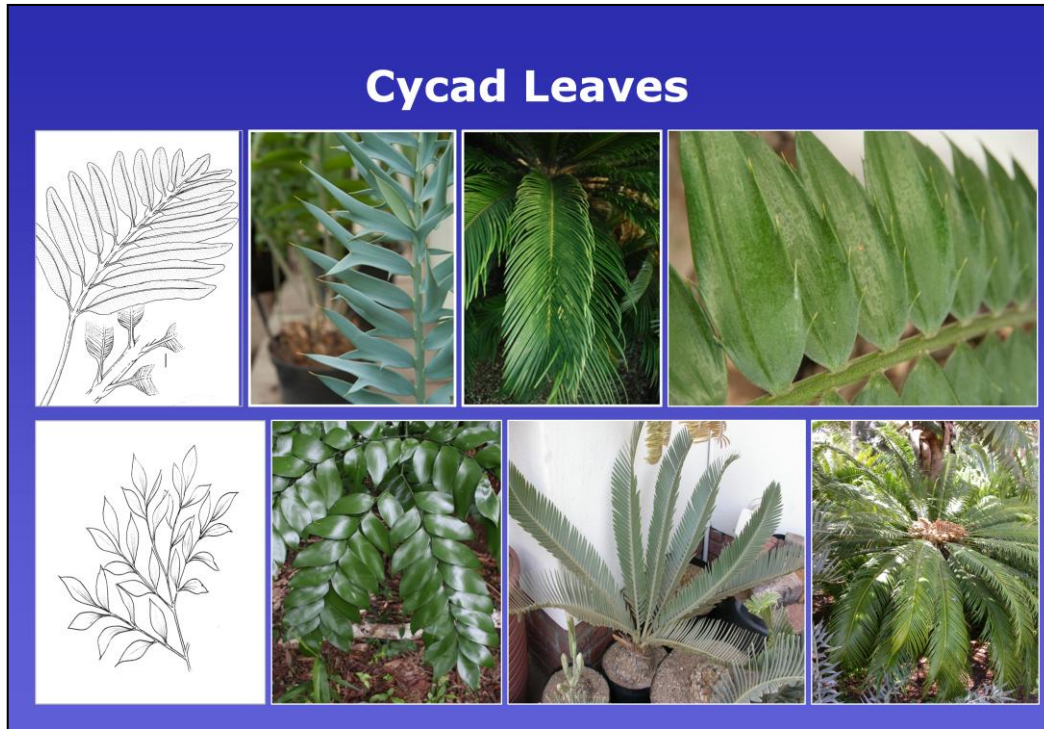
They act as hosts for numerous other organisms, and often have specialised interactions with insects, especially beetles, that are linked to pollination.

Cycads are also of great interest to scientists as they have unique characteristics, including various chemicals not found in any other plant groups.

They have been in decline since the flowering plants became dominant, some 100 million years ago. They have survived three global extinction events, including one which destroyed half the world's flora and fauna, but they are particularly vulnerable to human pressures, such as habitat loss and over collecting. John Donaldson, current chair of the IUCN Species Survival Commission Cycad Specialist Group, believes that they may act as flagship species for conservation, providing early warning of threats to plant diversity.

Source: www.kew.org; IUCN fact sheet

[Image: the Cycad Forest (in mist), Modjadji Nature Reserve, South Africa.]

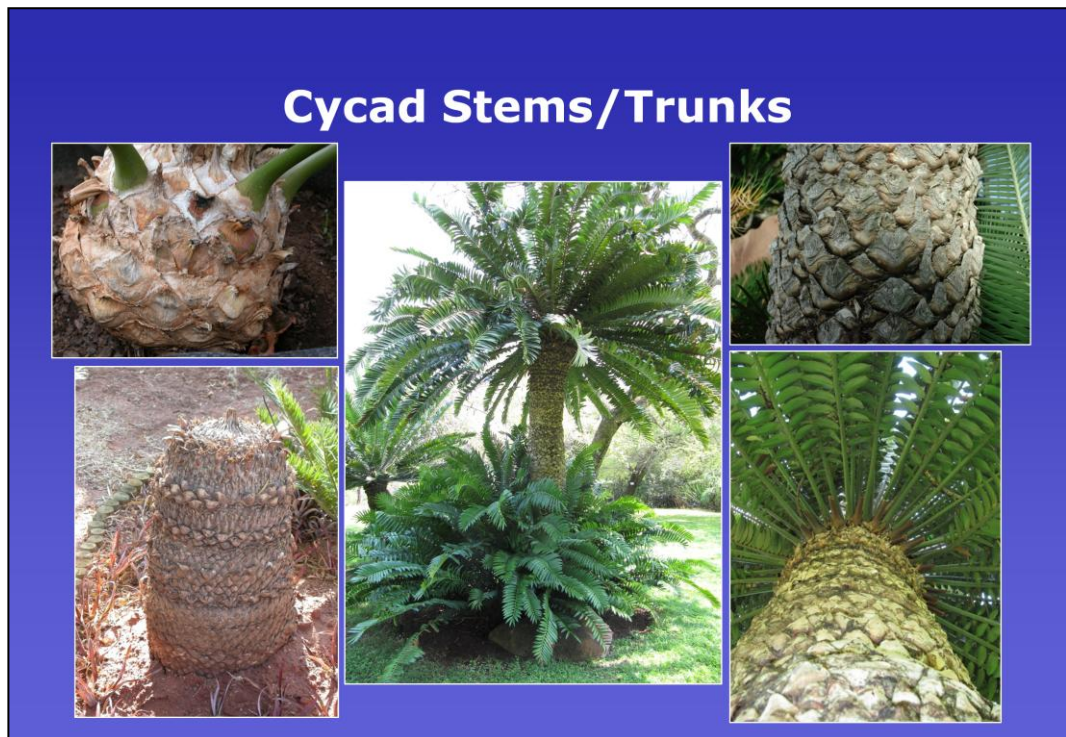


Slide 6: Cycad Leaves

Cycads are evergreen, and their leaves grow directly from the trunk, often developing into an attractive, palm-like crown. Most cycads have leaves that are once divided, or pinnate, with leaflets displayed on either side of a central stalk. Only the leaves of the Australian genus *Bowenia* and some Asian species of *Cycas* are twice divided, or bi-pinnate. Leaves can vary in length from 20cm to 7m and emergent leaves may be covered with hairs or prickles.

Source: Jones, D.L. (2002). *Cycads of the World*. Smithsonian Institute Press, Washington, USA; Whitelock, L.M. (2002). *The Cycads*. Timber Press, Portland, Oregon, USA.

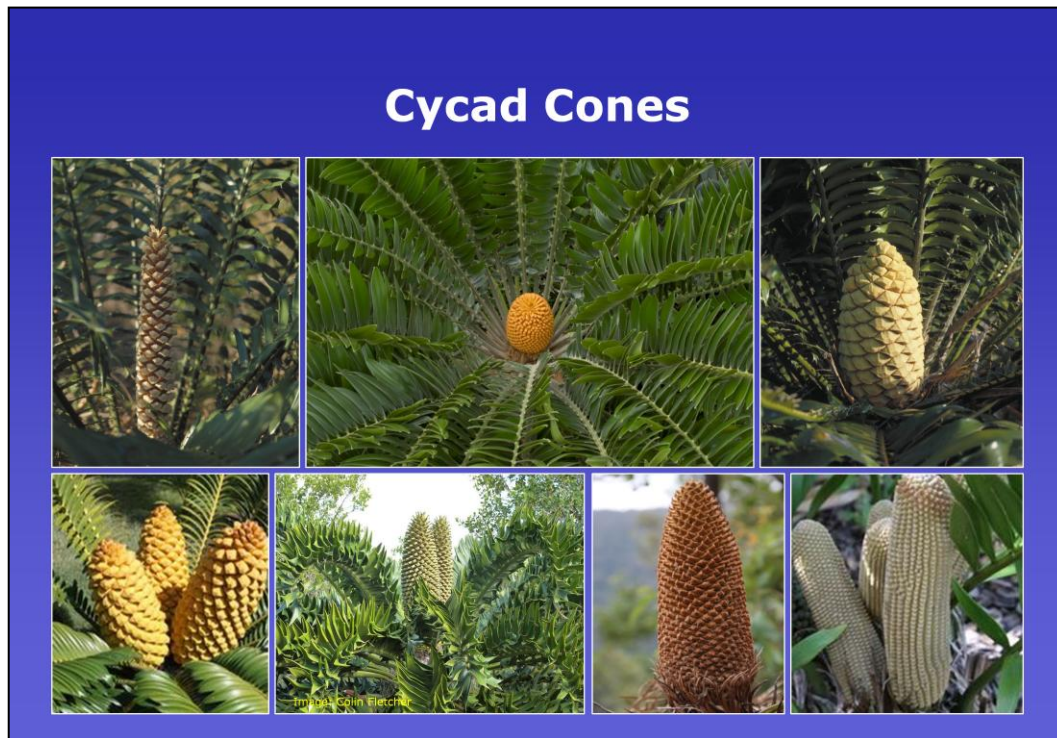
[Images, top from left: line drawing showing pinnate leaf of Stangeria eriopus; Encephalartos horridus; Cycas revoluta; Encephalartos natalensis; bottom from left: line drawing of bi-pinnate leaf of Bowenia; Bowenia spectabilis; Encephalartos spp.; Encephalartos spp.]



Slide 7: Cycad Stems/Trunks

A cycad stem, or caudex, has a woody appearance, and is mainly comprised of soft, pithy storage tissue protected by a hard layer of old leaf bases. It can be completely subterranean or emerge from the ground and be trunk-like. In shallow, stony ground, species which normally have a subterranean stem develop an above-ground trunk.

[Images, top from left: Encephalartos spp.; Encephalartos woodii; Dioon mejiae; bottom from left: Encephalartos spp.; Encephalartos spp.]



Slide 8: Cycad Cones

Cycads produce seeds in cones instead of flowers and are dioecious. This means that a plant is either male or female. Female cones of most cycads are larger than the male. The only way to determine the sex of the plant is by studying the cones.

To secure pollination (often by insects) and subsequent sexual reproduction, male and female plants of the same species have to occur in the same area. If plant densities become too sparse, pollination becomes increasingly difficult. When looking at the conservation status of cycads, it is evident that a greater distance between plants may increase their extinction risk. Another risk is the extinction of their pollinators.


A striking example is the story of *Encephalartos woodii*, discovered in 1895, a species of which only one (male) plant has ever been found in the wild. No female plants are known to exist and therefore sexual reproduction is not possible. The original clump consisted of four stems with a number of offsets at the base. These offsets were removed and propagated in botanic gardens, and later two of the stems were transplanted to rescue the plant. However, *E. woodii* reproduces well by basal suckers and trunk offsets and the species is now well represented in collections and gardens around the world.

Source: www.kew.org; www.AKRive.org

[Images, top from left: *Encephalartos hildebrandtii* (male cone); *E. woodii* (male cone); *E. hildebrandtii* (female cone); bottom from left: *E. sclavoi*; *E. latifrons* (male cone); *Cycas* spp.; *Zamia* spp.]

Cycad Classification

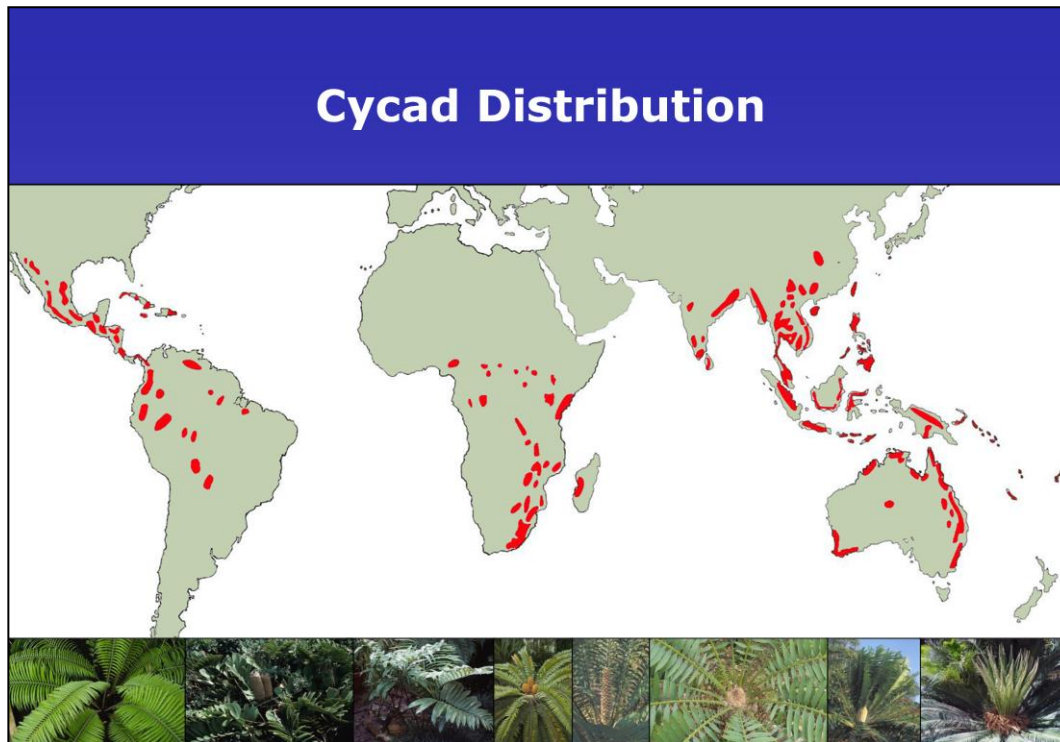
Family	Genera	Species
Cycadaceae	<i>Cycas</i>	107
Stangeriaceae	<i>Stangeria</i> <i>Bowenia</i>	3
Zamiaceae	<i>Ceratozamia</i> <i>Dioon</i> <i>Encephalartos</i> <i>Lepidozamia</i> <i>Macrozamia</i> <i>Microcycas</i> <i>Zamia</i>	224
Total	10	334



Slide 9: Cycad Classification

Cycads are currently classified into three families: Cycadaceae, Stangeriaceae and Zamiaceae. They are a relatively small plant group. According to the most recent World List of Cycads, published in 2012 and compiled by R. Osborne, M. A. Calonje, K. D. Hill, L. Stanberg and D.W. Stevenson, these three families contain 334 species in ten genera. This checklist represents a compilation of the currently recognised names of all extant cycad taxa. There have been a total of eleven published world lists since 1985, documenting new discoveries and changes in taxonomy. The number of described species has more than doubled since the first published list when 130 species were recognised, and most experts believe there are still more to be discovered.

For the most up-to-date species list, the World List of Cycads can be found at: <http://www.cycadsg.org/pages/worldlist.htm>



Slide 10: Cycad Distribution

This slide shows a map of cycad distribution throughout the world, with cycad populations represented in red. Present day cycad populations are probably relics of a once much larger distribution. Today they consist of generally small populations distributed on several continents: in Central and South America, Africa, Asia, and Oceania (mainly Australia).

Africa: all three cycad families - Cycadaceae, Stangeriaceae and Zamiaceae - are represented by the genera *Cycas*, *Encephalartos* and *Stangeria*.

Asia: one cycad family – Cycadaceae – and one genus, *Cycas*.

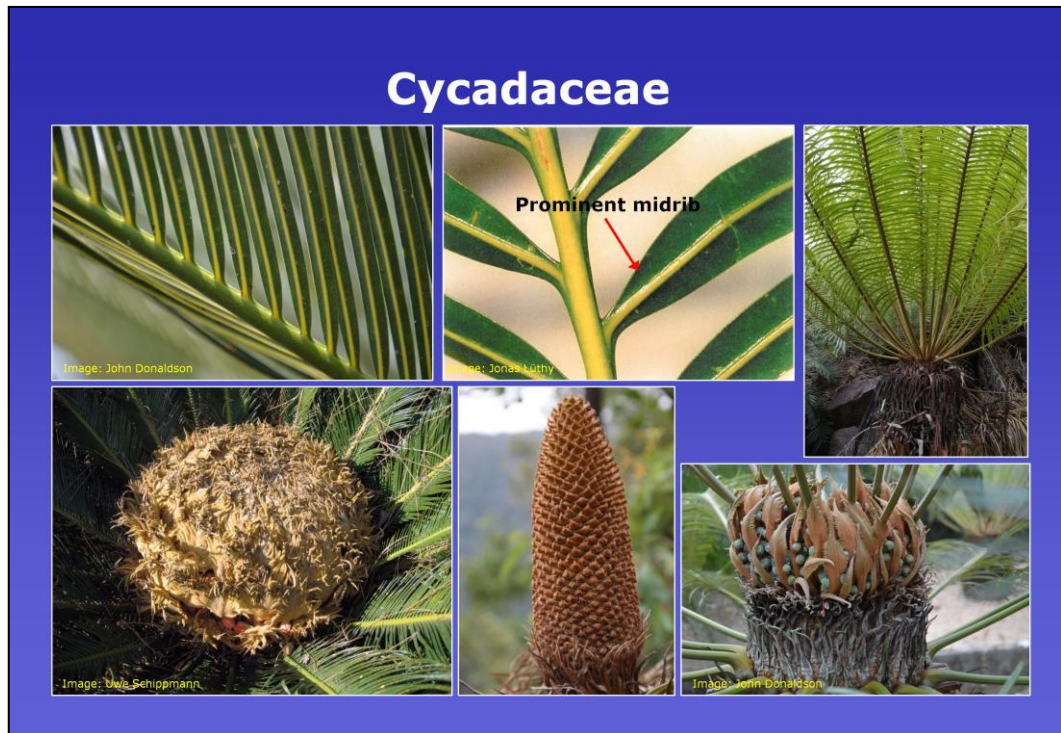
Oceania: all three cycad families, and four genera - *Bowenia*, *Cycas*, *Macrozamia*, and *Lepidozamia*.

Central and South America: one family – Zamiaceae – and the greatest diversity of species within four genera - *Ceratozamia*, *Dioon*, *Microcycas*, and *Zamia*.

A number of countries stand out as critical centres of species diversity, notably Australia, South Africa, Mexico, China and Viet Nam, which together account for more than 65% of the world's cycads.

Source of map: Donaldson J.S. (ed.). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN/SSC Cycad Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. ix + 86 pp.

[Images, border from left: *Encephalartos woodii* (Appendix I), *Zamia furfuracea* (Appendix II), *Stangeria eriopus* (Appendix I), *Encephalartos woodii*, *E. villosus* (Appendix I), *Cycas* spp. and *Cycas revoluta* (Appendix II).]

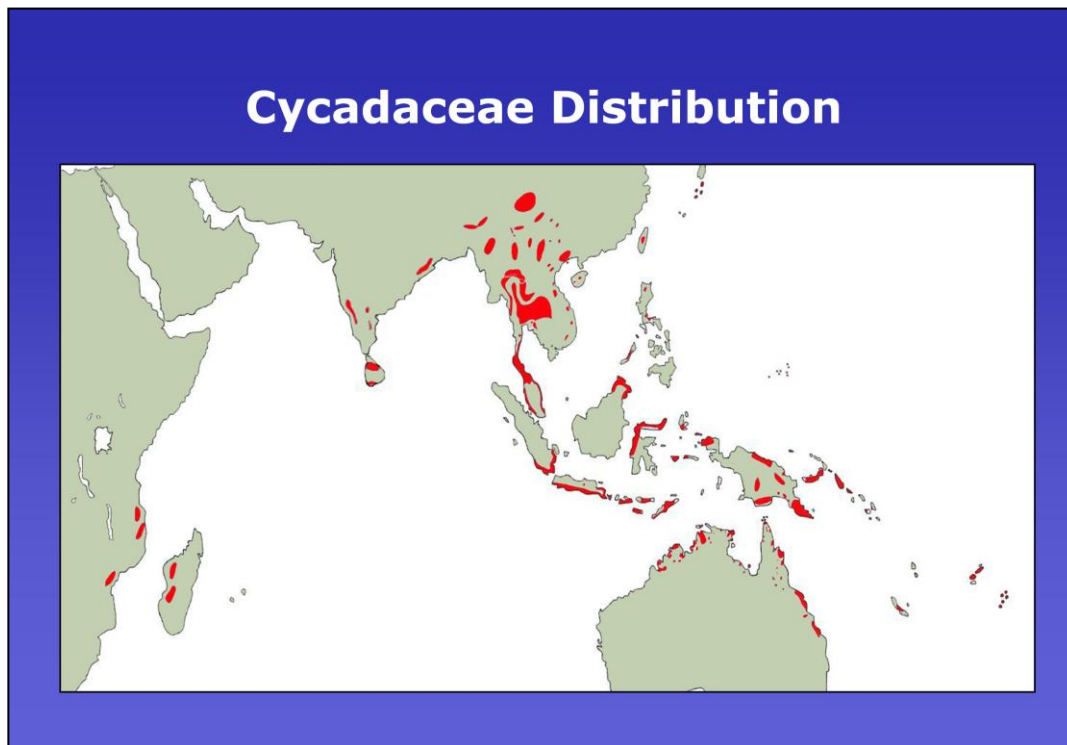


Slide 11: Cycadaceae

The **Cycadaceae** family has only one genus: *Cycas*. According to the World List of Cycads 2012 it comprises a total of 107 species plus eight subspecies.

In general, species of *Cycas* have only one vein in the centre of the leaflet (the central vein) and no side, or lateral, veins. The female cones in this family are not compact but loose and open.

[Images, top from left: leaflets of Cycas spp.; an important identification feature of all Cycas species: the prominent midrib of the leaflet; leaves of Cycas spp. Bottom from left: female cone of Cycas revoluta; male cone of Cycas spp.; female cone of Cycas glauca.]



Slide 12: Cycadaceae Distribution

Populations of *Cycas* are marked in red on the map. All species are distributed across Asia and Australia except one, *Cycas thouarsii*, which occurs in the Comoros, the Seychelles, Kenya, Madagascar, Mozambique and Tanzania. Most species are relatively localised in their range.

Source of map: Donaldson J.S. (ed.). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN/SSC Cycad Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. ix + 86 pp.



Slide 13: Stangeriaceae

The **Stangeriaceae** family has two genera: *Bowenia* and *Stangeria*.

Bowenia has two species: *Bowenia serrulata* and *Bowenia spectabilis*. They have bipinnate leaves in which the rachis (main axis) splits and this makes them easily recognisable. The only other cycads with bipinnate leaves are two *Cycas* species (*Cycas multipinnata* and *Cycas debaoensis*) in which the leaflet splits into two or more parts.

Stangeria consists of only one species, *Stangeria eriopus* which forms subterranean stems. Of all cycads, this species may be the one that can be most easily confused with a fern due to the frond-like shape of the leaves and the venation of their leaflets. The leaves of this family have one central vein, but also have lateral veins.

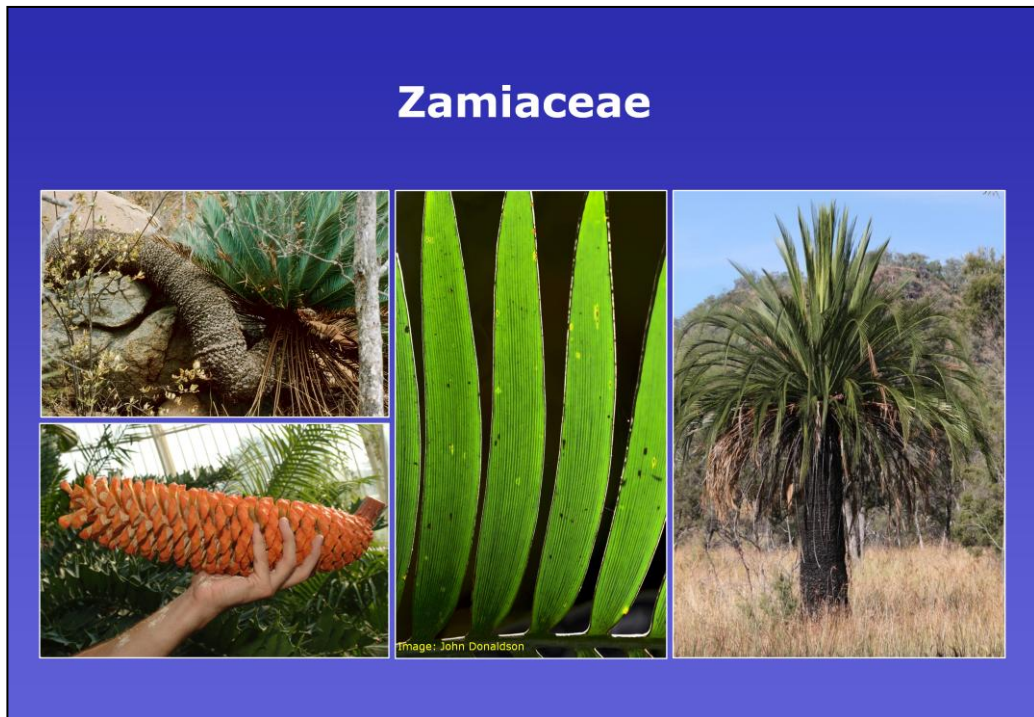
[Images, top from left: *Bowenia spectabilis*; *Stangeria eriopus*; female cone of *Stangeria eriopus*; *Cycas debaoensis* showing bipinnate leaves; bottom from left: *Stangeria eriopus* leaflet; male cone of *Stangeria eriopus*.]



Slide 14: Stangeriaceae Distribution

This slide shows a map of the distribution of **Stangeriaceae**, with populations marked in red. Stangeriaceae comprise only two genera, *Stangeria* and *Bowenia*, with a disjunct distribution: while *Stangeria eriopus* is endemic to the east coast of South Africa, the two species of *Bowenia* are found along the coast of Queensland in north-eastern Australia.

Source of map: Donaldson J.S. (ed.). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN/SSC Cycad Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. ix + 86 pp.

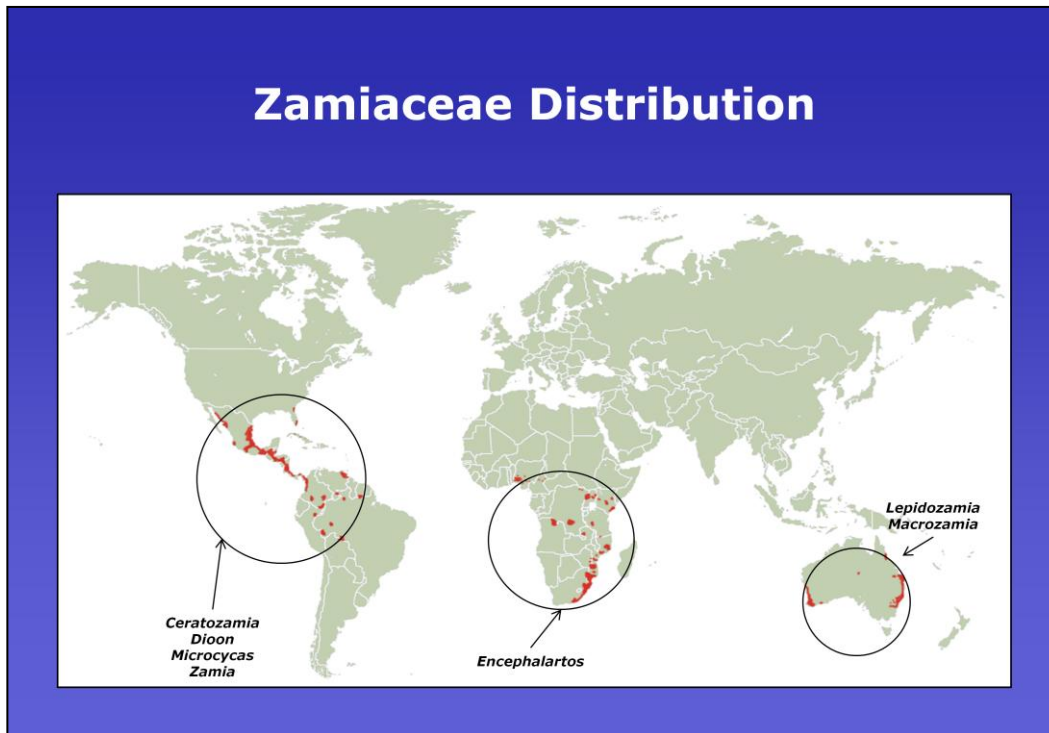


Slide 15: Zamiaceae

The **Zamiaceae** family is taxonomically more diverse than the other cycad families. It has seven genera: *Ceratozamia*, *Dioon*, *Encephalartos*, *Lepidozamia*, *Macrozamia*, *Microcycas* and *Zamia*. According to the World List of Cycads (2012) this family includes 224 species and 3 subspecies.

In general, they have more than one central vein, and these are parallel to each other.

[Images, top from left: *Encephalartos* spp. in habitat in South Africa; *Encephalartos* leaflets; *Macrozamia* spp. in Australia; bottom left: cone of *Encephalartos ferox*.]



Slide 16: Zamiaceae Distribution

This map shows the distribution of **Zamiaceae**, with the populations marked in red. The seven genera in this family include 224 species, distributed over the Americas, Africa and Australia.

Zamia is the largest genus in Zamiaceae with 74 species, widely scattered from the southern USA to northern Peru. *Zamia restrepoi* was previously included in a separate genus (*Chigua*) and is endemic to Colombia. Central America is the centre of diversity of Zamiaceae.

The genus **Encephalartos** is the second largest in the family with 65 species. It is restricted to the African continent with almost half of the species occurring in the Republic of South Africa and the remaining species distributed in the tropical regions of central and east Africa. 'Encephalartos' is derived from the Greek – 'cephale' for head and 'artos' for bread, which refers to the starchy material in the trunks of some species which is used for food by local people.

The genera **Ceratozamia** and **Dioon** are mainly restricted to Mexico.

Lepidozamia and **Macrozamia**, two other genera of Zamiaceae, are restricted to Australia. The two species of *Lepidozamia* occur on the East coast of the continent. Most of the 40 species of *Macrozamia* are also distributed in eastern Australia. Only one species, *M. riedlei* is widely distributed in western Australia, while another, *M. macdonnellii* occupies a restricted area in a mountain range of central Australia.

There is only one species of **Microcycas** (*Microcycas calocoma*) which is endemic to Cuba.

Source of map: Donaldson J.S. (ed.). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN/SSC Cycad Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. ix + 86 pp.

Cycads and Palms

Palms are flowering plants with inflorescences. Cycads have their reproductive organs within cones.



Slide 17: Cycads and Palms

In their overall appearance, cycads and palms have much in common - the erect trunks with scaly leaf bases, the terminal crown of pinnate leaves with numerous leaflets. However, palms are flowering plants (angiosperms) with inflorescences, whereas cycads belong to the gymnosperms, like conifers; they do not produce flowers but have their reproductive organs within cones or cone-like structures.

Source: Stewart. L, (1994). *A guide to palms and cycads of the world*. Cassell Illustrated, London, UK.

[Images, from left: cones of Encephalartos spp. (Appendix I); fishtail palm (Caryota rumphiana) with its inflorescence.]



Slide 18: Cycads and Palms – Stems

Both palms and cycads have cylindrical stems, though cycads can be irregularly cylindrical. In palms, the stems are marked with regular leaf scars (where leaves have fallen off) – these tend to be ring-like (encircling the stem), or sometimes neatly packed ellipses. Cycad scars are smaller, more round and densely packed.

The top left image is the stem of a palm, the top centre a cycad and the far left a palm, but the similarity between them all underlines the need to contact a cycad expert should similar trunks be found in trade. As a very general rule, palm stems are often hard, woody and fibrous whereas cycad stems are more pithy and easier to pull apart.

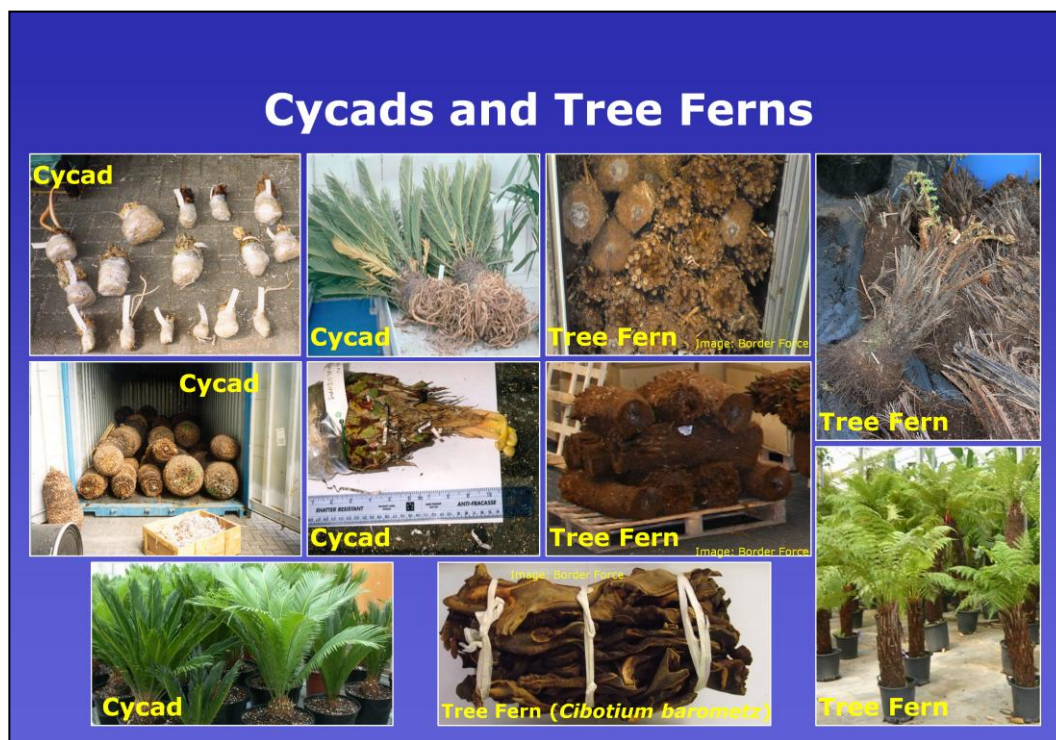
[Image, top from left: Pigafetta filaris (palm); Encephalartos spp. (cycad); Phytelephas macrocarpa (palm); bottom from left: close up of Phoenix canariensis (palm); close up of Encephalartos spp. (cycad).]



Slide 19: Cycads and Palms – Leaves

The leaves of palms and cycads can appear similar. However, there are several ways to distinguish between them. Firstly, palms produce palmate (fan-shaped) and pinnate (feather-shaped) leaves, whereas cycads only produce pinnate leaves. Secondly, the leaflets of palms can be conspicuously folded, especially at the base whereas cycads leaflets are not. Thirdly, new palm leaves emerge like a sword from the centre of the crown, later expanding and separating into leaflets. Young cycad leaves are not sword-like, and the new leaflets are visible from a very early stage, prior to full expansion.

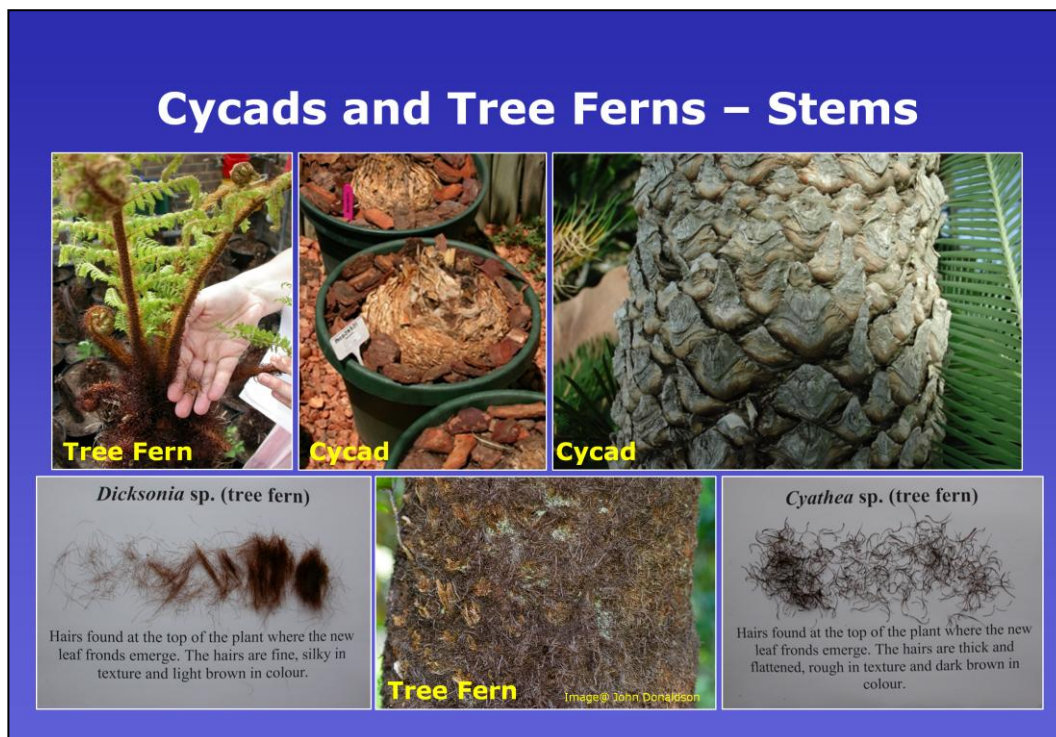
[Images, from top left: *Cycas rumphii*; *Dioon edule*; *Encephalartos spp.*; cycad leaves emerging from trunk. Bottom, from left: *Coccothrinax alta* (palm); *Dypsis ankirindo* (palm); *Euterpe precatoria* (palm) showing swordlike leaves; leaf of *Licuala grandis* (palm); palm leaflet showing folded base.]



Slide 20: Cycads and Tree Ferns

Tree ferns, although not as widely known as palms, can also be found in trade, and it can be hard to distinguish between cycads and tree ferns. Many tree ferns - *Dicksonia* spp. (populations from the Americas), *Cibotium barometz* (often used in traditional medicine, and traded as sliced rhizomes or hair), and all *Cyathea* spp. - are listed in Appendix II of the Convention, and therefore require a permit to be traded internationally. Both cycads and tree ferns are often traded as leafless, rootless trunks. Tree ferns trunks can be easily distinguished from cycad stems by the presence of brown hairs on the trunks. Cycad stems have either old leaf scars or a rough leathery texture but they are not covered in hairs.

[Images show a selection of tree ferns and cycads as found in both legal and illegal trade.]



Slide 21: Cycads and Tree Ferns – Stems

A tree fern trunk is formed from a slender stem surrounded by a dense mass of fibrous roots. The trunk apex and leaf bases are covered with glossy ginger-brown hairs up to 4.5 cm long. Cycad stems have no hairs and the stem surface is generally rough and bark-like.

[Images, top from left: leaves unfurling from a tree fern stem; trunks of Encephalartos spp.; close up of Encephalartos trunk; bottom centre: close up of trunk of Dicksonia antarctica covered in fibrous roots.]



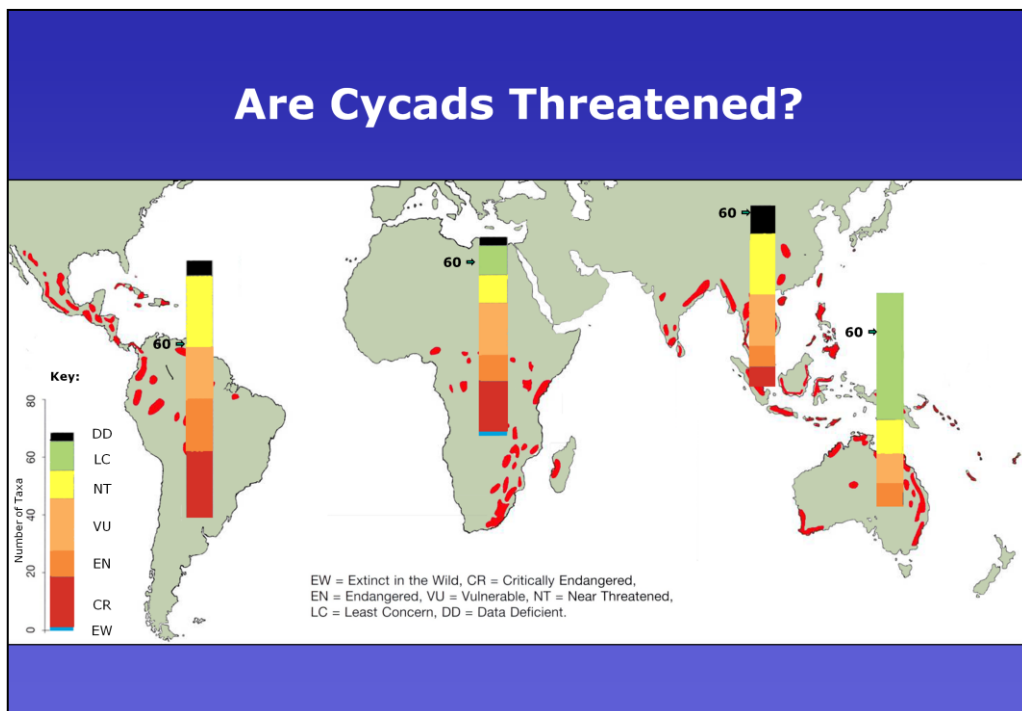
Slide 22: Cycads and Tree Ferns – Leaves

Leaves of cycads and tree ferns differ in several ways.

Cycad leaves emerge in groups from the crown of the plant so that there is a ring of leaves of the same age. The emerging leaves may have small hairs that are dropped as the leaf matures.

Tree ferns produce leaves individually and the young leaf frond emerges in a coil that unfurls as it grows. There may be numerous leaves which are borne in a large, spreading crown.

[Images, top from left: cycad leaves; emergent leaves of a cycad; drawing of cycad; bottom from left: Dicksonia antarctica leaves; emergent leaves of a tree fern; drawing of tree fern.]



Slide 23: Are Cycads Threatened?

Most cycad species have restricted distributions and relatively small population sizes which make them susceptible to a high risk of extinction through a number of threat scenarios. The first global assessment published by the IUCN in 2003 found that 53% of this group were threatened with extinction. By the next assessment in 2010 their status had deteriorated further: according to the IUCN Red List, which lists 307 species of cycad, a total of 196 (64%) species are either extinct in the wild or threatened with extinction.

Of particular concern is that this plant group is in decline all over the world, with Asia, Australia, and South and Central America all demonstrating a major shift towards a higher proportion of threatened cycad species. In the past, collection from the wild has been viewed as the main threat to native species (and is still the greatest danger facing South African species), but recent analysis has shown that habitat destruction and even habitat modification are possibly greater threats in some parts of the world. The extinction of the insect pollinators and a wide separation between male and female plants both increase the risk of decline.

The situation in Central and South America and Africa is most critical. In the Americas, 24 species fall into the highest category - Critically Endangered. In Africa, 18 species are classified as Critically Endangered; this is nearly one in four species in Africa. Two species of the African genus *Encephalartos* have become extinct in the wild in the last decade.

Sources: Donaldson J.S. (ed.). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN/SSC Cycad Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. ix + 86pp.; www.redlist.org

Introduction to Cycads: Summary

In this section we have outlined:

- What cycads are and what they look like
- The three cycad families and their distribution
- How to distinguish between cycads, palms and tree ferns
- The threat of extinction

Slide 24: Introduction to Cycads: Summary

In this section we have outlined:

- What cycads are and what they look like.
- The three cycad families – Cycadaceae, Stangeriaceae and Zamiaceae – and where they are distributed.
- How to distinguish cycads from similar plants in trade – palms and tree ferns.
- The threat of extinction.

CITES and Cycads

Trade Regulations

Family	Appendix I	Appendix II
Cycadaceae	<i>Cycas beddomei</i>	<i>Cycas</i> spp.
Stangeriaceae	<i>Stangeria eriopus</i>	<i>Bowenia</i> spp.
Zamiaceae	<i>Ceratozamia</i> spp. <i>Encephalartos</i> spp. <i>Microcycas calocoma</i> <i>Chigua</i> spp. (<i>Zamia restrepoi</i>)	Zamiaceae spp.

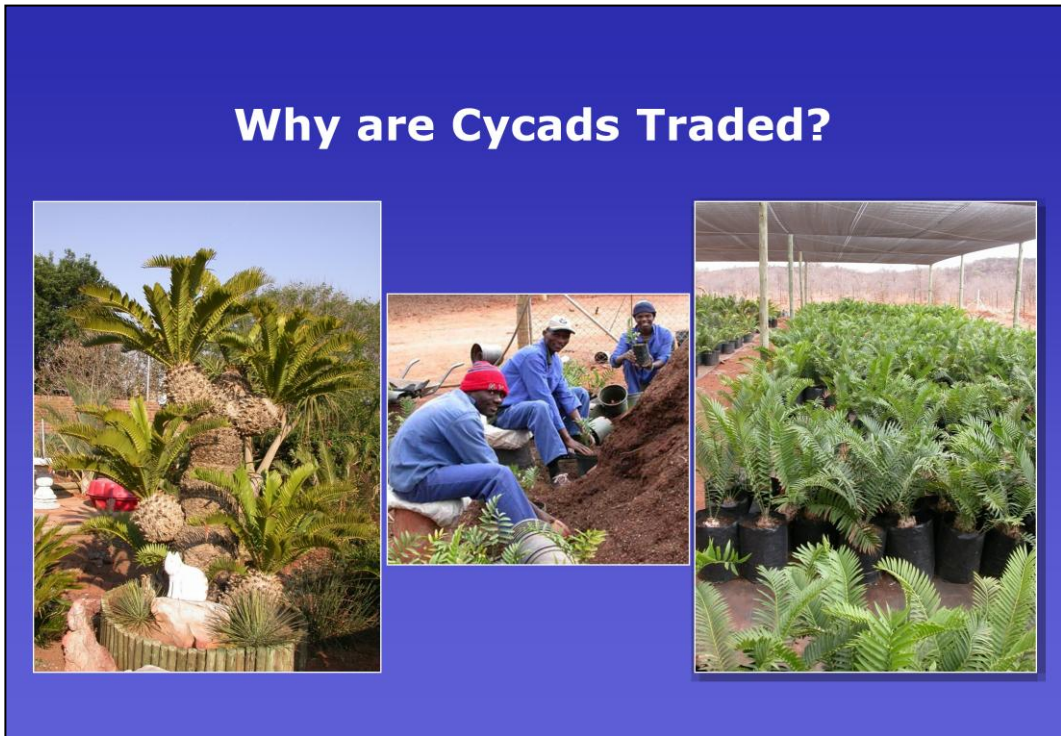


Slide 26: Trade Regulations

All species of the three cycad families are included in the CITES Appendices and their trade is therefore regulated. In the case of **Cycadaceae**, all species are included in Appendix II except *Cycas beddomei*, native to India, which is in Appendix I. In **Stangeriaceae**, the two *Bowenia* species are both in Appendix II, while *Stangeria eriopus*, the only species in the genus *Stangeria*, is included in Appendix I. In **Zamiaceae**, all species are included in Appendix II, except *Ceratozamia* spp., *Encephalartos* spp., *Microcycas calocoma* and *Chigua* spp. (now renamed *Zamia restrepoi*, according to the 2012 World List of Cycads) which are in Appendix I.

On a species level, a total of 96 species are currently included in Appendix I, while 238 species are included in Appendix II.

Why are Cycads Traded?



Slide 27: Why are Cycads Traded?

By far the greatest trade in cycads is as ornamental plants. *Cycas revoluta* is the mostly widely traded species although other species of *Cycas* are also in trade. It is important to note that ornamental plants in trade are distributed between at least three different markets: ornamentals, collectables and landscaping.

The large scale trade in ornamentals requires a consistent supply of similar looking plants in large numbers. *Cycas revoluta* is one of the few species that is propagated in sufficient numbers to satisfy this market. *Zamia furfuracea* is also ideal for this purpose: it has an attractive growth form, plants reach maturity within two to three years and cultivated plants tend to cone prolifically. As a result, *Z. furfuracea* is now cultivated in large numbers outside Mexico, its range state.

There are probably only a few thousand collectors of cycads around the world. They seek a wide range of species, but require only a few specimens of each taxon. The market is too small to justify large-scale commercial production. The scarcity of these plants in cultivation creates a market for wild-collected plants. This trade is likely to have an impact on rare species.

There is an ongoing demand for large landscape plants, even in low numbers. Because cycads tend to be slow growing, there are too few large plants in cultivation to satisfy the demand. As a consequence, there is a market for large plants of wild origin and the result may be illegal trade.

Source: PC14 Doc.9.2.2 – Annex 1 (2003). *Review of Significant Trade – Cycads*. Presented at the 14th Meeting of the Plants Committee, Windhoek, February 2004. Information compiled by TRAFFIC East and Southern Africa (TESA).

[Images, from left: ornamental *Encephalartos* spp. (Appendix I); potting up cycads in a South African nursery; nursery plants of *Encephalartos* spp.]

Why are Cycads Traded?

- Food
- Decoration
- Medicine




Slide 28: Why are Cycads Traded?

Cycads are also used for food (seeds and stems), starch (stems), ceremonies and decoration (leaves), basket work (leaves) and medicine or magic (stems, roots, bark).

The use of cycads as a food source has been recorded in every region where they are found, but it is mostly to supply local needs. Both stems and seeds are used. The impact on wild populations is thought to be limited and there is no evidence of ongoing international trade in cycads for this purpose. Commercial ventures to extract starch from cycad stems have operated in the USA and Australia but this industry had collapsed by 1925.

CITES records show that there has been a substantial trade in leaves, especially from species of *Cycas* and *Bowenia*. The leaves are used for floral arrangements and the bulk of the trade is in cultivated plants from Costa Rica, the principal exporter. In a report prepared in 2004 for the CITES Plants Committee, TRAFFIC, the wildlife trade monitoring network, found no evidence that leaf harvesting has a detrimental effect on wild populations.

The use of cycads for medicine and magic has been recorded in various range states, but it is mostly an internal trade. However, according to TRAFFIC, South Africa is one of the range states where medicinal trade takes place on a national level and does seem to have a negative impact on wild populations. *Stangeria eriopus* is apparently declining due to intensive harvesting for medicinal purposes. Bark harvesting from *Encephalartos* species has resulted in the decline of several populations.

Source: PC14.Doc.9.2.2 – Annex 1 (2003). *Review of Significant Trade – Cycads*. Presented at the 14th Meeting of the Plants Committee, Windhoek, February 2004. Information compiled by TRAFFIC East and Southern Africa (TESA).

[Images, from left: *Encephalartos* and *Stangeria eriopus* plants sold on the Faraday street market in Johannesburg (Appendix I); tonic listing *Cycas circinalis* (Appendix II) as ingredient.]

Which Commodities are Traded?

Live plants dominate the international trade, sometimes shipped as stems



Slide 29: Which Commodities are Traded?

By far the greatest trade in cycads is as ornamental plants, with nearly 50 million plants being traded between 2002 and 2011. Of these exports, 90% belong to only one species: *Cycas revoluta*.

When analysing trade data for live cycads, the terms used in CITES reports can be misleading. Cycads traded as ornamental plants destined for landscaping can be a considerable size and are often shipped as trunks only, without leaves or roots, and are reported as stems, logs or timber pieces. Similarly, trade in small plants with subterranean stems, as well as young plants with a large proportion of root, may be reported as roots.

Even mature cycad specimens transplant relatively easily, owing to their xerophytic nature. Their leathery leaves do not transpire freely therefore retaining water, and food and water reserves are also stored in the stem. The usual procedure is to dig up the plants, chop off or trim the leaves and roots and store the trunk on the ground in a shaded area. They can survive up to six months in this resting period. When the plants have been shipped and are ready for replanting, the stems are placed in damp sand which promotes new growth.

However, it is important to note that it is often impossible to identify these trunks to species level, only to genus level.

Sources: PC14.Doc.9.2.2 – Annex 1 (2003). *Review of Significant Trade – Cycads*. Presented at the 14th Meeting of the Plants Committee, Windhoek, February 2004. Information compiled by TRAFFIC East and Southern Africa (TESA); UNEP-WCMC Trade Database.

[Images: all *Encephalartos* spp. (Appendix I).]

Which Commodities are Traded?

- **Leaves**
- **Seeds** are traded from >100 species
- **Dried plants** - mainly for scientific purposes




Slide 30: Which Commodities are Traded?

CITES records from 2002 to 2011 show that there is a substantial trade in leaves, - 22.5 million - especially for species of *Cycas* (>10 million leaves) and *Bowenia* (23,136). Again this trade is dominated by *Cycas revoluta*.

The leaves are used for floral arrangements and the bulk of the trade is from artificially propagated plants in Costa Rica, the principal exporter (22 million leaves). The next largest leaf exporting country is China, with over 180,000 leaves. Countries who dominate this trade are rarely range states and trade is in leaves from artificially propagated plants. Australia is the only country exporting wild-sourced leaves - over 75,000 leaves were exported between 2002-2011 from two species: *Bowenia serrulata* and *Macrozamia communis*.

Although not required by CITES, some countries are reporting on import and export of seeds of Appendix II species. A total of 616,000 seeds were exported between 2002 and 2011. Here, the dominance of seeds produced from *Cycas revoluta* is less striking: only 50% was in *Cycas revoluta*, the remainder is sourced from more than 100 other species.

The principal exporters of seeds are Costa Rica (175,000 seeds), the USA (150,000) and Japan (147,000), mostly from *Cycas revoluta* and *Zamia furfuracea*, (both Appendix II). Australia is also exporting seeds but not from wild origin.

Most seed exports from South Africa originate from some 30 native *Encephalartos* species (Appendix I), declared as artificially propagated.

Some trade is recorded as 'dried plants'. Most of this is in low numbers and is declared as being for scientific purposes, most likely dried herbarium specimens.

Sources: PC14 Doc.9.2.2 – Annex 1 (2003). *Review of Significant Trade – Cycads*. Presented at the 14th Meeting of the CITES Plants Committee, Windhoek, February 2004. Information compiled by TRAFFIC East and Southern Africa (TESA).

UNEP-WCMC Trade Database.

[Images, from left: seeds of *Zamia furfuracea* (Appendix II therefore seeds not regulated by CITES) and right: seeds of *Encephalartos* spp. (Appendix I and seeds therefore regulated).]



Slide 31: Global Trade

Global trade in cycads amounts to around 50 million live plants over the ten year period 2002-2011 inclusive, with 99% of that trade in artificially propagated Appendix II specimens.

Trade is reported by both importer and exporter, and the figures received from each do not always match up. There are many reasons that importer- and exporter-reported figures vary; for example not all importers submit annual reports, or exporters report on permits issued rather than actual trade (i.e. reporting trade that never actually took place).

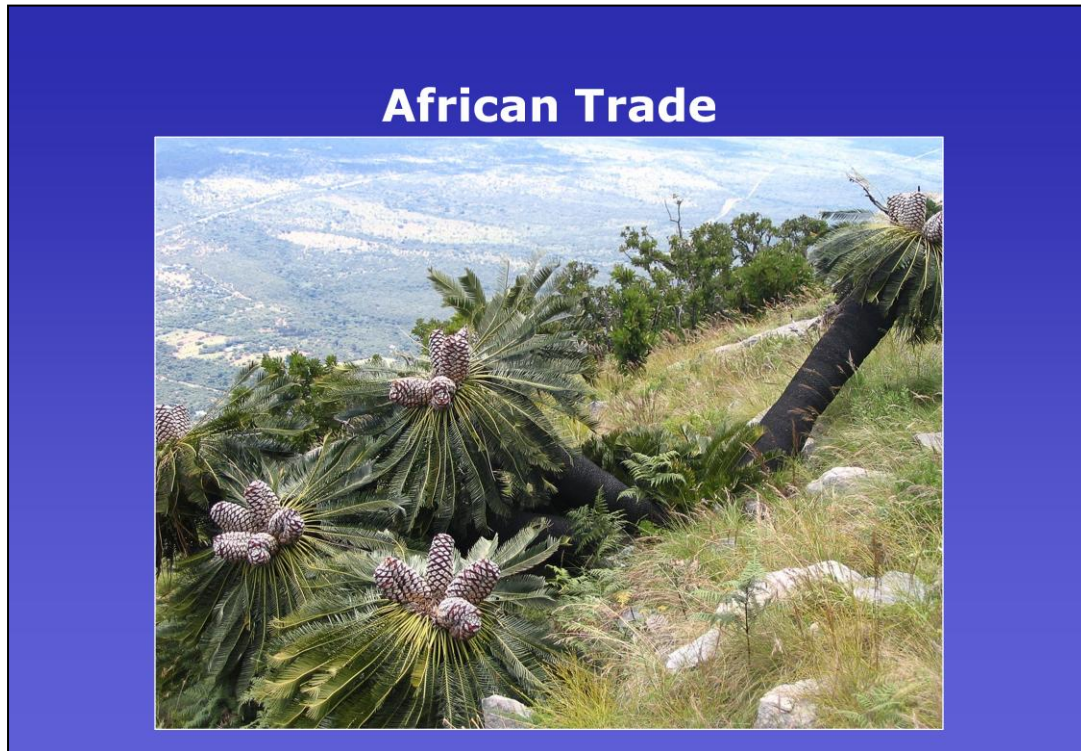
By analysing both sets of figures, a general trade estimate can be obtained. The principal exporter of artificially propagated Appendix II cycads (90% of which is in *Cycas revoluta*) is Costa Rica, followed by Taiwan (Province of China, or PoC) and Malaysia. The main importers of artificially propagated Appendix II cycads are the Netherlands and the USA. Mozambique and South Africa, followed by Costa Rica and Taiwan (PoC), export most of the artificially propagated Appendix I specimens, imported by the USA and Thailand.

The main exporters for wild Appendix II cycads are Taiwan (PoC), Australia and Honduras, imported by Japan, the USA and Germany. For wild Appendix I cycads the main exporters are Zimbabwe, Australia, Belize and South Africa, imported by the USA, New Zealand and Thailand.

Cycads are not only exported by range States. Non range States may export cycads from propagation facilities in their own countries and there is a small amount of re-exports from other countries, notably the Netherlands.

In an analysis by TRAFFIC covering a five year period between 1997-2002, a total of 30 million plants were found to be traded. During the following ten year period 2002-2011, trade has decreased to 49 million plants.

[Images: *Encephalartos* spp. in trade.]



Slide 32: African Trade

Cycads are distributed in Africa from Ghana in the west to South Africa in the south, and in this continent there are 67 species of cycad in three genera: *Stangeria eriopus* in Stangeriaceae, *Cycas thouarsii* in Cycadaceae and 65 *Encephalartos* spp. in Zamiaceae. This region is the largest exporter of artificially propagated Appendix I cycad species.

The main exporters of artificially propagated plants are South Africa and Mozambique (both mainly *Encephalartos* spp.), and for wild plants are Mozambique (mainly *Cycas thouarsii*) and Zimbabwe (mainly *Encephalartos* spp.). There has been a trade suspension in place since 2006 against Mozambique for all three cycad families.

The main importers of live plants from Africa are the USA and New Zealand.

The biggest importer in Africa of artificially propagated plants is South Africa (mainly *Cycas revoluta*) and of wild plants is Mozambique (mainly *Cycas* spp.).

[Image: *Encephalartos laevifolius* in habitat.]

Illegal Trade – Africa



Slide 33: Illegal Trade – Africa

South Africa is a regional centre of diversity, home to 37 of the 65 species of *Encephalartos*, 75% of which are threatened with extinction. The main threat in South Africa is removal from the wild for private collections. Habitat loss, which is the main cause of decline in other parts of the world, is less of a problem for South African cycads. Many species continue to decline and there is a high probability that several species will become extinct in the wild as a direct result of ongoing trade. More recently, bark harvesting for the medicinal trade has increased in South Africa which has also resulted in declines in cycad populations. The loss of complete populations has occurred in KwaZulu Natal and Eastern Cape.

In 2010 South Africa had seven cycad species that have fewer than 100 individuals left in the wild. Three species are already possibly extinct in the wild. One species is *Encephalartos brevifoliolatus* which was only discovered in 1996 when a small population was found in a remote mountainous area in Limpopo Province. The only known population comprised 5-7 plants. Several of these plants were removed by poachers and conservation officials then removed the last stems to a safe location in 2004. Another is *E. nubimontanus*, originally known from 66 plants, but only eight were counted in a 2001 survey and none could be found in a 2004 survey despite very careful searching. The species is popular with collectors and there has been much poaching activity in the Limpopo Province of South Africa. It is now considered extinct in the wild although there are unconfirmed reports of additional wild plants. Finally, *Encephalartos inopinus*, an unusual species with very distinctive leaves, could also be extinct in the wild. Conservation authorities in Limpopo have been monitoring this species since 1992 and the population declined from 677 in 1992 to only 81 in 2004. There are unconfirmed reports that the species has declined even further since 2004 and may now be extinct in the wild.

Source: SANBI press release 2010.

[Images: illegally collected *Encephalartos* spp., seized by South African authorities.]

Illegal Trade – Africa



Slide 34: Illegal Trade – Africa

There are at least three possible reasons for ongoing decline. There is a large domestic market in South Africa so that wild harvested plants can be smuggled into garden collections within South Africa or pass through borders with neighbouring countries. Secondly, after the large scale collecting that took place prior to 1970, some populations were already very small (a few hundred plants). Even low levels of harvesting since then have reduced the populations to levels near extinction in the wild. Finally, the lack of availability of plants in cultivation means that there is always a demand for wild harvested plants.

Critically Endangered species of *Encephalartos* are particularly at risk from trade. They are in demand and their populations are extremely small and cannot sustain any further collecting. Where consignments contain Critically Endangered species (see below), inspection is advised. If the plants are suspected of being of wild origin or are suckers (see slide 45 for more information on suckers) a cycad expert in your country or the South African CITES authority should be contacted without delay.

Critically Endangered species comprise *Encephalartos aemulans*, *E. cerinus*, *E. cupidus*, *E. dolomiticus*, *E. dyerianus*, *E. equatorialis*, *E. heenanii*, *E. hirsutus*, *E. inopinus*, *E. laevifolius*, *E. latifrons*, *E. middelburgensis*, *E. msinganus*, *E. munchii*, *E. nubimontanus*, *E. pterogonus* and *E. tegulaneus*

Other species where trade seems to be having an impact include most *Encephalartos* from South Africa, *E. manikensis* (Zimbabwe, Mozambique), and *E. schmitzii* (Democratic Republic of the Congo, Zambia, Tanzania).

Source: PC14 Doc.9.2.2 – Annex 1 (2003). *Review of Significant Trade – Cycads*. Presented at the 14th Meeting of the CITES Plants Committee, Windhoek, February 2004. Information compiled by TRAFFIC East and Southern Africa (TESA).

[Images: illegally collected *Encephalartos* spp., seized by the South African authorities.]



Slide 35: Australian Trade

Australia has great cycad diversity, with four genera and 83 species and subspecies. It is also the one range State where most of its species have large, stable and healthy populations. It is the largest exporter of wild-collected specimens, mainly *Macrozamia* and *Bowenia*. According to the CITES trade database, Australia exported around 130,000 live plants over the period 2000-2010, of which over 95,000 were wild collected (98% *Macrozamia* spp.).

A recent awareness of native flora, and an appreciation of the horticultural usefulness of certain *Macrozamia* species, is leading to an increased demand from landscapers for these plants. As a result, pressure on wild populations of these slow-growing species is likely to increase. Some taxa have already been removed in commercial quantities, but this is usually restricted to land destined for development and is regulated by a licence system that is monitored by conservation authorities. The Northern Territories have a Management Plan in place restricting harvesting to 25% of leaves and well-formed seeds from any one plant, and 10% of whole plants from any one population. Collection of leaves and whole plants require permits, and whole plant harvesting is assessed on a case-by-case basis. In Australia the greatest damage to cycad populations is from habitat loss. Large-scale clearing of land has removed entire populations of *Cycas armstrongii*, *C. canalis*, *C. media*, *C. ophiolitica*, *Macrozamia communis*, *M. lomandroides*, *M. moorei* and *M. pauli-guilielmi*. However, most of these species remain in viable populations and in numbers of tens of thousands or even millions. The CITES Trade Database records that Australia has imported around 122,500 live artificially propagated plants over the last ten years, mainly from China and Japan (*Cycas revoluta*) and Mozambique (24,390 *Encephalartos* spp., including *E. munchii* and *E. pterogonus*). They import very few wild-collected plants.

Source: Donaldson, J.S. (ed). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN /SSC Cycad Specialist Group; 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, Australia.

[Images, from left: *Macrozamia* spp. in habitat in Australia; fires are becoming more common due to invasive exotic pasture grasses; bottom: *Lepidozamia peroffskyana*.]



Slide 36: Asian Trade

Cycads are represented throughout Asia by a single genus, *Cycas*, and there are circa 70 species that occur in the region. Of these, 44 species are listed on the IUCN Red List as threatened with extinction. The main centres of diversity are Viet Nam, China and Thailand.

The biggest exporters of artificially propagated plants are Taiwan (PoC), Malaysia and China. Taiwan was reported as the biggest exporter of wild plants (28,000 specimens of *Zamia furfuracea*, Appendix II) but Taiwan is not a range area for this species so it may be incorrectly reported. Thailand has the most diverse exports of wild Appendix II species of *Cycas*.

The largest importers of the region are the Republic of Korea, Japan, Singapore and Japan. The vast majority of these are artificially propagated *Cycas revoluta*.

[Images, from left: seed sorting of Cycas circinalis in India; Cycas elongata in habitat in Viet Nam.]



Slide 37: Illegal Trade – Asia

Viet Nam is a centre of species diversity, having an estimated 27 species of *Cycas*, 14 of which are threatened with extinction in the wild.

There is information to suggest that there is unreported and unregulated trade in the region that does not seem to pass through borders that are monitored for CITES trade. Large numbers of *Cycas* plants of wild origin have been moved from Viet Nam to neighbouring countries and wild-harvested plants have been observed in the border areas. CITES Authorities in the region are now aware of this and are putting procedures in place to clamp down on illegal trade.

Sources: IUCN Red List; PC14 Doc.9.2.2 – Annex 1 (2003). *Review of Significant Trade – Cycads*. Presented at the 14th Meeting of the CITES Plants Committee, Windhoek, February 2004. Information compiled by TRAFFIC East and Southern Africa (TESA).

[Images, top right: wild-collected *Cycas pectinata*; top left: wild-collected *Cycas pachypoda*; bottom: wild-collected *Cycas elongata*.]

Central and South American Trade



Slide 38: Central and South American Trade

Central and South America have the largest global diversity of cycad species: 113 species from four genera occurring from southern USA to northern Brazil. Mexico alone has 49 endemic species, 45 of which are threatened with extinction in the wild.

The largest exporter in the region is Costa Rica which exports vast quantities of artificially propagated *Cycas revoluta* – 18 million plants between 2002-2011 – followed by the Dominican Republic (4.5 million plants), Honduras (4.4 million) and Guatemala (3.4 million).

The largest exporter of live wild-collected plants is Honduras, followed by Belize. These are mainly Appendix II species of *Zamia*, with a very small amount of Appendix I *Ceratozamia*. The main importer of wild-collected plants is the USA.

The main importers of the region are Costa Rica, Mexico and Guatemala. The trade is in artificially propagated Appendix II *Cycas revoluta* with no declared wild trade.

[Images, from left: *Dioon spinulosum*, with cone; *Dioon edule*.]

Illegal Trade – Central and South America



Slide 39: Illegal Trade – Central and South America

There are also several other species that do not appear in CITES trade records as wild-collected specimens, but where cycad experts report that wild harvesting, probably for international trade, is a threat to wild populations. These include *Dioon holmgrenii*, *Zamia lacondona*, *Z. purpurea* and *Z. vasquezii* (Mexico), *Z. chigua*, *Z. cunaria* (Panama) and *Z. wallisii* (Colombia).

There are indications that overcollecting from wild populations has decreased since cycads were listed in the CITES Appendices. This appears to be especially true of Mexican taxa that were heavily exploited prior to 1985.

However, illegal collecting of endangered species is still a great concern in Mexico. It has been reported that tourists take ecotours to visit wild cycad populations, for the most part just to take photos to add to their collections. However, some clandestinely note GPS data and return at a later date to remove plants from the wild. There is also a large local demand for festivals and religious ceremonies. In the larger Mexican cities wreaths of cycad leaves are offered for sale by the roadside, mainly from *Dioon* spp., made from the cut off crowns of adult plants, effectively killing the plants. In 2008, according to the TRAFFIC Bulletin, 284 *Dioon edule* plants were seized at a bus terminal at San Luis Potosi, after a passenger was attempting to take them to sell in Mexico City.

Source: Vovides, A.P and Pérez Farrera, M.A. (2010). *Cycadas Mesoamericanas sujetas a comercialización: bases para su identificación. Traffic Noteamerica-Oficina, México.*

[Images show, from left: *Dioon edule* with cut off crown; *Dioon edule* leaf crowns.]

CITES and Cycads: Summary

In this section we have outlined:

- All cycads are CITES regulated
- 96 species in Appendix I, 238 species in Appendix II
- Majority artificially propagated = *Cycas revoluta*
- Wild trade dominated by Australian species
- Illegal trade

Slide 40: CITES and Cycads: Summary

In this section we have outlined:

- All three cycad families are regulated by CITES, with 96 species included in Appendix I and 238 in Appendix II.
- The majority of trade is in artificially propagated live plants, dominated by *Cycas revoluta*.
- Wild plants exports for commercial purposes mainly originate from Australia.
- Illegal trade.

Implementing CITES for Cycads



Slide 42: Enforcement – General Checks

A Customs officer, or others involved in border inspection, is often the first, and sometimes the only, level of inspection for CITES shipments. This places a great burden on Customs to verify that trade is in accordance with CITES provisions, to detect fraud and illegal trade where it occurs and inform the Management Authority.

Documents must be checked to ensure authenticity of the CITES permits (signatures, stamps). The plant names and quantities specified on the permit should be checked against the delivery note or invoice. Always check the country of origin on the permits. Are the cycads being exported from a country where the plants grow in the wild? If so then the plants may be more likely to be wild-collected. Check the source of the plants - are they declared as wild or artificially propagated? Using the declaration that plants are ‘artificially propagated’ is one of the most commonly used methods of fraud in the plant trade. There are several incentives to do this: many countries prohibit the export of wild-collected plants, and exporters may try to export such wild-collected plants as artificially propagated, after having them in cultivation in a ‘nursery’ for a short period. Trade in Appendix I cycads is only possible if plants are artificially propagated.

Nurseries will usually package their plants carefully to avoid damaging them, and ship them in boxes marked with the nursery’s name and with printed labels. Consignments of illegally collected plants may be poorly packaged using local materials, contain handwritten labels (sometimes with collecting data), and the plants may not be identified to species level to disguise the fact that new, unnamed species may have been collected.

Illegal collections of rare or new species may be shipped using postal / courier services or in hand luggage to avoid detection. Collections may also be split up and sent in several different packages to ensure both a high level of survival and that at least some of the plants will evade discovery.

[Images, from left: a shipment of artificially propagated Encephalartos spp. plants, clean, uniform in size, and in good condition; wild collected Encephalartos spp.; top right: a shipment of wild collected trunks of E. cupidus; bottom right: artificially propagated Encephalartos spp. plants in containers and of uniform size.]

CITES Definition of 'Artificially Propagated'



Slide 43: CITES Definition of 'Artificially Propagated'

The CITES definition of artificially propagated is included in Resolution Conf. 11.11: (Rev. CoP15) *Regulation of trade in plants*. The definition within CITES includes several unique criteria. The application of these criteria may result in a plant which bears all the physical characteristics of artificial propagation being considered as wild-collected in CITES terms. The key points are:

Plants must be grown in controlled conditions. This means, for example, the plants are manipulated in a *non-natural environment* to promote prime growing conditions and to exclude predators. A traditional nursery or simple greenhouse is 'controlled conditions'. A managed tropical shade house would also be an example of 'controlled conditions'. Temporary management of a piece of natural vegetation where wild specimens of the plants already occur would not be 'controlled conditions'. Wild collected plants are considered wild even if they have been cultivated in controlled conditions for some time.

The cultivated parent stock must have been *established in a manner not detrimental to the survival of the species in the wild* and managed in a manner which *ensures long term maintenance of the cultivated stock*.

The cultivated parental stock must have been *established in accordance with the provisions of CITES and relevant national laws*. This means that the stock must be obtained legally in CITES terms and also in terms of any national laws in the country of origin. For example, a plant may have been illegally collected within a country of origin then cultivated in a local nursery and its offspring exported declared as artificially propagated. However, such offspring cannot be considered to be artificially propagated in CITES terms due to the illegal collection of the parent plants.

Seeds can only be considered artificially propagated if they are taken from plants which themselves fulfil the CITES definition of artificially propagated. Specimens grown from wild collected seeds can exceptionally be regarded as artificially propagated if they are grown in a range State and fulfil several other precautionary conditions. See Res. Conf. 11.11 (Rev. CoP15).

Applying the CITES definition is a complex mixture of checking legal origin, propagation status and non-detrimental collection. To achieve this, the assessment needs to be carried out in close co-operation between the CITES Management and Scientific Authorities. The implementation of the criteria on a day by day basis needs to be tailored to the situation in an individual CITES Party. National CITES authorities should consider producing a checklist as a means of standardising the process and informing the local plant traders.

[Images, left and right: *Encephalartos spp.* (Appendix I) in a South African nursery; centre: CITES permits.]

Wild or Artificially Propagated – Key Characteristics		
	Wild	Artificially propagated
General Appearance	<ul style="list-style-type: none"> • Irregular shape & size • Wounds & insect damage • Possible fire damage 	<ul style="list-style-type: none"> • Uniform • Healthy plant parts
Roots	<ul style="list-style-type: none"> • Irregular • Dead & broken • Coarsely cut back when removed from the wild 	<ul style="list-style-type: none"> • In shape of pot • Roots cut back but healthy
Soil	<ul style="list-style-type: none"> • Local soils and associated plants 	<ul style="list-style-type: none"> • Usually clean of soil • Horticultural soil present (e.g. peat, sand, perlite, rockwool)

Slide 44: Wild or Artificially Propagated – Key Characteristics

The majority of cycads in international trade are declared to be artificially propagated and are recorded as such in trade records. Only Australia has frequent legal exports of plants harvested from the wild. The key challenge in enforcement is in making the judgment whether plants in a consignment are, in CITES terms, wild-collected or artificially propagated. The following features can be used as guidelines to determine the source of a plant consignment: uniform or mixed batches of plants, packaging, transportation, condition and growth form of leaves, roots, stem, and whether there is soil or companion plants attached.

Leaves of wild-collected plants often display the marks of their natural habitat, the damage caused by collection, and often the contrasting fresh growth which has occurred after collection. The base leaves are often dead or damaged, and may also carry the tracks made by burrowing insects. Stems may show the damage caused by fire, a common hazard in their natural habitat. Roots of wild-collected plants are often dead, roughly broken, or cut off in an effort to clean up the plant after collection. New roots may be growing from old damaged root material and there may also be material from the natural substrate still attached.

You may suspect that the plants are of wild origin if the plants have no name tags and they are leafless and not fully rooted, they have a large trunk size (over 100cm tall), are hidden or kept away from the regular nursery stock and the prices are low compared to the size and presumed age of the plants. Such consignments usually consist of small samples of plants of different size and age groups that are not uniform in shape. From a commercial perspective, nurseries cannot afford to cultivate plants in their nurseries for longer than 5-10 years. The majority of cycad species are very slow growing, and therefore there is an increased probability that plants with trunks larger than 100cm are wild-collected. This is why plants in a shipment over a certain age have a high probability of being of wild origin.

Artificially propagated plants will be uniform in size and shape and be clean of soil, pests and diseases, weeds or native plants.

Remember: always be cautious in your assessment and if in doubt call in an expert.

Stricter Measures



Image: Nguyen Tien Hiep

Slide 45: Stricter Measures

When checking CITES guidelines for import and export of cycads, please be aware that other CITES Parties can take stricter measures, putting export / import bans in place or limiting the size of caudexes in order to tackle illegal trade in wild-collected cycads. It is therefore very important to check with the current regulations of the importing country. Check with the national CITES Management Authority – you can find their details on the CITES website.

[Image: wild-collected Cycas elongata in transit.]



Slide 46: What are Suckers?

A sucker is a shoot or bud that usually develops on the roots of a plant. The process is called suckering and is used by plants to vegetatively reproduce. Many cycad species sucker from the base, while others produce branches from higher up the stem, mainly as a response to damage. The occurrence of branches higher up on the stem is less common than below ground suckering. The suckers which arise from the rootstock usually have their own roots. Those that arise from out of the stem are in fact branches and do not have their own roots as they are connected to the vascular system of the main stem.

Basal suckers can be easily removed and rooted and even aerial suckers (branches) can be removed and rooted. This poses a problem when wild collected suckers are traded as artificially propagated seedlings.

In comparison to seed grown material, suckers have the following characteristics. There may be no central thick root but several smaller secondary roots from around the base of the stem, the roots are clearly narrower and younger than the stem, and older secondary roots may be damaged where cut from next to the parent plant. The plants may not be completely symmetrical, and may show flattening on one or more sides from pressure exerted by the parent plant or where the sucker was cut from the parent plant. Suckers may bear a complete or several whorls of leaves and these may form a crown off centre to the stem, especially where a sucker is growing at an angle to the parent or where the terminal bud has been previously damaged. The old leaf bases may be large, whereas the new leaves have the same size leaf bases.

[Images, from left: Encephalartos spp. showing suckers; Australian Cycas spp. with sucker; Encephalartos altensteinii showing scar where sucker removed.]

Are Suckers Artificially Propagated?

A sucker taken from a wild plant and cultivated in a nursery is only artificially propagated if the mother plant:

- fulfils the criteria of legally cultivated parental stock
- is grown under controlled conditions
- has been obtained in accordance with the provisions of CITES



Slide 47: Are Suckers Artificially Propagated?

In order to determine whether suckers from a cycad are artificially propagated, we have to look into Resolution Conf. 11.11 (Rev. CoP15) which states that the term ‘artificially propagated’ shall be interpreted to refer to plant specimens grown a) “under controlled conditions” and b) “from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that [...] have been derived from cultivated parental stock”

If the sucker has been taken from a wild plant cultivated in a nursery under controlled conditions, the sucker is only artificially propagated if the mother plant fulfils the criteria of being legally cultivated parental stock, that it has been obtained in accordance with the provisions of CITES and grown under controlled conditions.

‘Under controlled conditions’ means in a non-natural environment that is **intensively manipulated** by human intervention. Characteristics of controlled conditions are soil preparation, fertilization, weed control or use of insecticides, irrigation, and nursery operations like regular repotting, removal of dead plant parts and protection against unfavourable weather.

However, one has to keep in mind that the mother plant itself which has been legally taken from the wild and brought into a nursery can only be regarded as legally cultivated parental stock, and can never be regarded as artificially propagated, no matter how long it is cultivated in the nursery.

Source: Giddy, C. (1984). *Cycads of South Africa*. C Struik, Cape Town.

[Image: suckers growing out of the trunk of a *Cycas revoluta* plant (Appendix II).]

Control of Seeds

- Seeds of Appendix II cycads are exempt from CITES
- Seeds of Appendix I cycads can only be traded for commercial purposes if they meet the definition of artificial propagation



Slide 48: Control of Seeds

Cycad seeds are in international trade for horticultural purposes, i.e. to raise cultivated plants from seed. Fresh cycad seeds have a brightly coloured fleshy covering (yellow, pink or red). However, most trade is not in fresh seeds: the fleshy covering is usually removed before seeds enter international trade. The clean seeds have a woody seed coat and the kernels are extremely toxic.

All cycads included in **Appendix II** carry the annotation #4 which excludes seeds from the provisions of CITES. **They can be traded without CITES permits.**

For all cycads included in **Appendix I** of CITES, the **seeds are regulated in trade** e.g. the Latin American genus *Ceratozamia* and the African genus *Encephalartos*. Their seeds have to meet the same requirements as live plants: trade for primarily commercial purposes is not allowed if the seeds do not fulfil the definition of artificial propagation.

The definition of artificial propagation in Res. Conf. 11.11 was specifically modified to take into account plants grown from wild-collected seed of Appendix I species. For full details see Res. Conf. 11.11 (Rev. CoP15). If the seed has been taken from a wild plant cultivated in a nursery under controlled conditions, the seed is only artificially propagated if the mother plant fulfils the criteria of being legally cultivated parental stock, above all that is has been obtained in accordance with the provisions of CITES and grown under controlled conditions.

[Images: seeds of *Encephalartos* spp. (Appendix I).]

Exemptions



Annotation #4
excludes
seeds, spores,
pollen, tissue
cultures and
cut flowers
from artificially
propagated
plants from
CITES control



Slide 49: Exemptions

When plants are listed in the CITES Appendices the listing may be **annotated**. The aim of the **annotation** is to target the listing at the plants and the parts and derivatives which are likely to be traded from the wild and which can also be identified. Certain species or parts of plants may be exempted from a listing.

Generally, no annotations apply to Appendix I listings; in that case **all** of the plant **and** its parts and its 'readily recognisable' derivatives are controlled. No special exemptions apply to cycads presently listed in Appendix I of the Convention.

All cycad taxa included in Appendix II carry the standard annotation #4. This annotation, in the case of cycads, excludes from CITES control seeds, spores and pollen (including pollinia), tissue cultures and cut flowers from artificially propagated plants.

[Images, from left: seeds of Ceratozamia spp. (Appendix I); Dioon edule (Appendix II).]

Implementation: Summary

In this section we have outlined:

- An inspection checklist
- CITES definition of 'artificial propagation'
- How to distinguish wild from artificially propagated plants
- The control of suckers and seeds
- Exemptions

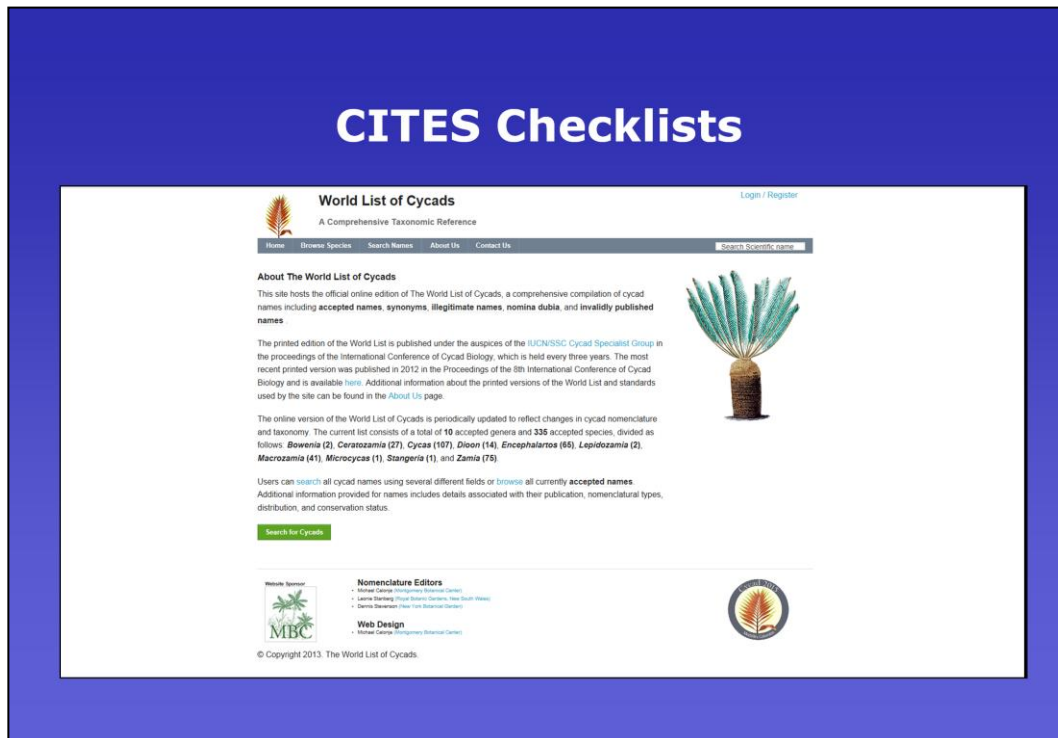
Slide 50: Implementation: Summary

We have covered the following key issues in the implementation of CITES for cycads:

- An inspection checklist.
- The CITES definition of 'artificial propagation'.
- How to distinguish wild from artificially propagated plants.
- The control of suckers and seeds.
- Exemptions.

For more information on enforcement issues and training check the CITES website:
www.cites.org

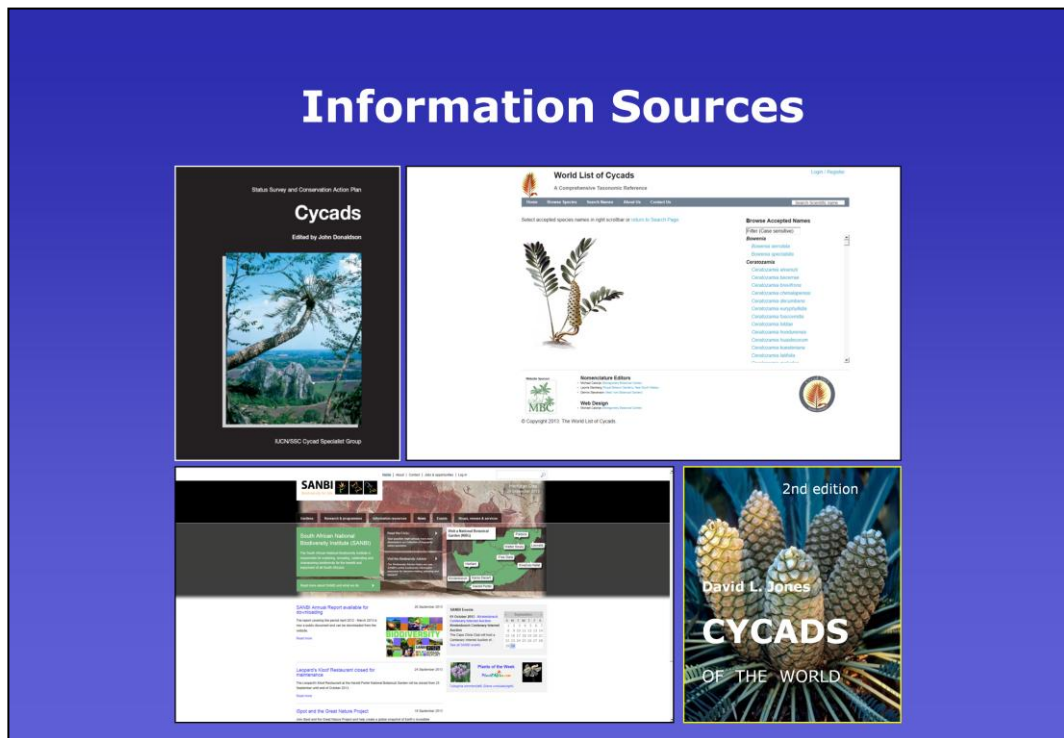
Additional Slides



Slide 52: CITES Checklists

To aid CITES Parties in finding the correct accepted name for a plant or animal the CITES Plants and Animals Committees recommend the adoption of standard references. Resolution Conference 12.11 (Rev. CoP16) includes the most recent list of standard references. For Cycads the standard reference is *The World List of Cycads* (D. W. Stevenson, R. Osborne and K. D. Hill, 1995; In: P. Vorster (Ed.), *Proceedings of the Third International Conference on Cycad Biology*, pp. 55-64, Cycad Society of South Africa, Stellenbosch).

This list is now out of date. The CITES Plants Committee is in the process of reviewing suitable updates and the Committee will recommend that a new list be adopted at the 17th meeting of the Conference of the Parties. It is likely that the most recent version of the cycad list: *The World List of Cycads*. R. Osborne, M. A. Calonje, K. D. Hill, L. Stanberg & D. W. Stevenson (2012). In: *Proceedings of the 8th International Conference on Cycad Biology* (CYCAD 2008), January 2008, Panama City, Panama. *Memoirs of the New York Botanical Garden* 106:480-510 will be recommended to CoP17. For this reason and to allow the Parties an opportunity to assess the updated list, the most recent version, prepared in CITES plant checklist format, has been included as an annex to this user guide.



Slide 53: Information Sources

One of the main sources regarding the conservation of cycads world wide is contained in the Cycad Action Plan published by the IUCN Cycad Specialist Group in 2003. Containing an assessment of the main threats that cycads are facing, it makes recommendations for an improved cycad management plan. Donaldson J.S. (ed.). (2003). *Cycads. Status Survey and Conservation Action Plan*. IUCN/SSC Cycad Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. ix + 86 pp.

Cycads of the World by David Jones has a 97 page introductory text followed by fact sheets of all species with photos and distribution maps. Jones, D.L. (2002). *Cycads of the World, edition 2*. Smithsonian Institution Press, Washington, D.C.

The IUCN Cycad Specialist Group publishes and regularly updates the **World List of Cycads**. The most recent version dates from 2012. It contains the scientific names of all accepted species together with synonyms, distribution range and an assessment of population status of the species using the IUCN threat categories. Osborne, R., Calonje, M.A., Hill, K.D., Stanberg, L. & Stevenson, D.W. (2012). *The World List of Cycads*. In: *Proceedings of the 8th International Conference on Cycad Biology (CYCAD 2008)*, January 2008, Panama City, Panama. *Memoirs of the New York Botanical Garden* 106:480-510.

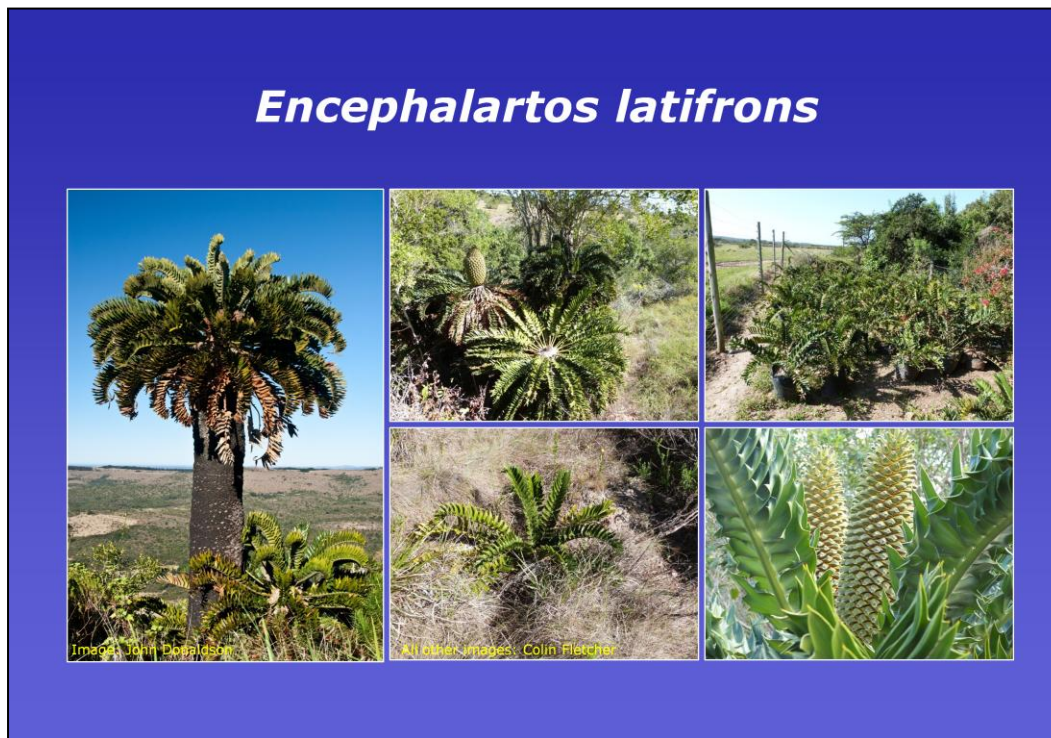
Cycad pages: An online botanical database, including access to the **World List of Cycads**, is available at <http://plantnet.rbgsyd.nsw.gov.au/PlantNet/cycad/>.

CITES Annual Reports are the only means of monitoring the level of international trade in specimens of species included in the Appendices. The CITES Trade Database, managed by UNEP-WCMC on behalf of the CITES Secretariat currently holds 6 million records of trade in wildlife and ca. 30,000 scientific names of taxa listed by CITES. Around 500,000 records of trade in CITES-listed species of wildlife are reported annually and entered into the database. This can be queried and data downloaded from the UNEP-WCMC website: <http://www.unep-wcmc-apps.org/citestrade/trade.cfm>

Fairchild Tropical Botanical Garden is involved in scientific research to support cycad conservation, and is home to a large collection of cycads: <http://www.fairchildgarden.org>

The Royal Botanic Gardens, Kew holds the UK national collection of *Encephalartos* species. Specimens can be found in the Palm House, Temperate House and Evolution House. <http://www.kew.org/plants/cycads/>

The South African National Biodiversity Institute (SANBI) leads and coordinates research, and monitors and reports on the state of biodiversity in South Africa: www.sanbi.org



Slide 54: *Encephalartos latifrons*

This South African cycad, commonly known as the Albany cycad, has declined to the point where fewer than 60 plants exist in the wild. It is sought after by collectors and the removal of relatively large numbers of plants has been recorded, sometimes by helicopter, with some plants recovered by law enforcement and conservation agencies. Due to the possible extinction of its pollinator (a type of weevil) and the wide separation of male and female plants this species no longer sets seed and is therefore functionally extinct.

The remaining plants all occur on private land outside protected conservation areas. Some farmers have been protecting this plant on their own land and it is due to their efforts that the cycad still occurs on private land. A species management plan, involving all the stakeholders, was developed for the Albany cycad which recognises this positive role and supports use of seeds derived from these well managed populations to propagate seedlings. The cycads are hand pollinated, the seed collected and grown on in the nursery. The nursery is registered, and permits are then issued to the landowner allowing him to sell the seedlings. Trade in seedlings derived in this way is consistent with the amendments to the CITES definition of artificially propagated (Res. Conf. 11.11 (Rev. CoP15)), which were made specifically to accommodate this type of conservation action. In this case, 85% of seedlings can be sold by the landowner, 10% are used for conservation research and 5% returned to the wild to bulk up the remaining wild population.

In addition, the management plan recognises the need to expand the genepool by reintroducing genotypes from *ex situ* collections such as the cycad collection at Kirstenbosch Botanical Garden, which was established in ca. 1916. Kirstenbosch has been growing plants for reintroduction but also has a surplus, i.e. more plants than can be realistically introduced. Part of the overall plan is to use these plants to raise awareness and increase funding for the restoration efforts. Funding raised by the project will be managed by the South African National Biodiversity Institute, a not for profit statutory body, and the IUCN SSC Cycad Specialist Group.

Source: www.cycadsg.org; IUCN Red List; www.sanbi.org

[Images: all *Encephalartos latifrons* in habitat, except top, far right showing *E. latifrons* nursery.]

Cycas revoluta: the Supermarket Plant

Appendix II:

- Not threatened
- Confined to Japan
- Millions of propagated plants in trade



Slide 55: *Cycas revoluta*: the Supermarket Plant

Cycas revoluta is a medium sized cycad with a trunk of up to 3m. Distributed on the Ryuku Islands and several other southern Japanese islands, it grows in colonies on hillsides and often represents the dominant component of the vegetation. It is not regarded as threatened by IUCN. As with all other *Cycas* species except for *Cycas beddomei*, it is included in Appendix II of CITES.

Cycas revoluta is the most commonly cultivated and heavily traded species of all cycads, with 48 million plants exported between 2000 and 2010. The exporters are Costa Rica, Taiwan (PoC), Malaysia and China. In the horticultural trade, the species is known as Sago Palm. It is propagated by seed and through basal suckers and trunk offsets.

Cycas revoluta can be easily distinguished from other species by its strongly revolute margins of the leaflets.

[Image: *Cycas revoluta* (Appendix II).]

Encephalartos altensteinii

Appendix I:

- Vulnerable
- Confined to South Africa
- 200-500 propagated plants exported per year



Slide 56: *Encephalartos altensteinii*

Encephalartos altensteinii is a medium to large-sized cycad which has trunks of up to 5m tall and grows in clumps of up to three stems. It is endemic to South Africa and distributed on a small coastal stretch in the Eastern Cape Province. Its conservation status has been assessed as “Vulnerable” by IUCN. The whole genus *Encephalartos* is included in CITES Appendix I.

The species is well known because it is common in cultivation. It can be propagated from seed and by removal of suckers which transplant readily. Possibly the oldest pot plant in the world is a specimen of *E. altensteinii*, which was brought to Kew by Francis Masson in 1775 where it continues to be on display in the Palm House.

Artificially propagated plants of *Encephalartos altensteinii* are exported on a regular basis from South Africa. Between 2000 and 2010 a total of 5,100 live specimens and nearly 9,000 seeds were exported. The annual exports ranged from 200-500 plants per year in this period.

[Image: *Encephalartos altensteinii* (Appendix I) in the Palm House at Kew.]

Dioon edule



Image: Pietro Zito



Image: Uwe Schippmann

Slide 57: *Dioon edule*

Dioon edule is small to medium sized, its trunk reaching 1m in height, with an obliquely erect crown of slender but stiff blue-green leaves. Coming from Mexico where it is widely distributed in the Sierra Madre Oriental mountains, this species is included in CITES Appendix II.

Dioon edule is under threat from forest clearance and the removal of plants from the wild for landscaping and plant collections. The species is easily grown in cultivation, but many thousands have been removed for use as ornamentals, mainly to markets in the USA. The Latin name of this species means 'edible', and, although all parts of cycads are toxic, the seeds of *Dioon edule* have also been extensively used as food, being ground into a flour which is then boiled or roasted to remove the toxins. A further threat to the species is the common practice of cutting the crowns off mature plants, mainly for use as decorations. This practice has all but eliminated seed production in some areas, resulting in little or no regeneration. Although *Dioon edule* still has a relatively large population and range, the extremely slow rates of growth and reproduction typical of cycads limit the population's ability to recover from the ongoing decline. In Mexico, this species forms part of a village nursery project supervised by cycad experts where wild seeds are collected, grown in local villages to market size with a percentage of plants re-introduced to their habitat.

Sources: Vovides, A.P., Pérez-Farrera, M.A. and Iglesias, C. (2006). *Sixteen years of cycad propagation in rural nurseries in Mexico: An alternative conservation strategy aimed at sustainable management*. Available at:

<http://www.fondoeltriunfo.org/pdf/16%20yrs%20of%20cycad%20consevation-%20RP.pdf>

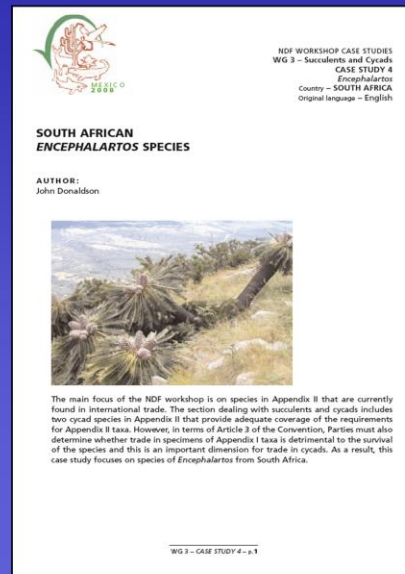
www.Arkive.org

[Images, left and centre: *Dioon edule* (Appendix II); right: a *Dioon edule* plant which has re-grown after its crown had been chopped off by plant collectors in its natural habitat in Mexico.]

The CITES Non-Detriment Finding

Article IV of Convention:

- an export permit shall only be granted when, *inter alia*, "a Scientific Authority of the state of export has advised that such export will not be detrimental to the survival of that species".



Slide 58: The CITES Non-Detriment Finding

The aim of CITES is to ensure that international trade in specimens of wild animals and plants does not threaten their survival in the wild. Appendix I includes those species 'threatened with extinction which are or may be affected by trade'. Trade in wild specimens of Appendix I taxa for commercial purposes is in effect banned under CITES. Appendix II includes 'all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to regulation in order to avoid utilisation incompatible with their survival'. Trade is allowed in wild Appendix II species subject to permits being issued.

Before granting an export permit for Appendix II plants a CITES Management Authority must fulfil Article IV of the Convention. This states that an export permit shall only be granted when, *inter alia*, 'a Scientific Authority of the state of export has advised that such export will not be detrimental to the survival of that species'. **This is, in effect, a statement of sustainability which in CITES is termed a non-detriment finding (NDF).** Resolution Conf. 16.7 recommends non-binding guiding principles and information for CITES Scientific Authorities to use in the making of NDFs.

This Resolution had its genesis at a major workshop in Cancun in November 2008, where guidelines were prepared on how to best assess whether an export is detrimental or not. This has resulted in, *inter alia*, a series of fact sheets, four of which deal with cycads species. They are available for download at:

http://www.conabio.gob.mx/institucion/cooperacion_internacional/TallerNDF/wfunctioning.html. The latest workshop took place in Viet Nam in 2012, and case studies were prepared for *Cycas elongata*, *C. pachypoda* and *C. pectinata*.

GLOSSARY

Axil – the upper angle formed where a leaf meets the stem.

Basal sucker - a shoot which grows from a bud at the base of the stem or from its roots. This shoot then becomes, or takes the form of, a singular plant.

Bi-pinnate - a pinnate leaf with the leaflets again subdivided pinnately, i.e. twice pinnate. This, for example is found in *Bowenia* and some of the species of *Cycas*.

Dioecious – having either only male flowers or only female flowers on one plant.

Disjunct – having a marked separation between distributions of natural populations.

Diversity – number of taxa in a local area (α -diversity or local diversity) or in a region (β -diversity).

Endemic – refers to a taxon that is native to a certain limited area or region and is not found in the wild in other places.

Genus (pl. genera) – taxonomic rank below family but above species.

Gymnosperm – refers to any vascular plant that produces exposed seeds not enclosed in an ovary, or within plant tissue, as opposed to an angiosperm (flowering plant) whose seeds are enclosed by mature ovaries, or fruits. Gymnosperms do not produce flowers.

Inflorescence – refers to the cluster or arrangement of flowers or the flowering part of a plant on a branch or stem.

IUCN Red List – is the world's most comprehensive, objective assessment system of the global conservation status of declining plant and animal species published by The International Union for the Conservation of Nature and Natural Resources (IUCN). Available at: www.redlist.org

The extinction risk is expressed using the following threat categories: EW = Extinct in the Wild; CR = Critically Endangered; EN = Endangered; and VU = Vulnerable. Other categories used are NT = Near Threatened; LC = Least Concern; DD = Data Deficient and NE = Not Evaluated.

Lamina – the expanded part of a leaf.

Leafbase - is the slightly expanded area where the leaf attaches to the stem.

Leaflet - a segment of a bipinnate leaf but generally also used loosely for pinnate.

Midrib – describes the strengthened vein down the centre of a flower petal or leaf.

Morphology – study of the size, shapes, and arrangement of parts of organisms in relation to such general principles as evolutionary relations, function, and development. It includes aspects of the outward appearance (shape, structure, colour, pattern) as well as the form and structure of the internal parts.

Petiole - the stalk of a leaf; in a cycad leaf that section between the expanded base and the first leaflet.

Pinnate – describes a leaf structure where there are leaflets on each side of a common axis in a featherlike arrangement.

Revolute margins – refers to leaf margins which are rolled down towards the back or lower surface of the leaf.

Rhachis – the main axis of an entire or compound leaf of a cycad, extending from the petiole to the end of the lamina.

Sucker – a shoot or bud that develops on the roots of a plant. The process is called suckering and is used by plants to vegetatively reproduce.

Susceptible – means yielding readily to changes. An entity that lacks the inherent ability to resist threats or attacks is susceptible.

Taxon (pl. taxa) – is a level of biological classification within a scientific system that categorizes living organisms based on their characteristics.

Transpire – is the process whereby water is given off through the plant surface. In plant transpiration, water and waste products are emitted through the stomata on the plant's leaves.

Trunk offset – a trunk offset is a mature bulbil. A bulbil is a small or immature, secondary bulb, or bulb-shaped growth arising from the leaf axil or an inflorescence. They are planted to produce new plants which then form an offset.

Xerophytic – adapted to life in a dry habitat by means of mechanisms to prevent water loss or to store available water.

Annex

CITES and Cycads: Checklist

2013

**Roy Osborne, Michael A. Calonje, Ken D. Hill, Leonie Stanberg and
Dennis Wm. Stevenson.**

Based on

The World List of Cycads

Roy Osborne, Michael A. Calonje, Ken D. Hill, Leonie Stanberg and Dennis Wm. Stevenson. 2012. In: Proceedings of the 8th International Conference on Cycad Biology (CYCAD 2008), January 2008, Panama, City, Panama, *Memoirs of the New York Botanical Garden* 106: 480-510.

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Formatted in line with standards used in CITES Plant Checklists by Rebecca Pullinger, Royal Botanic Gardens, Kew, 2013.

PART I: CYCAD BINOMIALS IN CURRENT USE
Ordered alphabetically on All Names for the genera:

*Bowenia, Ceratozamia, Cycas, Dioon, Encephalartos,
Lepidozamia, Macrozamia, Microcycas, Stangeria and Zamia*

ALL NAMES.....**ACCEPTED NAMES**

Aulacophyllum.....*Zamia*

Aulacophyllum lindeni.....*Zamia lindeni*

Aulacophyllum montanum.....*Zamia montana*

Aulacophyllum ortgiesii.....*Zamia chigua*

Aulacophyllum roezlii.....*Zamia roezlii*

Aulacophyllum skinneri.....*Zamia skinneri*

Aulacophyllum wallisii.....*Zamia wallisii*

Bowenia serrulata

Bowenia specatabis

Bowenia spectabilis var. *serrata* F.M.Bailey.....*Bowenia serrulata*

Bowenia spectabilis var. *serrulata* W.Bull.....*Bowenia serrulata*

Catakidozamia.....*Lepidozamia*

Catakidozamia hopei.....*Lepidozamia hopei*

Ceratozamia alvarezii

Ceratozamia beccerae

Ceratozamia boliviana.....*Zamia boliviana*

Ceratozamia brevifrons

Ceratozamia chimalapensis

Ceratozamia decumbens

Ceratozamia euryphyllidia

Ceratozamia fuscoviridis

Ceratozamia hildae

Ceratozamia hondurensis

Ceratozamia huastecorum

Ceratozamia intermedia.....**Ceratozamia mexicana**

Ceratozamia katzeriana.....**Zamia katzeriana**

Ceratozamia kuesteriana

Ceratozamia latifolia

Ceratozamia longifolia.....**Ceratozamia mexicana**

Ceratozamia matudae

Ceratozamia mexicana

Ceratozamia mexicana var. *tenuis*.....**Ceratozamia vovidesii**

Ceratozamia microstrobila

Ceratozamia miqueliana

Ceratozamia mirandae

Ceratozamia mixeorum

Ceratozamia morettii

Ceratozamia norstogii

Ceratozamia robusta

Ceratozamia sabatoi

Ceratozamia santillanii

Ceratozamia vovidesii

Ceratozamia whitelockiana

Ceratozamia zaragozae

Ceratozamia zoquorum

Chigua bernalii.....**Zamia restrepoi**

Chigua restrepoi.....**Zamia restrepoi**

Cycas aculeata

Cycas acuminatissima.....**Cycas sexseminifera**

Cycas aenigma

Cycas angulata

Cycas annaikalensis

Cycas apoa

Cycas arenicola

Cycas armstrongii

Cycas arnhemica

Cycas arnhemica subsp. *muninga*

Cycas arnhemica subsp. *natja*

Cycas badensis

Cycas baguanheensis.....**Cycas panzhihuaensis**

Cycas balansae

Cycas basaltica

Cycas beddomei

Cycas bellefontii.....**nomen dubium**

Cycas bifida

- Cycas bougainvilleana**
Cycas brachycantha
Cycas brevipinnata..... **Cycas**
sexseminifera
Cycas brunnea
Cycas caffra..... **Encephalartos**
caffer/
E. longifolius

Cycas cairnsiana
Cycas calcicola
Cycas campestris
Cycas canalis
Cycas canalis subsp. *carinata*..... **Cycas canalis**
Cycas candida
Cycas cantafolia
Cycas celebica..... **Cycas rumphii**
Cycas chamaoensis
Cycas chamberlainii..... **Cycas riuminiana**
Cycas changjiangensis
Cycas chevalieri
Cycas circinalis
Cycas circinalis f. *glauca*..... **Cycas glauca**
Cycas circinalis f. *gothanii*..... **nomen dubium**
Cycas circinalis subsp. *circinalis* forma *undulata*..... **Cycas circinalis**
Cycas circinalis subsp. *madagascariensis*..... **Cycas thourarsii**
Cycas circinalis subsp. *madagascariensis* f. *trigonocarpoidea*..... **Cycas thourarsii**
Cycas circinalis subsp. *papuana*..... **Cycas papuana**
Cycas circinalis subsp. *papuana* var. *scratchleyana*..... **Cycas**
scratchleyana
Cycas circinalis subsp. *riuminiana*..... **Cycas riuminiana**
Cycas circinalis subsp. *riuminiana* var. *curranii*..... **Cycas curranii**
Cycas circinalis subsp. *riuminiana* var. *chamberlainii*... **Cycas riuminiana**
Cycas circinalis subsp. *riuminiana* var. *curranii* f. *graminea*..... **Cycas wadei**
Cycas circinalis subsp. *riuminiana* var. *curranii* f. *maritima* **Cycas edentata**
Cycas circinalis subsp. *seemannii*..... **Cycas seemannii**
Cycas circinalis subsp. *thourarsii*..... **Cycas thourarsii**
Cycas circinalis subsp. *vera* var. *beddomei*..... **Cycas beddomei**
- Cycas circinalis* subsp. *vera* var. *pectinata*..... **Cycas pectinata**
Cycas circinalis var. *angustifolia*..... **Cycas circinalis**
Cycas circinalis var. *javana*..... **Cycas javana**
Cycas circinalis var. *orixensis*..... **Cycas sphaerica**
Cycas clivicola
Cycas clivicola subsp. *lutea*..... **Cycas clivicola**
Cycas collina
Cycas condaoensis
Cycas conferta
Cycas couttsiana
Cycas crassipes..... **Cycas**
sexseminifera

Cycas cupida
Cycas curranii
Cycas debaoensis
Cycas desolata
Cycas diannanensis
Cycas dolichophylla
Cycas edentata
Cycas elephantipes
Cycas elongata
Cycas fairylakea..... **Cycas**
szechuanensis
subsp.
fairylakea

Cycas falcata
Cycas ferruginea
Cycas fugax
Cycas furfuracea
Cycas glauca
Cycas gracilis Miq..... **Cycas media**
Cycas gracilis Y.Y.Huang, Y.C.Zhong & Z.F.Fu..... **nomen illeg.**
Cycas gracilis var. *glauca*..... **Cycas media**
Cycas gracilis var. *viridis*..... **Cycas media**
Cycas guizhouensis
Cycas hainanensis

Cycas hainanensis subsp. *changjiangensis*..... *Cycas*
changjiangensis
Cycas hoabinhensis
Cycas hongheensis
Cycas hypoleuca..... *nomen dubium*
Cycas immersa..... *Cycas siamensis*
Cycas indica
Cycas inermis
Cycas javana
Cycas jenkinsiana..... *Cycas pectinata*
Cycas kennedyana..... *Cycas media*
Cycas lacrimans
Cycas lane-poolei
Cycas lindstromii
Cycas lingshuiensis..... *Cycas hainanensis*
Cycas litoralis..... *Cycas edentata*
Cycas longiconifera..... *Cycas*
segmentifida
Cycas longipetiolula..... *Cycas bifida* x
Cycas
multipinaata
Cycas
sexseminifera
Cycas
segmentifida
Cycas maconochiei
Cycas maconochiei subsp. *lanata*
Cycas maconochiei subsp. *viridis*
Cycas macrocarpa
Cycas madagascariensis..... *Cycas thoursii*
Cycas media
Cycas media subsp. *ensata*
Cycas media subsp. *banksii*
Cycas megacarpa
Cycas micholitzii
Cycas micholitzii var. *simplicipinna*..... *Cycas*
simplicipinna
Cycas micronesica
Cycas miquellii..... *Cycas revoluta*
Cycas montana
Cycas multifida..... *Cycas*
segmentifida
Cycas bifida x *C.*
dolichophylla
Cycas
guizhouensis
Cycas multipinnata
Cycas nathorstii
Cycas nitida
Cycas nongnoochiae
Cycas normanbyana..... *Cycas media*
Cycas ophiolitica
Cycas orientis
Cycas pachypoda
Cycas palmatifida..... *Cycas balansae*
Cycas panzhihuaensis
Cycas papuana
Cycas parvulus..... *Cycas diannanensis*
Cycas pectinata
Cycas pectinata var. *elongata*..... *Cycas elongata*
Cycas pectinata var. *manhaensis*..... *Cycas diannanensis*
Cycas petraea
Cycas platyphylla
Cycas pranburiensis
Cycas pruinosa
Cycas pygmaea..... *nomen dubium*
Cycas revoluta
Cycas revoluta var. *prolifera*..... *Cycas revoluta*
Cycas revoluta var. *robusta*..... *Cycas revoluta*
Cycas revoluta var. *brevifrons*..... *Cycas revoluta*
Cycas revoluta var. *planifolia*..... *Cycas revoluta*
Cycas riuminiana
Cycas rumphii
Cycas rumphii f. *undulata*..... *Cycas circinalis*

<i>Cycas rumphii</i> subsp. <i>zeylanica</i>	<i>Cycas zeylanica</i>
<i>Cycas rumphii</i> var. <i>bifida</i>	<i>Cycas bifida</i>
<i>Cycas rumphii</i> var. <i>timorensis</i>	<i>Cycas glauca</i>
<i>Cycas sancti-lasallei</i>	
<i>Cycas saxatilis</i>	
<i>Cycas schumanniana</i>	
<i>Cycas scratchleyana</i>	
<i>Cycas seemannii</i>	
<i>Cycas segmentifida</i>	
<i>Cycas semota</i>	
<i>Cycas septemsperma</i>	<i>Cycas</i> sexseminifera
<i>Cycas sexseminifera</i>	
<i>Cycas shanyaensis</i>	
<i>Cycas shiwandashanica</i>	<i>Cycas balansae</i>
<i>Cycas siamensis</i>	
<i>Cycas siamensis</i> subsp. <i>balansae</i>	<i>Cycas balansae</i>
<i>Cycas silvestris</i>	
<i>Cycas simplicipinna</i>	
<i>Cycas sphaerica</i>	
<i>Cycas spiniformis</i>	<i>Cycas</i> sexseminifera
<i>Cycas sundaica</i>	
<i>Cycas swamyi</i>	<i>Cycas indica</i>
<i>Cycas szechuanensis</i>	
<i>Cycas szechuanensis</i> subsp. <i>fairylakea</i>	
<i>Cycas taitungensis</i>	
<i>Cycas taiwaniana</i>	
<i>Cycas tanqingii</i>	
<i>Cycas tansachana</i>	
<i>Cycas terryana</i>	<i>C. media</i> x <i>C.</i> <i>ophiolitica</i>
<i>Cycas thouarsii</i>	
<i>Cycas tonkinensis</i>	nomen dubium
<i>Cycas tropophylla</i>	
<i>Cycas truncata</i>	<i>Cycas riuminiana</i>
<i>Cycas tuckeri</i>	
<i>Cycas undulata</i>	<i>Cycas circinalis</i>
<i>Cycas verspertilio</i>	
<i>Cycas wadei</i>	
<i>Cycas wallichii</i>	<i>Cycas circinalis</i>
<i>Cycas xilingensis</i>	<i>Cycas</i> segmentifida
<i>Cycas xipholepis</i>	
<i>Cycas yorkiana</i>	
<i>Cycas zambalensis</i>	
<i>Cycas zeylanica</i>	
<i>Dioon aculeatum</i>	<i>Dioon</i> angustifolium
<i>Dioon angustifolium</i>	
<i>Dioon argenteum</i>	
<i>Dioon califanoi</i>	
<i>Dioon caputoi</i>	
<i>Dioon edule</i>	
<i>Dioon edule</i> f. <i>angustifolium</i>	<i>Dioon</i> angustifolium
<i>Dioon edule</i> subsp. <i>angustifolium</i>	<i>Dioon</i> angustifolium
<i>Dioon edule</i> var. <i>angustifolium</i>	<i>Dioon</i> angustifolium
<i>Dioon edule</i> var. <i>lanuginosum</i>	<i>Dioon edule</i>
<i>Dioon edule</i> var. <i>latipinnium</i>	<i>Dioon mejiae</i>
<i>Dioon edule</i> var. <i>sonorensis</i>	<i>Dioon sonorensis</i>
<i>Dioon holmgrenii</i>	
<i>Dioon imbricatum</i>	<i>Dioon edule</i>
<i>Dioon mejiae</i>	
<i>Dioon merolae</i>	
<i>Dioon purpusii</i>	
<i>Dioon rzedowskii</i>	
<i>Dioon sonorensis</i>	
<i>Dioon spinulosum</i>	
<i>Dioon stevensonii</i>	
<i>Dioon strobilacea</i>	<i>Dioon edule</i>
<i>Dioon tomasellii</i>	

Encephalartos macrostrobilus
Encephalartos manikensis
Encephalartos marumii..... **Encephalartos**
altensteinii
Encephalartos marunguensis
Encephalartos mauritanus..... **Encephalartos**
longifolius
Encephalartos middelburgensis
Encephalartos msinganus
Encephalartos munchii
Encephalartos nanus..... **Encephalartos**
horridus
Encephalartos natalensis
Encephalartos ngoyanus
Encephalartos nubimontanus
Encephalartos paucidentatus
Encephalartos poggei
Encephalartos princeps
Encephalartos pterogonus
Encephalartos pungens..... **nomen dubium**
Encephalartos relictus
Encephalartos schaijesii
Encephalartos schmitzii
Encephalartos sclavoi
Encephalartos senticosus
Encephalartos septentrionalis
Encephalartos spinulosus..... **Encephalartos**
lehmannii
Encephalartos striatus..... **nomen dubium**
Encephalartos successibus..... **Encephalartos**
whitelockii
Encephalartos tegulaneus
Encephalartos tegulaneus subsp. **powysii**
Encephalartos transvenosus
Encephalartos tridentatus..... **nomen dubium**
Encephalartos trispinosus
Encephalartos turneri

Encephalartos umbeluziensis
Encephalartos venetus..... **Encephalartos**
nubimontanus
Encephalartos dolomiticus
Encephalartos verrucosus..... **Encephalartos**
Encephalartos villosus
Encephalartos volensis..... **Encephalartos**
kisambo
Encephalartos vroomii..... **nomen dubium**
Encephalartos whitelockii
Encephalartos woodii
Epicycas..... **Cycas**
Epicycas elongata..... **Cycas elongata**
Epicycas lindstromii..... **Cycas lindstromii**
Epicycas micholitzii..... **Cycas micholitzii**
Epicycas miquelii..... **Cycas revoluta**
Epicycas multipinnata..... **Cycas**
multipinnata
Epicycas siamensis..... **Cycas siamensis**
Epicycas tonkinensis..... **nomen dubium**
Lepidozamia hopei
Lepidozamia peroffskyana
Lomaria eriopus..... **Stangeria eriopus**
Macrozamia cardiocensis
Macrozamia communis
Macrozamia concinna
Macrozamia conferta
Macrozamia corallipes..... **Macrozamia**
spiralis
Macrozamia cranei
Macrozamia crassifolia
Macrozamia cylindrica..... **?Macrozamia**
miquelii or **Macrozamia**
johnsonii
Macrozamia denisonii..... **Lepidozamia**
peroffskyana

Macrozamia diplomera
Macrozamia douglasii
Macrozamia dyeri
Macrozamia elegans
Macrozamia fawcettii
Macrozamia fearsidei
Macrozamia flexuosa
Macrozamia fraseri
Macrozamia glaucophylla
Macrozamia heteromera
Macrozamia hopei..... **Lepidozamia hopei**
Macrozamia humilis
Macrozamia johnsonii
Macrozamia lomandroides
Macrozamia longispina
Macrozamia lucida
Macrozamia macdonnellii
Macrozamia machinii
Macrozamia mackenziei..... **Macrozamia miquelii**
Macrozamia macleayi
Macrozamia miquelii
Macrozamia montana
Macrozamia moorei
Macrozamia mountperriensis
Macrozamia occidua
Macrozamia oldfieldii..... **Macrozamia fraseri**
Macrozamia parcifolia
Macrozamia pauli-guilelmi
Macrozamia pauli-guilelmi subsp. *flexuosa*..... **Macrozamia flexuosa**
Macrozamia pauli-guilelmi subsp. *plurinervia*..... **Macrozamia plurinervia** and **Macrozamia concinna**
Macrozamia peroffskyana..... **Lepidozamia peroffskyana**
Macrozamia platyrhachis
Macrozamia plurinervia
Macrozamia polymorpha
Macrozamia preissii..... **Macrozamia fraseri**
Macrozamia reducta
Macrozamia riedlei
Macrozamia secunda
Macrozamia serpentina
Macrozamia spiralis
Macrozamia stenomera
Macrozamia viridis
Microcycas calocoma
Platyzamia..... **Dioon**
Platyzamia rigida..... **Dioon edule**
Stangeria eriopus
Stangeria katzeri..... **Stangeria eriopus**
Stangeria paradoxa..... **Stangeria eriopus**
Stangeria schizodon..... **Stangeria eriopus**
Zamia acuminata
Zamia allison-armourii..... **Zamia pumila**
Zamia amazonum
Zamia amblyphyllidia..... **Zamia erosa**
Zamia amplifolia
Zamia angustifolia
Zamia angustissima..... **Zamia angustifolia**
Zamia barauquiniana Hort. ex Regel..... **nomen illeg.**
Zamia barauquiniana Mast..... **Zamia poeppigiana**
Zamia boliviana
Zamia brongniartii..... **nomen illeg.**
Zamia bussellii..... **Zamia onan-reyesii**

Zamia caffra..... Encephalartos
caffer
Zamia calocoma..... Microcycas
calocoma
Zamia chamberlainii..... *Zamia pygmaea*
Zamia chigua
Zamia cremnophila
Zamia cunaria
Zamia cupatiensis..... *Zamia ulei*
Zamia cycadifolia Dyer..... nomen illeg.
Zamia cycadifolia Jacq..... Encephalartos
cycadifolius
Zamia cycadis..... Encephalartos
caffer
Zamia debilis..... *Zamia pumila*
Zamia decumbens
Zamia dentata..... ?*Zamia*
integrifolia
Zamia disodon
Zamia dressleri
Zamia elegantissima
Zamia encephalartoides
Zamia erosa
Zamia fairchildiana
Zamia fischeri
Zamia floridana..... *Zamia integrifolia*
Zamia floridana var. *umbrosa*..... *Zamia integrifolia*
Zamia furfuracea
Zamia furfuracea var. *trewii*..... *Zamia furfuracea*
Zamia galeotti..... *Zamia loddigesii*
Zamia gentryi
Zamia gomeziana
Zamia grijalvensis
Zamia guggenheimiana..... *Zamia*
angustifolia
Zamia gutierrezii..... *Zamia muricata*
Zamia hamannii

Zamia herrerae
Zamia horrida..... Encephalartos
horridus
Zamia huilensis
Zamia humilis..... nomen illeg.
Zamia hymenophyllidia
Zamia imperialis
Zamia incognita
Zamia inermis
Zamia integrifolia
Zamia ipetiensis
Zamia jirjirimensis..... *Zamia lecointei*
Zamia katzeriana
Zamia kickxii..... *Zamia pygmaea*
Zamia lacandona
Zamia laeta..... nomen illeg.
Zamia lanuginosa..... Encephalartos
longifolius
Zamia latifolia..... *Zamia furfuracea*
Zamia latifoliolata..... *Zamia pumila*
Zamia lawsoniana..... *Zamia loddigesii*
Zamia lecointei
Zamia leiboldii..... *Zamia loddigesii*
Zamia leiboldii var. *angustifolia*..... *Zamia loddigesii*
Zamia leiboldii var. *latifolia*..... *Zamia loddigesii*
Zamia lindleyi
Zamia lindleyi
Zamia loddigesii
Zamia loddigesii var. *angustifolia*..... *Zamia loddigesii*
Zamia loddigesii var. *longifolia*..... *Zamia loddigesii*
Zamia loddigesii var. *obtusifolia*..... *Zamia loddigesii*
Zamia longifolia..... Encephalartos
longifolius
Zamia lucayana
Zamia macrochiera
Zamia madida..... *Zamia manicata*
Zamia maeleni..... *Dioon edule*

Zamia manicata	
<i>Zamia media</i>	Zamia integrifolia
Zamia meermanii	
Zamia melanorrhachis	
<i>Zamia mexicana</i>	Zamia loddigesii
Zamia montana	
Zamia monticola	
<i>Zamia multifoliolata</i>	Zamia angustifolia
Zamia muricata	
<i>Zamia muricata</i> var <i>angustifolia</i>	Zamia muricata
<i>Zamia muricata</i> var. <i>obtusifolia</i>	Zamia muricata
Zamia nana	
Zamia nesophila	
Zamia neurophyllidia	
<i>Zamia noeffiana</i>	nomen dubium
<i>Zamia obdensis</i>	Zamia lecointei
Zamia obliqua A.Braun	
<i>Zamia obliqua</i> Regel ex A.Ducos.....	nomen illeg.
<i>Zamia oligodonta</i>	Zamia montana
Zamia onan-reyesii	
Zamia oreillyi	
<i>Zamia ottonis</i>	Zamia pygmea
<i>Zamia pallida</i>	nomen illeg.
Zamia paucijuga	
<i>Zamia picta</i>	Zamia variegata
Zamia poeppigiana	
<i>Zamia polymorpha</i>	Zamia prasina
Zamia portoricensis	
<i>Zamia potemkinii</i>	nomen dubium
Zamia prasina	
Zamia pseudomonticola	
Zamia pseudoparasitica	
Zamia pumila	
<i>Zamia pungens</i>	nomen dubium
Zamia purpurea	
Zamia pygmaea	
	Zamia pyrophylla
	Zamia restrepoi
	Zamia roezlii
	Zamia sandovalii
	<i>Zamia silicea</i>
	Zamia pygmea
	<i>Zamia silvicola</i>
	Zamia integrifolia
	Zamia skinneri
	Zamia soconuscensis
	Zamia sparteae
	<i>Zamia splendens</i>
	Zamia katzerina
	Zamia standleyi
	Zamia stevensonii
	Zamia stricta
	<i>Zamia sylvatica</i>
	Zamia loddigesii
	<i>Zamia tenuis</i>
	Zamia integrifolia
	Zamia tolimensis
	Zamia tuerckheimii
	Zamia ulei
	<i>Zamia umbrosa</i>
	Zamia integrifolia
	Zamia urep
	Zamia variegata
	Zamia vazquezii
	<i>Zamia vernicosa</i>
	Encephalartos
	altensteinii
	nomen dubium
	<i>Zamia verschaffeltii</i>
	Zamia wallisii
	<i>Zamia wielandii</i>
	nomen illeg.
	<i>Zamia yatesii</i>
	Zamia angustifolia

BOWENIA BINOMIALS IN CURRENT USE

Bowenia serrulata (W.Bull) Chamb.

Bowenia spectabilis var. *serrata* F.M.Bailey

Bowenia spectabilis var. *serrulata* W.Bull

Distribution: Australia

Bowenia spectabilis Hook. ex Hook. f.

Distribution: Australia

PART II: ACCEPTED NAMES IN CURRENT USE

Ordered alphabetically on Accepted Names for the genera:

Bowenia, *Ceratozamia*, *Cycas*, *Dioon*, *Encephalartos*,
Lepidozamia, *Macrozamia*, *Microcycas*, *Stangeria* and *Zamia*

CERATOZAMIA BINOMIALS IN CURRENT USE

Ceratozamia alvarezii Pérez-Farr., Vovides & Iglesias

Distribution: Mexico

Ceratozamia beccerrae Pérez-Farr., Vovides & Schutzman

Distribution: Mexico

Ceratozamia brevifrons Miq.

Distribution: Mexico

Ceratozamia chimalapensis Pérez-Farr. & Vovides

Distribution: Mexico

Ceratozamia decumbens Vovides, Avendaño, Pérez-Farr. & Gonz.-Astorga

Distribution: Mexico

Ceratozamia euryphylidia Vázq. Torres, Sabato & D.W.Stev.

Distribution: Mexico

Ceratozamia fuscoviridis Moore ex R.Osborne, D.W.Stev. & Vovides

Distribution: Mexico

Ceratozamia hildae G.P.Landry & M.C.Wilson

Distribution: Mexico

Ceratozamia hondurensis J.L.Haynes, Whitelock, Schutzman & R.S.Adams

Distribution: Honduras

Ceratozamia huastecorum Avendaño, Vovides & Cast.- Campos

Distribution: Mexico

Ceratozamia kuesteriana Regel

Distribution: Mexico

Ceratozamia latifolia Miq.

Distribution: Mexico

Ceratozamia matudae Lundell

Distribution: Guatemala, Mexico

Ceratozamia mexicana Brongn.

Ceratozamia intermedia Miq.

Ceratozamia longifolia Miq.

Distribution: Mexico

Ceratozamia microstrobila Vovides & J.D.Rees

Distribution: Mexico

Ceratozamia miqueliana H.Wendl.

Distribution: Mexico

Ceratozamia mirandae Vovides, Pérez- Farr. & Iglesias

Distribution: Mexico

Ceratozamia mixeorum Chemnick, T.J.Greg. & Salas-Mor

Distribution: Mexico

Ceratozamia morettii Vázq.Torres & Vovides

Distribution: Mexico

Ceratozamia norstogii D.W.Stev.

Distribution: Mexico

Ceratozamia robusta Miq.

Distribution: Belize, Guatemala, Mexico

Ceratozamia sabatoi Vovides, Vázq.Torres, Schutzman & Iglesias

Distribution: Mexico

Ceratozamia santillanii Pérez- Farr. & Vovides

Distribution: Mexico

Ceratozamia vovidesii Pérez- Farr. & Iglesias

Ceratozamia mexicana var. *tenuis* Dyer

Distribution: Mexico

Ceratozamia whitelockiana Chemnick & T.J.Greg.

Distribution: Mexico

Ceratozamia zaragozae Medellín

Distribution: Mexico

Ceratozamia zoquorum Pérez- Farr., Vovides & Iglesias

Distribution: Mexico

CYCAS BINOMIALS IN CURRENT USE

Cycas aculeata K.D.Hill & T.H.Nguyên

Distribution: Vietnam

Cycas aenigma K.D.Hill & A.Lindstr.

Distribution: Philippines

Cycas angulata R.Br

Distribution: Australia

Cycas annaikalensis Rita Singh & P.Radha

Distribution: India

Cycas apoa K.D.Hill

Distribution: Indonesia, Papua New Guinea

Cycas arenicola K.D.Hill

Distribution: Australia

Cycas armstrongii Miq.

Distribution: Australia

Cycas arnhemica K.D.Hill

Distribution: Australia

Cycas arnhemica subsp. **muninga** Chirgwin & K.D.Hill

Distribution: Australia

Cycas arnhemica subsp. **natja** K.D.Hill

Distribution: Australia

Cycas badensis K.D.Hill

Distribution: Australia

Cycas balansae Warb.

Cycas palmatifida Hung T.Chang, Y.Y. Huang & Y.C.Zhong

Cycas shiwandashanica Hung T.Chang & Y.C.Zhong

Cycas siamensis subsp. *balansae* (Warb.) J.Schust.

Distribution: China, Vietnam

Cycas basaltica C.A.Gardner

Distribution: Australia

Cycas beddomei Dyer

Cycas circinalis subsp. *vera* var. *beddomei* (Dyer) J.Schust

- Distribution: India
- Cycas bifida** (Dyer) K.D.Hill
Cycas rumphii var. *bifida* Dyer
- Distribution: China, Vietnam
- Cycas bougainvilleana** K.D.Hill
- Distribution: Papua New Guinea, Solomon Islands
- Cycas brachycantha** K.D.Hill, T.H.Nguyên & P.K.Lôc
- Distribution: Vietnam
- Cycas brunnea** K.D.Hill
- Distribution: Australia
- Cycas cairnsiana** F.Muell.
- Distribution: Australia
- Cycas calcicola** Maconochie
- Distribution: Australia
- Cycas campestris** K.D.Hill
- Distribution: Papua New Guinea
- Cycas canalis** K.D.Hill
Cycas canalis subsp. *carinata* K.D.Hill
- Distribution: Australia
- Cycas candida** K.D.Hill
- Distribution: Australia
- Cycas cantafolia** Jutta, K.L.Chew & Saw
- Distribution: Malaysia
- Cycas chamaoensis** K.D.Hill
- Distribution: Thailand
- Cycas changjiangensis** N.Liu
Cycas hainanensis subsp. *changjiangensis* (N.Liu) N.Liu
- Distribution: China
- Cycas chevalieri** Leandri
- Distribution: Vietnam
- Cycas circinalis** L.
Cycas circinalis subsp. *circinalis* forma *undulata* (Hort. ex Gaudich.) J.Schust.
Cycas circinalis var. *augustifolia* Miq.
Cycas rumphii f. *undulata* (Desf. ex Gaudich.) Kaneh
Cycas undulata Desf. ex Gaudich

Cycas wallichii Miq.

Distribution: India

Cycas clivicola K.D.Hill

Cycas clivicola subsp. *lutea* K.D.Hill

Distribution: Cambodia, Malaysia, Thailand, Vietnam

Cycas collina K.D.Hill, T.H.Nguyễn & P.K.Lôc

Distribution: Vietnam

Cycas condaoensis K.D.Hill & S.L.Yang

Distribution: Vietnam

Cycas conferta Chirgwin ex Chirgwin & Wigston

Distribution: Australia

Cycas couttsiana K.D.Hill

Distribution: Australia

Cycas cupida P.I.Forst.

Distribution: Australia

Cycas curranii (J.Schust.) K.D.Hill

Cycas circinalis subsp. *riuminiana* var. *curranii* J.Schust.

Distribution: Philippines

Cycas debaoensis Y.C.Zhong & C.J.Chen

Distribution: China

Cycas desolata P.I.Forst.

Distribution: Australia

Cycas diannanensis Z.T.Guan & G.D.Tao

Cycas parvulus S.L.Yang

Cycas pectinata var. *manhaoensis* C.J.Chen & P.Yun

Distribution: China, ?Vietnam

Cycas dolichophylla K.D.Hill, T.H.Nguyễn & P.K.Lôc

Distribution: China, Vietnam

Cycas edentata de Laub.

Cycas circinalis subsp. *riuminiana* var. *curranii* f. *maritima* J.Schust.

Cycas litoralis K.D.Hill

Distribution: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam

- Cycas elephantipes** A.Lindstr. & K.D.Hill
Distribution: Thailand
- Cycas elongata** (Leandri) D.Yue Wang
Cycas pectinata var. *elongata* Leandri
Epicycas elongata (Leandri) S.L.Yang ex de Laub.
Distribution: Vietnam
- Cycas falcata** K.D.Hill
Distribution: Indonesia
- Cycas ferruginea** F.N.Weii
Distribution: China, Vietnam
- Cycas fugax** K.D.Hill, T.H.Nguyễn & P.K.Lôc
Distribution: Vietnam
- Cycas furfuracea** W.Fitzg.
Distribution: Australia
- Cycas glauca** Hort. ex Miq.
Cycas circinalis f. *glauca* (Miq.) J.Schust.
Cycas rumphii var. *timorensis* Miq.
- Distribution: East Timor, Indonesia
- Cycas guizhouensis** K.M.Lan & R.F.Zou
Cycas multiovola D.Yue Wang
Distribution: China
- Cycas hainanensis** C.J.Chen
Cycas lingshuiensis G.A.Fu
Distribution: China
- Cycas hoabinhensis** P.K.Lôc & T.H.Nguyễn
Distribution: Vietnam
- Cycas hongheensis** S.Y.Yang & S.L.Yang ex D.Yue Wang
Distribution: China
- Cycas indica** A.Lindstr. & K.D.Hill
Cycas swamyi Rita Singh & P.Radha
Distribution: India
- Cycas inermis** Lour.
Distribution: Vietnam

Cycas javana (Miq.) de Laub
Cycas circinalis var. *javana* Miq.

Distribution: Indonesia

Cycas lacrimans A.Lindstr. & K.D.Hill

Distribution: Philippines

Cycas lane-poolei C.A.Gardner

Distribution: Australia

Cycas lindstromii S.L.Yang, K.D.Hill & T.H.Nguyễn
Epicycas lindstromii (S.L.Yang, K.D.Hill & T.H.Nguyễn) de Laub.

Distribution: Vietnam

Cycas maconochiei Chirgwin & K.D.Hill

Distribution: Australia

Cycas maconochiei subsp. **lanata** K.D.Hill

Distribution: Australia

Cycas maconochiei subsp. **viridis** K.D.Hill

Distribution: Australia

Cycas macrocarpa Griff.

Distribution: Malaysia, Thailand

Cycas media R.Br

Cycas normanbyana F. Muell.

Cycas gracilis Miq.

Cycas gracilis var. *glauca* Regel

Cycas gracilis var. *viridis* Regel

Cycas kennedyana F. Muell.

Distribution: Australia

Cycas media subsp. **ensata** K.D.Hill

Distribution: Australia

Cycas media subsp. **banksii** K.D.Hill

Distribution: Australia

Cycas megacarpa K.D.Hill

Distribution: Australia

Cycas micholitzii Dyer

Dyerocycas micholitzii (Dyer) Nakai

Epicycas micholitzii (Dyer) de Laub.

Distribution: ? Laos, Vietnam

- Cycas micronesica** K.D.Hill
 Distribution: Guam (Dependent Territory USA), Micronesia, Northern Mariana Islands (DT USA), Palau
- Cycas montana** A.Lindstr. & K.D.Hill
 Distribution: Indonesia
- Cycas multipinnata** C.J.Chen & S.Y.Yang
Epicycas multipinnata (C.J.Chen & S.Y.Yang) de Laub.
 Distribution: China, Vietnam
- Cycas nathorstii** J.Schust.
 Distribution: India, Sri Lanka
- Cycas nitida** K.D.Hill & A.Lindstr.
 Distribution: Philippines
- Cycas nongnoochiae** K.D.Hill
 Distribution: Thailand
- Cycas ophiolitica** K.D.Hill
 Distribution: Australia
- Cycas orientis** K.D.Hill
 Distribution: Australia
- Cycas pachypoda** K.D.Hill
 Distribution: Vietnam
- Cycas panzhihuaensis** L.Zhou & S.Y.Yang
Cycas baguanheensis L.K.Fu & S.Z.Cheng
 Distribution: China
- Cycas papuana** F.Muell.
Cycas circinalis subsp. *papuana* (F.Muell.) J.Schust.
 Distribution: Indonesia, Papua New Guinea
- Cycas pectinata** Buch.-Ham.
Cycas circinalis subsp. *vera* var. *pectinata* (Griff.) J.Schust.
Cycas jenkinsiana Griff.
 Distribution: Bangladesh, Bhutan, China, India, Laos, Myanmar, Nepal, Thailand, Vietnam
- Cycas petraea** A.Lindstr. & K.D.Hill
 Distribution: Thailand

Cycas platyphylla K.D.Hill

Distribution: Australia

Cycas pranburiensis S.L.Yang, W.Tang, K.D.Hill & Vatch.

Distribution: Thailand

Cycas pruinosa Machonochie

Distribution: Australia

Cycas revoluta Thunb.

Cycas miquelii Warb.

Cycas revoluta var. *prolifera* Siebold & Zucc.

Cycas revoluta var. *robusta* Messeri

Cycas revoluta var. *brevifrons* Miq.

Cycas revoluta var. *planifolia* Miq.

Epicycas miquelii (Warb.) de Laub.

Distribution: ?China, Japan

Cycas riuminiana Porte ex Regel

Cycas chamberlainii W.H.Br. & Kienholz

Cycas circinalis subsp. *riuminiana* (Porte ex Regel) J.Schust.

Cycas circinalis subsp. *riuminiana* var. *curranii* f. *chamberlainii* (W.H.Br. &

Kienholz) J.Schust

Cycas truncatade Laub.

Distribution: Philippines

Cycas rumphii Miq.

Cycas celebica Miq.

Distribution: Australia, Indonesia, Papua New Guinea

Cycas sancti-lasallei Agoo & Madulid

Distribution: Philippines

Cycas saxatilis K.D.Hill & A.Lindstr.

Distribution: Philippines

Cycas schumanniana Lauterb.

Distribution: Papua New Guinea

Cycas scratchleyana F.Muell.

Cycas circinalis subsp. *papuana* var. *scratchleyana* (F.Muell.) J.Schust.

Distribution: Indonesia, Papua New Guinea

Cycas seemannii A.Braun

Cycas circinalis subsp. *seemannii* (A.Braun) J.Schust.

Distribution: Australia, Fiji, New Caledonia, Tonga, Vanuatu

Cycas segmentifida D.Yue Wang & C.Y. Deng

Cycas longiconifera Hung T. Chang, Y.C. Zhong & Y.Y. Huang

Cycas langlinensis Hung T. Chang & Y.C. Zhong

Cycas multifida Hung T. Chang & Y.C. Zhong
Cycas xilingensis Hung T. Chang & Y.C. Zhong

Distribution: China, Vietnam

Cycas semota K.D.Hill

Distribution: Australia

Cycas sexseminifera F.N.Wei

Cycas acuminatissima Hung T.Chang, Y.C.Zhong & Z.F.Lu
Cycas brevipinnata Hung T.Chang, Y.Y.Huang & Y.C.Zhong
Cycas crassipes Hung T.Chang, Y.C.Zhong & Z.F.Lu
Cycas longisporophylla F.N.Wei
Cycas septemsperma Hung T.Chang, Y.Y.Huang & H.X.Zheng
Cycas spiniformis J.Y.Liang

Distribution: China, Vietnam

Cycas shanyaensis G.A.Fu

Distribution: China

Cycas siamensis Miq.

Cycas immersa Craib
Epicycas siamensis (Miq.) de Laub

Distribution: Cambodia, Laos, Myanmar, Thailand, Vietnam

Cycas silvestris K.D.Hill

Distribution: Australia

Cycas simplicipinna (Smitinand) K.D.Hill

Cycas micholitzii var. *simplicipinna* Smitinand

Distribution: Laos, ?Myanmar, Thailand, Vietnam

Cycas sphaerica Roxb.

Cycas circinalis var. *orixensis* Haines

Distribution: India

Cycas sundaica Miq. ex A.Lindstr. & K.D.Hill

Distribution: Indonesia

Cycas szechuanensis C.Y.Cheng, W.C.Cheng & L.K.Fu

Distribution: China

Cycas szechuanensis subsp. **fairylakea** (D.Yue Wang) N.Liu

Cycas fairylakea D.Yue Wang

Distribution: China

Cycas taitungensis C.F. Shen, K.D.Hill, C.H.Tsou & C.J.Chen

Distribution: China

Cycas taiwaniana Carruth.

Distribution: China

Cycas tanqingii D. Yue Wang

Distribution: China, ?Vietnam

Cycas tansachana K. D. Hill & S. L. Yang

Distribution: Thailand

Cycas thouarsii R. Br. ex Gaudich.

Cycas circinalis subsp. *madagascariensis* (Miq.) J. Schust.

Cycas circinalis subsp. *madagascariensis* f. *trigonocarpooides* J. Schust.

Cycas circinalis subsp. *thouarsii* (R. Br. ex Gaudich.) Engl

Cycas madagascariensis Miq.

Distribution: Comoros, Kenya, Madagascar, Mozambique, Seychelles, Tanzania

Cycas tropophylla K. D. Hill & P. K. Lôt

Distribution: Vietnam

Cycas tuckeri K. D. Hill

Distribution: Australia

Cycas versperilio A. Lindstr. & K. D. Hill

Distribution: Australia

Cycas wadei Merr.

Cycas circinalis subsp. *riuminiana* var. *curranii* f. *graminea* J. Schust.

Distribution: Philippines

Cycas xipholepis K. D. Hill

Distribution: Australia

Cycas yorkiana K. D. Hill

Distribution: Australia

Cycas zambalensis Madulid & Agoo

Distribution: Philippines

Cycas zeylanica (J. Schust.) A. Lindstr. & K. D. Hill

Cycas rumphii subsp. *zeylanica* J. Schust

Distribution: India, Sri Lanka

DIOON BINOMIALS IN CURRENT USE

Dioon angustifolium Miq.

Dioon aculeatum Lem.

Dioon edule f. *angustifolium* (Miq.) Miq.

Dioon edule subsp. *angustifolium* (Miq.) A.E.Murray

Dioon edule var. *angustifolium* (Miq.) Miq

Distribution: Mexico

Dioon argenteum T.J.Greg., Chemnick, Salas-Mor. & Vovides

Distribution: Mexico

Dioon califanoi De Luca & Sabato

Distribution: Mexico

Dioon caputoi De Luca, Sabato & Vázq. Torres

Distribution: Mexico

Dioon edule Lindl.

Dioon edule var. *lanuginosum* Wittm.

Dioon imbricatum Miq.

Dioon strobilaceum Lem. ex A.DC.

Platyzamia rigida Zucc.

Zamia maeleni Miq.

Distribution: Mexico

Dioon holmgrenii De Luca, Sabato & Vázq. Torres

Distribution: Mexico

Dioon mejiae Standl. & L.O.Williams

Dioon edule var. *latipinnium* Dyer

Distribution: Honduras

Dioon merolae De Luca, Sabato & Vázq. Torres

Distribution: Mexico

Dioon purpusii Rose

Distribution: Mexico

Dioon rzedowskii De Luca, A.Moretti, Sabato & Vázq. Torres

Distribution: Mexico

Dioon sonorensis (De Luca, Sabato & Vázq. Torres) Chemnick, T.J.Greg. & Salas-Mor.

Dioon edule var. *sonorensis* (De Luca, Sabato & Vázq. Torres) McVaugh & Pérez de la Rosa

Dioon tomasellii var. *sonorensis* De Luca, Sabato & Vázq. Torres

Distribution: Mexico

Dioon spinulosum Dyer ex Eichler

Distribution: Mexico

Dioon stevensonii Nic.- Mor. & Vovides

Distribution: Mexico

Dioon tomasellii De Luca, Sabato & Vázq. Torres

Distribution: Mexico

ENCEPHALARTOS BINOMIALS IN CURRENT USE

Encephalartos aemulans Vorster

Distribution: South Africa

Encephalartos altensteinii Lehm.

Encephalartos marumii De Vriese
Zamia vernicosa Mast.

Distribution: South Africa

Encephalartos aplanatus Vorster

Distribution: Swaziland

Encephalartos arenarius R.A.Dyer

Distribution: South Africa

Encephalartos barteri Carruth. ex Miq.

Distribution: Benin, Ghana, Nigeria, ?Togo

Encephalartos barteri subsp. allochrous L.E.Newton

Distribution: Nigeria

Encephalartos brevifoliolatus Vorster

Distribution: South Africa

Encephalartos bubalinus Melville

Distribution: Kenya, Tanzania

Encephalartos caffer (Thunb.) Lehm.

Encephalartos brachyphyllus Lehm. & De Vriese

Zamia cycadis L. f.

?*Cycas caffra* Thunb.

Zamia caffra (Thunb.) Thunb.

Distribution: South Africa

Encephalartos cerinus Lavranos & D.L.Goode

Distribution: South Africa

Encephalartos chimanimaniensis R.A.Dyer & I.Verd.

Distribution: Mozambique, Zimbabwe

Encephalartos concinnus R.A.Dyer & I.Verd.

Distribution: Zimbabwe

Encephalartos cupidus R.A.Dyer

Distribution: South Africa

Encephalartos cycadifolius (Jacq.) Lehm.

Encephalartos acanthus Mast.

Encephalartos elongatus Miq.

Encephalartos eximius I.Verd.

Zamia cycadifolia Jacq.

Distribution: South Africa

Encephalartos delucanus Malaisse, Sclavo & Crosiers

Distribution: Tanzania

Encephalartos dolomiticus Lavranos & D.L.Goode

Encephalartos verrucosus Vorster, Robbertse & S. van der Westh.

Distribution: South Africa

Encephalartos dyerianus Lavranos & D.L.Goode

Encephalartos graniticola Robbertse, Vorster & S. van der Westh.

Distribution: South Africa

Encephalartos equatorialis P.J.H.Hurter

Encephalartos imbricans Vorster

Distribution: Uganda

Encephalartos eugene-maraisii I. Verd.

Distribution: South Africa

Encephalartos ferox G. Bertol

Encephalartos kosiensis Hutch.

Distribution: Mozambique, South Africa

Encephalartos friderici-guilielmi Lehm.

Distribution: South Africa

Encephalartos ghellinckii Lem.

Distribution: South Africa

Encephalartos gratus Prain

Distribution: Malawi, Mozambique

Encephalartos heenanii R.A. Dyer

Distribution: South Africa, Swaziland

Encephalartos hildebrandtii A. Braun & C.D. Bouché

?*Encephalartos hildebrandtii* var. *dentatus* Melville

Distribution: Kenya, Tanzania

Encephalartos hirsutus P.J.H. Hurter

Distribution: South Africa

Encephalartos horridus (Jacq.) Lehm.

Encephalartos nanus Lehm.

Zamia horrida Jacq.

Distribution: South Africa

Encephalartos humilis I. Verd.

Distribution: South Africa

Encephalartos inopinus R.A. Dyer

Distribution: South Africa

Encephalartos ituriensis Bamps and Lisowski

Distribution: Democratic Republic of the Congo

Encephalartos kisambo Fadan & Beentje

Encephalartos voiensis A. Moretti, D.W. Stev. & Sclavo

?*Encephalartos kanga* Pócs & Q. Luke

Distribution: Kenya

Encephalartos laevifolius Stapf & Burtt Davy

Distribution: South Africa, Swaziland

Encephalartos lanatus Stapf & Burtt Davy

Distribution: South Africa

Encephalartos latifrons Lehm.

Distribution: South Africa

Encephalartos laurentianus De Wild.

Distribution: Angola, Democratic Republic of the Congo

Encephalartos lebomboensis I. Verd.

Distribution: Mozambique, South Africa, Swaziland

Encephalartos lehmannii Lehm.

Encephalartos spinulosus Lehm.

Distribution: South Africa

Encephalartos longifolius (Jacq.) Lehm.

Encephalartos lanuginosus (Jacq.) Lehm.

Encephalartos mauritianus Miq.

Zamia lanuginosa Jacq.

Zamia longifolia Jacq.

Distribution: South Africa

Encephalartos mackenziei L.E. Newton

Distribution: South Sudan

Encephalartos macrostrobilus S.Jones & Wynants

Distribution: Uganda

Encephalartos manikensis (Gilliland) Gilliland

Distribution: Mozambique, Zimbabwe

Encephalartos marunguensis Devred

Distribution: Democratic Republic of the Congo

Encephalartos middelburgensis Vorster, Robbertse & S.van der Westh.

Encephalartos eugene-maraisii subsp. *middelburgensis* Lavranos & D.L.Goode

Distribution: South Africa

Encephalartos msinganus Vorster

Distribution: South Africa

Encephalartos munchii R.A.Dyer & I.Verd.

Distribution: Mozambique

Encephalartos natalensis R.A.Dyer & I.Verd.

Distribution: South Africa

Encephalartos ngoyanus I.Verd.

Distribution: South Africa, Swaziland

Encephalartos nubimontanus P.J.H.Hurter

Encephalartos venetus Vorster

Distribution: South Africa

Encephalartos paucidentatus Stapf & Burtt Davy

Distribution: South Africa, Swaziland

Encephalartos poggei Asch.

Encephalartos lemarinelianus De Wild. & T.Durnad

Distribution: Democratic Republic of the Congo

Encephalartos princeps R.A.Dyer

Distribution: South Africa

Encephalartos pterogonus R.A.Dyer & I.Verd.

Distribution: Mozambique

Encephalartos relictus P.J.H.Hurter

Distribution: Swaziland

Encephalartos schajiesii Malaisse, Sclavo & Crosiers

Encephalartos flavistrobilus I.Turner & Sclavo

Distribution: Democratic Republic of the Congo

Encephalartos schmitzii Malaisse

Distribution: Democratic Republic of the Congo, Zambia

Encephalartos sclavoi A. Moretti, D.W.Stev. & De Luca

Distribution: Tanzania

Encephalartos senticosus Vorster

Distribution: South Africa, Swaziland

Encephalartos septentrionalis Schweinf.

Distribution: South Sudan, Uganda

Encephalartos villosus Lem.

Distribution: South Africa, Swaziland

Encephalartos whitelockii P.J.H.Hurter
Encephalartos succisibus Vorster

Distribution: Uganda

Encephalartos woodii Sander

Distribution: South Africa

Encephalartos tegulaneus Melville

Distribution: Kenya

Encephalartos tegulaneus subsp. **powysii** Miringu & Beentje

Distribution: Kenya

Encephalartos transvenosus Stapf & Burttt Davy

Distribution: South Africa

Encephalartos trispinosus (Hook.) R.A.Dyer
Encephalartos horridus var. *trispinosus* Hook.

Distribution: South Africa

Encephalartos turneri Lavranos & D.L.Goode

Distribution: Mozambique

Encephalartos umbeluziensis R.A.Dyer

Distribution: Mozambique, Swaziland

LEPIDOZAMIA BINOMIALS IN CURRENT USE

Lepidozamia hopei (W.Hill) Regel

Catakidozamia hopei W.Hill

Macrozamia hopei C.Moore

Distribution: Australia

Lepidozamia peroffskyana Regel

Macrozamia denisonii C.Moore & F.Muell.

Macrozamia peroffskyana (Regel) Miq.

Distribution: Australia

MACROZAMIA BINOMIALS IN CURRENT USE

Macrozamia cardiacensis P.I.Forst. & D.L.Jones

Distribution: Australia

Macrozamia communis L.A.S.Johnson

Distribution: Australia

Macrozamia concinna D.L.Jones

Distribution: Australia

Macrozamia conferta D.L.Jones & P.I.Forst.

Distribution: Australia

Macrozamia cranei D.L.Jones & P.I.Forst.

Distribution: Australia

Macrozamia crassifolia P.I.Forst. & D.L.Jones

Distribution: Australia

Macrozamia diplomera (F.Muell.) L.A.S.Johnson

Distribution: Australia

Macrozamia douglasii W. Hill ex F.M.Bailey

Distribution: Australia

Macrozamia dyeri (F.Muell.) C.A.Gardner

Distribution: Australia

Macrozamia elegans K.D.Hill & D.L.Jones

Distribution: Australia

Macrozamia fawcettii C.Moore

Distribution: Australia

Macrozamia fearnsidei D.L.Jones

Distribution: Australia

Macrozamia flexuosa C.Moore

Macrozamia pauli-guilielmi subsp. *flexuosa* (C.Moore) L.A.S.Johnson

Distribution: Australia

Macrozamia fraseri Miq.

Macrozamia olafieldii (Miq.) A.DC.

Macrozamia preissii Lehm.

Distribution: Australia

Macrozamia glaucophylla D.L.Jones

Distribution: Australia

Macrozamia heteromera C.Moore

Distribution: Australia

Macrozamia humilis D.L.Jones

Distribution: Australia

Macrozamia johnsonii D.L.Jones & K.D.Hill

?*Macrozamia cylindrica* C.Moore

Distribution: Australia

Macrozamia lomandroides D.L.Jones

Distribution: Australia

- Macrozamia longispina** P.I.Forst. & D.L.Jones
Distribution: Australia
- Macrozamia lucida** L.A.S. Johnson
Distribution: Australia
- Macrozamia macdonnellii** (F.Muell. ex Miq.) A.DC.
Distribution: Australia
- Macrozamia machinii** P.I.Forst. & D.L.Jones
Distribution: Australia
- Macrozamia macleayi** Miq.
Distribution: Australia
- Macrozamia miquelii** (F.Muell) A.DC.
Macrozamia mackenziei Hort. ex Mast.
? *Macrozamia cylindrica* C.Moore
Distribution: Australia
- Macrozamia montana** K.D.Hill
Distribution: Australia
- Macrozamia moorei** F.Muell.
Distribution: Australia
- Macrozamia mountperriensis** F.M.Bailey
Distribution: Australia
- Macrozamia occidua** D.L.Jones & P.I.Forst.
Distribution: Australia
- Macrozamia parcifolia** P.I.Forst. & D.L.Jones
Distribution: Australia
- Macrozamia pauli-guilielmi** W. Hill & F.Muell.
Distribution: Australia
- Macrozamia platyrhachis** F.M.Bailey
Distribution: Australia
- Macrozamia plurinervia** (L.A.S.Johnson) D.L.Jones
Macrozamia pauli-guilielmi subsp. *plurinervia* L.A.S.Johnson
Distribution: Australia

Macrozamia polymorpha D.L.Jones

Distribution: Australia

Macrozamia viridis D.L.Jones & P.I.Forst.

Distribution: Australia

Macrozamia reducta K.D.Hill & D.L.Jones

Distribution: Australia

Macrozamia riedlei (Gaudich.) C.A.Gardner

Distribution: Australia

Macrozamia secunda C.Moore

Distribution: Australia

Macrozamia serpentina D.L.Jones & P.I.Forst.

Distribution: Australia

Macrozamia spiralis (Salisb.) Miq.

Macrozamia corallipes Hook. f.

Distribution: Australia

Macrozamia stenomera L.A.S.Johnson

Distribution: Australia

MICROCASCAS BINOMIALS IN CURRENT USE

Microcycas calocoma (Miq.) A.DC.

Zamia calocoma Miq.

Distribution: Cuba

STANGERIA BINOMIALS IN CURRENT USE

Stangeria eriopus (Kunze) Baill.

Lomaria eriopus Kunze

Stangeria katzeri Regel

Stangeria paradoxa T. Moore

Stangeria schizodon Bull

Distribution: South Africa

ZAMIA BINOMIALS IN CURRENT USE

Zamia acuminata Oerst. ex Dyer

Distribution: Costa Rica

Zamia amazonum D.W.Stev.

Distribution: Brazil, Columbia, Ecuador, Peru, Venezuela

Zamia amplifolia W.Bull ex Mast.

Distribution: Colombia

Zamia angustifolia Jacq.

Zamia angustissima Miq.

Zamia guggenheimiana Carabia

Zamia multifoliolata A.DC.

Zamia yatesii Miq.

Distribution: Bahamas, Cuba

Zamia boliviana (Brongn.) A.DC.

Ceratozamia boliviana Brongn.

Distribution: Bolivia, Brazil

Zamia chigua Seem.

Aulacophyllum ortgiesii Regel

Distribution: Colombia

Zamia cremnophila Vovides, Schutzman & Dehgan

Distribution: Mexico

Zamia cunaria Dressler & D.W.Stev.

Distribution: Panama

Zamia decumbens Calonje, Meerman, M.P.Griff. & Hoese

Distribution: Belize

Zamia disodon D.W.Stev. & Sabato

Distribution: Colombia

Zamia dressleri D.W.Stev.

Distribution: Panama

Zamia elegantissima Schutzman, Vovides & R.S.Adams

Distribution: Panama

Zamia encephalartoides D.W.Stev.

Distribution: Colombia

Zamia erosa O.F.Cook & G.N.Collins
Zamia amblyphyllidia D.W.Stev.

Distribution: Cuba, Jamaica, Puerto Rico (DT USA)

Zamia fairchildiana L.D.Gómez

Distribution: Costa Rica, Panama

Zamia fischeri Miq.

Distribution: Mexico

Zamia furfuracea L. f.

Zamia furfuracea var. *trewii* A.DC.

Zamia latifolia Lodd. ex Miq.

Distribution: Mexico

Zamia gentryi Dodson

Distribution: Ecuador

Zamia gomeziana R.H.Acuña

Distribution: Costa Rica

Zamia grijalvensis Pérez-Farr., Vovides, & Mart. -Camilo

Distribution: Mexico

Zamia hamannii A.S.Taylor, J.L.Haynes & Holzman

Distribution: Panama

Zamia herrerae S.Calderón & Standl.

Distribution: El Salvador, Guatemala, Mexico

Zamia huilensis Calonje, H.E.Esquivel & D.W.Stev.

Distribution: Colombia

Zamia hymenophyllidia D.W.Stev.

Distribution: Colombia, Peru

Zamia imperialis A.S.Taylor, J.L.Haynes & Holzman

Distribution: Panama

Zamia incognita A.Lindstr. & Idárraga

Distribution: Colombia

Zamia inermis Vovides, J.D.Rees & Vázq. Torres

Distribution: Mexico

Zamia integrifolia L. f.

- Zamia floridana* A.DC.
- Zamia floridana* var. *umbrosa* Small
- Zamia media* Jacq.
- Zamia silvicola* Small
- Zamia tenuis* Willd.
- Zamia umbrosa* Small

Distribution: Bahamas, Cayman Islands (UK Overseas Territory), Cuba, USA

Zamia ipetiensis D.W.Stev.

Distribution: Panama

Zamia katzeriana (Regel) E. Rettig

- Ceratozamia katzeriana* Regel
- Zamia splendens* Schutzman

Distribution: Mexico

Zamia lacandona Schutzman & Vovides

Distribution: Mexico

Zamia lecointei Ducke

- Zamia jirijirimensis* R.E.Schult.
- Zamia obidensis* Ducke

Distribution: Brazil, Colombia, Peru, Venezuela

Zamia lindenii Regel ex André

Aulacophyllum lindenii (Regel ex André) Regel

Distribution: Ecuador, Peru

Zamia lindleyi Warsz. ex A.Dietr.

Distribution: Panama

Zamia loddigesii Miq.

- Zamia lawsoniana* Dyer
- Zamia leiboldii* Miq.
- Zamia leiboldii* var. *angustifolia* Regel
- Zamia leiboldii* var. *latifolia* Regel
- Zamia loddigesii* var. *angustifolia* Regel
- Zamia loddigesii* var. *longifolia* J.Schust.
- Zamia loddigesii* var. *obtusifolia* Regel
- Zamia mexicana* Miq.
- Zamia sylvatica* Chamb.
- Zamia galeotti* De Vriese

Distribution: Mexico

Zamia lucayana Britton

Distribution: Bahamas

Zamia macrochiera D.W.Stev.

Distribution: Peru

Zamia manicata Linden ex Regel

Zamia madida R.E.Schult.

Distribution: Colombia, Panama

Zamia meermanii Calonje

Distribution: Belize

Zamia melanorrhachis D.W.Stev.

Distribution: Colombia

Zamia montana A.Braun

Aulacophyllum montanum (A.Braun) Regel

Zamia oligodonta E.Calderón & D.W.Stev.

Distribution: Colombia

Zamia monticola Chamb.

Distribution: Guatemala

Zamia muricata Willd.

Zamia gutierrezii Sauvalle

Zamia muricata var *angustifolia* Miq.

Zamia muricata var. *obtusifolia* Miq.

Distribution: Colombia, Venezuela

Zamia nana A.Lindstr., Calonje, D.W.Stev., & A.S.Taylor

Distribution: Panama

Zamia nesophila A.S.Taylor, J.L.Haynes & Holzman

Distribution: Panama

Zamia neurophyllidia D.W.Stev.

Distribution: Costa Rica, Nicaragua, Panama

Zamia obliqua A.Braun

Distribution: Colombia, Panama

Zamia onan-reyesii C.Nelson & Sandoval

Zamia bussellii Schutzman, R.S.Adams, J.L.Haynes & Whitelock

Distribution: Honduras

Zamia oreillyi C.Nelson

Distribution: Honduras

- Zamia paucijuga** Wieland
Distribution: Mexico
Zamia poeppigiana Mart. & Eichler
Zamia baraquiniana Mast.
Distribution: Brazil, Peru
- Zamia portoricensis** Urb.
Distribution: Puerto Rico (DT USA)
- Zamia prasina** W.Bull
Zamia polymorpha D.W.Stev., A. Moretti & Vázq.Torres
Distribution: Belize, Guatemala, Mexico
- Zamia pseudomonticola** L.D.Gómez ex D.W. Stev. & Sabato
Distribution: Costa Rica, Panama
- Zamia pseudoparasitica** J.Yates
Distribution: Panama
- Zamia pumila** L.
Zamia allison-armourii Millsp.
Zamia debilis L. f.
Zamia latifoliolata Prenlel.
Distribution: Cuba, Dominican Republic, Puerto Rico (DT USA)
- Zamia purpurea** Vovides, J.D.Rees & Vázq. Torres
Distribution: Mexico
- Zamia pygmaea** Sims
Zamia chamberlainii J.Schust.
Zamia kickxii Miq.
Zamia ottonis Miq.
Zamia silicea Britton
Distribution: Cuba
- Zamia pyrophylla** Calonje, D.W.Stev. & A. Lindstr.
Distribution: Colombia
- Zamia restrepoi** (D.W.Stev.) A.Lindstr.
Chigua bernalii D.W.Stev.
Chigua restrepoi D.W.Stev.
Distribution: Colombia
- Zamia roezlii** Linden
Aulacophyllum roezlii (Linden) Regel
Distribution: Colombia, Ecuador
- Zamia sandovalii** C.Nelson
Distribution: Honduras

- Zamia skinneri** Warsz. ex A.Dietrich
Aulacophyllum skinneri (Warsz. ex A.Dietrich) Regel
Distribution: Panama
- Zamia soconuscensis** Schutzman, Vovides & Dehgan
Distribution: Mexico
- Zamia spartea** A.DC.
Distribution: Mexico
- Zamia standleyi** Schutzman
Distribution: Guatemala, Honduras
- Zamia stevensonii** A.S. Taylor & Holzman
Distribution: Panama
- Zamia stricta** Miq.
Distribution: Cuba
- Zamia tolimensis** Calonje, H.E.Esquivel & D.W.Stev.
Distribution: Colombia
- Zamia tuerckheimii** Donn.Sm.
Distribution: Guatemala
- Zamia ulei** Dammer
Zamia cupatiensis Ducke
Distribution: Brazil, Colombia, Ecuador, Peru
- Zamia urep** B.Walln.
Distribution: Peru
- Zamia variegata** Warsz.
Zamia picta Dyer
Distribution: Belize, Guatemala, Mexico
- Zamia vazquezii** D.W.Stev., Sabato & De Luca
Distribution: Mexico
- Zamia wallisii** A.Braun
Aulacophyllum wallisii (Hort. Veitch ex A.Braun) Regel
Distribution: Colombia

PART III: COUNTRY CHECKLIST

For the genera:

*Bowenia, Ceratozamia, Cycas, Dioon, Encephalartos,
Lepidozamia, Macrozamia, Microcycas, Stangeria and Zamia*

ANGOLA

Encephalartos laurentianus De Wild

AUSTRALIA

Bowenia serrulata (W.Bull) Chamb.

Bowenia specatabis Hook. ex Hook. f.

Cycas angulata R.Br

Cycas arenicola K.D.Hill

Cycas armstrongii Miq.

Cycas arnhemica K.D.Hill

Cycas arnhemica subsp. *muninga* Chirgwin & K.D.Hill

Cycas arnhemica subsp. *natja* K.D.Hill

Cycas badensis K.D.Hill

Cycas basaltica C.A.Gardner

Cycas brunnea K.D.Hill

Cycas cairnsiana F.Muell.

Cycas calcicola Maconochie

Cycas canalis K.D.Hill

Cycas candida K.D.Hill

Cycas conferta Chirgwin ex Chirgwin & Wigston

Cycas couttsiana K.D.Hill

Cycas cupida P.I.Forst

Cycas desolata P.I.Forst

Cycas furfuracea W.Fitzg.

Cycas lane-poolei C.A.Gardner

Cycas maconochiei Chirgwin & K.D.Hill

Cycas maconochiei subsp. *lanata* K.D.Hill

Cycas maconochiei subsp. *viridis* K.D.Hill

Cycas media R.Br

Cycas media subsp. *ensata* K.D.Hill

Cycas media subsp. *banksii* K.D.Hill

Cycas megacarpa K.D.Hill

Cycas ophiolitica K.D.Hill

Cycas orientis K.D.Hill

Cycas platyphylla K.D.Hill

Cycas pruinosa Maconochie

Cycas rumphii Miq.

Cycas seemannii A.Braun

Cycas semota K.D.Hill

Cycas silvestris K.D.Hill

Cycas tuckeri K.D.Hill

Cycas xipholepis K.D.Hill

Cycas yorkiana K.D.Hill

Lepidozamia hopei (W.Hill) Regel

Lepidozamia peroffskyana Regel

Macrozamia cardiacensis P.I.Forst. & D.L.Jones

Macrozamia communis L.A.S.Johnson

Macrozamia concinna D.L.Jones

Macrozamia conferta D.L.Jones & P.I.Forst.

Macrozamia cranei D.L.Jones & P.I.Forst.

Macrozamia crassifolia P.I.Forst. & D.L.Jones

Macrozamia diplomera (F.Muell.) L.A.S.Johnson

Macrozamia douglassi W. Hill ex F.M.Bailey

Macrozamia dyeri (F.Muell.) C.A.Gardner

Macrozamia elegans K.D.Hill & D.L.Jones

Macrozamia fawcettii C.Moore

Macrozamia fearsidei D.L.Jones

Macrozamia flexuosa C.Moore

Macrozamia fraseri Miq.

Macrozamia glaucophylla D.L.Jones

Macrozamia heteromera C.Moore

Macrozamia humilis D.L.Jones

Macrozamia johnsonii D.L.Jones & K.D.Hill

Macrozamia lomandroides D.L.Jones

Macrozamia longispina P.I.Forst. & D.L.Jones

Macrozamia lucida L.A.S. Johnson

Macrozamia macdonnellii (F.Muell. ex Miq.) A.DC.

Macrozamia machinii P.I.Forst. & D.L.Jones

Macrozamia macleayi Miq.

Macrozamia miquelii (F.Muell) A.DC.

Macrozamia montana K.D.Hill

Macrozamia moorei F. Muell.
Macrozamia mountperriensis F. M. Bailey
Macrozamia occidua D. L. Jones & P. I. Forst.
Macrozamia parcifolia P. I. Forst & D. L. Jones
Macrozamia pauli-guilelmi W. Hill & F. Muell.
Macrozamia platyrhachis F. M. Bailey
Macrozamia plurinervia (L. A. S. Johnson) D. L. Jones
Macrozamia polymorpha D. L. Jones
Macrozamia reducta K. D. Hill & D. L. Jones
Macrozamia riedlei (Gaudich.) C. A. Gardner
Macrozamia secunda C. Moore
Macrozamia serpentina D. L. Jones & P. I. Forst.
Macrozamia spiralia (Salisb.) Miq.
Macrozamia stenomera L. A. S. Johnson
Macrozamia viridis D. L. Jones & P. I. Forst.

BAHAMAS

Zamia angustifolia Jacq.
Zamia integrifolia L. f.
Zamia lucayana Britton

BANGLADESH

Cycas pectinata Buch.-Ham.

BELIZE

Ceratozamia robusta Miq.
Zamia decumbens Calonje, Meerman, M. P. Griff. & Hoese
Zamia meermanii Calonje
Zamia prasina W. Bull
Zamia variegata Warsz.

BENIN

Encephalartos barteri Carruth. ex Miq.

BHUTAN

Cycas pectinata Buch.-Ham.

BOLIVIA

Zamia boliviana (Brongn.) A. DC.

BRAZIL

Zamia amazonum D. W. Stev.
Zamia boliviana (Brongn.) A. DC.
Zamia lecointei Ducke
Zamia poeppigiana Mart. & Eichler
Zamia ulei U. Dammer

CAMBODIA

Cycas clivicola K. D. Hill
Cycas siamensis Miq.

CAYMAN ISLANDS (UK Overseas Territory)

Zamia integrifolia L. f.

CHINA

- Cycas balansae* Warb.
Cycas bifida K.D.Hill
Cycas changjiangensis N.Liu
Cycas debaoensis Y.C.Zhong & C.J.Chen
Cycas diannanensis Z.T.Guan & G.D.Tao
Cycas dolichophylla K.D.Hill, T.H.Nguyễn & P.K.Lôc
Cycas ferruginea F.N.Wei
Cycas guizhouensis K.M.Lan & R.F.Zou
Cycas hainanensis C.J.Chen
Cycas hongheensis S.Y.Yang & S.L.Yang ex D.Yue Wang
Cycas multipinnata C.J.Chen & S.Y.Yang
Cycas panzhihuaensis L.Zhou & S.Y.Yang
Cycas pectinata Buch.-Ham.
Cycas revoluta Thunb.
Cycas segmentifida D.Yue Wang & C.Y.Deng
Cycas sexseminifera F.N.Wei
Cycas shanyaensis G.A.Fu
Cycas szechuanensis C.Y.Cheng, W.C.Cheng & L.K.Fu
Cycas szechuanensis subsp. **fairylakea** (D.Yue Wang) N.Liu
Cycas taitungensis C.F.Shen, K.D.Hill, C.H.Tsou & C.J.Chen
Cycas taiwaniana Carruth.
Cycas tanqingii D.Yue Wang

COLOMBIA

- Zamia amazonum* D.W.Stev.
Zamia amplifolia Hort. W.Bull ex Mast.
Zamia chigua Seem.
Zamia disodon D.W.Stev. & Sabato
Zamia encephalartoides D.W.Stev.
Zamia huilensis Calonje, H.E.Esquivel & D.W.Stev.
Zamia hymenophyllidia D.W.Stev.
Zamia incognita A.Lindstr. & Idárraga
Zamia lecointei Ducke

- Zamia manicata* Linden ex Regel
Zamia melanorrhachis D.W.Stev.
Zamia montana A.Braun
Zamia muricata Willd.
Zamia obliqua A.Braun
Zamia pyrophylla Calonje, D.W.Stev. & A.Lindstr.
Zamia restrepoi (D.W.Stev.) A.Lindstr.
Zamia roezlii Linden
Zamia tolimensis Calonje, H.E.Esquivel & D.W.Stev.
Zamia ulei U.Dammer
Zamia wallisii A.Braun

COMOROS

- Cycas thouarsii* R.Br. ex Gaudich.

COSTA RICA

- Zamia acuminata* Oerst. ex Dyer
Zamia fairchildiana L.D.Gómez
Zamia gomeziana R.H.Acuña
Zamia neurophyllidia D.W.Stev.
Zamia pseudomonticola L.D.Gómez ex D.W. Stev. & Sabato

CUBA

- Zamia angustifolia* Jacq.
Zamia erosa O.F.Cook & G.N.Collins
Zamia integrifolia L. f.
Zamia pumila L.
Zamia pygmaea Sims
Zamia stricta Miq.
Microcycas calocoma (Miq.) A.DC.

DEMOCRATIC REPUBLIC OF THE CONGO

Encephalartos laurentianus De Wild
Encephalartos ituriensis Bamps and Lisowski
Encephalartos marunguensis Devred
Encephalartos poggei Asch.
Encephalartos schajiesii Malaisse, Sclavo & Crosiers
Encephalartos schmitzii Malaisse

DOMINICAN REPUBLIC

Zamia pumila L.

EAST TIMOR

Cycas glauca Hort. ex Miq.

ECUADOR

Zamia amazonum D.W.Stev.
Zamia gentryi Dodson
Zamia lindenii Regel ex André
Zamia roezlii Linden
Zamia ulei U.Dammer

EL SALVADOR

Zamia herrerae S.Calderón & Standl.

FIJI

Cycas seemannii A.Braun

GHANA

Encephalartos barteri Carruth. ex Miq.

GUAM (Dependent Territory USA)

Cycas micronesia K.D.Hill

GUATEMALA

Ceratozamia matudae Lundell
Ceratozamia robusta Miq.
Zamia herrerae S.Calderón & Standl.
Zamia monticola Chamb.
Zamia prasina W.Bull
Zamia standleyi Schutzman
Zamia tuerckheimii Donn.Sm.
Zamia variegata Warsz.

HONDURAS

Ceratozamia hondurensis J.L.Haynes, Whitelock, Schutzman & R.S.Adams
Dioon mejiae Standl. & L.O.Williams
Zamia onan-reyesii C.Nelson & Sandoval
Zamia oreillyi C.Nelson
Zamia sandovalii C.Nelson
Zamia standleyi Schutzman

INDIA

Cycas annaikalensis Rita Singh & P.Radha
Cycas beddomei Dyer

Cycas circinalis L.
Cycas indica A.Lindstr. & K.D.Hill
Cycas nathorstii J.Schust.
Cycas pectinata Buch.- Ham.
Cycas sphaerica Roxb.
Cycas zeylanica (J.Schust.) A.Lindstr. & K.D.Hill
Encephalartos kisambo Fadan & Beentje
Encephalartos tegulaneus Melville
Encephalartos tegulaneus subsp. **powysii** Miringu & Beentje

LAOS

?*Cycas micholitzii* Dyer
Cycas pectinata Buch.- Ham.
Cycas siamensis Miq.
Cycas simplicipinna (Smitinand) K.D.Hill

MADAGASCAR

Cycas thouarsii R.Br. ex Gaudich.

MALAWI

Encephalartos gratus Prain

MALAYSIA

Cycas cantafolia Jutta, K.L.Chew & Saw
Cycas clivicola K.D.Hill
Cycas edentata de Laub.
Cycas macrocarpa Griff.

MEXICO

Ceratozamia alvarezii Pérez-Farr, Vovides & Iglesias
Ceratozamia beccerrae Pérez-Farr, Vovides & Schutzman
Ceratozamia brevifrons Miq.
Ceratozamia chimalapensis Pérez-Farr. & Vovides

Cycas circinalis L.
Cycas indica A.Lindstr. & K.D.Hill
Cycas nathorstii J.Schust.
Cycas pectinata Buch.- Ham.
Cycas sphaerica Roxb.
Cycas zeylanica (J.Schust.) A.Lindstr. & K.D.Hill

INDONESIA

Cycas apoa K.D.Hill
Cycas edentata de Laub.
Cycas falcata K.D.Hill
Cycas glauca Hort. ex Miq.
Cycas javana (Miq.) de Laub
Cycas montana A.Lindstr. & K.D.Hill
Cycas papuana F.Muell.
Cycas rumphii Miq.
Cycas scratchleyana F.Meull.
Cycas sundaica Miq. ex A.Lindstr. & K.D.Hill

JAMAICA

Zamia erosa O.F.Cook & G.N.Collins

JAPAN

Cycas revoluta Thunb.

KENYA

Cycas thouarsii R.Br. ex Gaudich.
Encephalartos bubalinus Melville
Encephalartos hildebrandtii A.Braun & C.D.Bouché

- Ceratozamia decumbens* Vovides, Avendaño, Pérez-Farr. & Gonz.-Astorga
Ceratozamia euryphyllidia Vázq.Torres, Sabato & D.W.Stev.
Ceratozamia fuscoviridis Moore ex R.Osborne, D.W.Stev. & Vovides
Ceratozamia hildae G.P.Landry & M.C.Wilson
Ceratozamia huastecorum Avendaño, Vovides & Cast.- Campos
Ceratozamia kuesteriana Regel
Ceratozamia latifolia Miq.
Ceratozamia matudae Lundell
Ceratozamia mexicana Brongn.
Ceratozamia microrobila Vovides & J.D.Rees
Ceratozamia miqueliana H.Wendl.
Ceratozamia mirandae Vovides, Pérez- Farr. & Iglesias
Ceratozamia mixeorum Chemnick, T.J.Greg. & Salas-Mor
Ceratozamia moretii Vázq.Torres & Vovides
Ceratozamia norstogii D.W.Stev.
Ceratozamia robusta Miq.
Ceratozamia sabatoi Vovides, Vázq.Torres, Schutzman & Iglesias
Ceratozamia santillanii Pérez- Farr. & Vovides
Ceratozamia vovidesii Pérez- Farr. & Iglesias
Ceratozamia whitelockiana Chemnick & T.J.Greg.
Ceratozamia zaragozae Medellín
Ceratozamia zoquorum Pérez- Farr., Vovides & Iglesias
Dioon angustifolium Miq.
Dioon argenteum T.J.Greg., Chemnick, Salas-Mor. & Vovides
Dioon califanoi De Luca & Sabato
Dioon caputoi De Luca, Sabato & Vázq.Torres
Dioon edule Lindl.
Dioon holmgrenii De Luca, Sabato & Vázq.Torres
Dioon merolae De Luca, Sabato & Vázq.Torres
Dioon purpusii Rose
Dioon rzedowskii De Luca, A.Moretti, Sabato & Vázq.Torres
Dioon sonorensis (De Luca, Sabato & Vázq. Torres) Chemnick, T.J.Greg. & Salas-Mor.
Dioon spinulosum Dyer ex Eichler
Dioon stevensonii Nic.- Mor. & Vovides
Dioon tomasellii De Luca, Sabato & Vázq. Torres
Zamia cremnophila Vovides, Schutzman & Dehgan
Zamia fischeri Miq.
Zamia furfuracea L. f.
Zamia grijalvensis Pérez- Farr., Vovides, & Mart.-Camilo
Zamia herrerae S.Calderón & Standl.
Zamia inermis Vovides, J.D.Rees & Vázq. Torres
Zamia katzeriana (Regel) E. Rettig
Zamia lacandona Schutzman & Vovides
Zamia loddigesii Miq.
Zamia paucijuga Wieland
Zamia prasina W.Bull
Zamia purpurea Vovides, J.D.Rees & Vázq. Torres
Zamia soconuscensis Schutzman, Vovides & Dehgan
Zamia sparteae A.DC.
Zamia variegata Warsz.
Zamia vazquezii D.W.Stev., Sabato & De Luca

MICRONESIA (Federated States Of)

Cycas micronesica K.D.Hill

MOZAMBIQUE

- Cycas thouarsii* R.Br. ex Gaudich.
Encephalartos chimanimaniensis R.A.Dyer & I.Verd.
Encephalartos ferox G.Bertol.
Encephalartos gratus Prain
Encephalartos lebomboensis I.Verd.
Encephalartos manikensis (Gilliland) Gilliland
Encephalartos munchii R.A.Dyer & I.Verd.
Encephalartos pterogonus R.A.Dyer & I.Verd.
Encephalartos turneri Lavranos & D.L.Goode
Encephalartos umbeluziensis R.A.Dyer

MYANMAR

Cycas edentata de Laub.
Cycas pectinata Buch.- Ham.
Cycas siamensis Miq.
Cycas simplicipinna (Smitinand) K.D.Hill

NEPAL

Cycas pectinata Buch.- Ham.

NEW CALEDONIA

Cycas seemannii A.Braun

NICARAGUA

Zamia neurophyllidia D.W.Stev.

NIGERIA

Encephalartos barteri Carruth. ex Miq.
Encephalartos barteri subsp. *allochrous* L.E.Newton

NORTHERN MARIANA ISLANDS (Dependent Territory USA)

Cycas micronesia K.D.Hill

PALAU

Cycas micronesia K.D.Hill

PANAMA

Zamia cunaria Dressler & D.W.Stev.
Zamia dressleri D.W.Stev.
Zamia elegantissima Schutzman, Vovides & R.S.Adams
Zamia fairchildiana L.D.Gómez
Zamia hamannii A.S.Taylor, J.L.Haynes & Holzman
Zamia imperialis A.S.Taylor, J.L.Haynes & Holzman
Zamia ipetiensis D.W.Stev.
Zamia lindleyi Warsz. ex A.Dietr.
Zamia manicata Linden ex Regel
Zamia nana A.Lindstr., Calonje, D.W.Stev., & A.S.Taylor
Zamia nesophila A.S.Taylor, J.L.Haynes & Holzman
Zamia neurophyllidia D.W.Stev.
Zamia obliqua A.Braun
Zamia pseudomonticola L.D.Gómez ex D.W.Stev. & Sabato
Zamia pseudoparasitica J.Yates
Zamia skinneri Warsz. ex A.Dietrich
Zamia stevensonii A.S.Taylor & Holzman

PAPUA NEW GUINEA

Cycas apoa K.D.Hill
Cycas bougainvilleana K.D.Hill
Cycas campestris K.D.Hill
Cycas papuana F.Muell.
Cycas rumphii Miq.
Cycas schumanniana Lauterb.
Cycas scratchleyana F.Meull.

PERU

Zamia amazonum D.W.Stev.
Zamia hymenophyllidia D.W.Stev.
Zamia lecointei Ducke

Zamia lindenii Regel ex André
Zamia macrochiera D.W.Stev.
Zamia poeppigiana Mart. & Eichler
Zamia ulei U.Dammer
Zamia urep B.Walln.

PHILIPPINES

Cycas aenigma K.D.Hill & A.Lindstr.
Cycas curranii (J.Schust.) K.D.Hill
Cycas edentata de Laub.
Cycas lacrimans A.Lindstr. & K.D.Hill
Cycas nitida K.D.Hill & A.Lindstr.
Cycas riuminiana Porte ex Regel
Cycas sancti-lasallei Agoo & Madulid
Cycas saxatilis K.D.Hill & A.Lindstr.
Cycas verspertilio A.Lindstr. & K.D.Hill
Cycas wadei Merr.
Cycas zambalensis Madulid & Agoo

PUERTO RICO (Dependent Territory USA)

Zamia erosa O.F.Cook & G.N.Collins
Zamia portoricensis Urb.
Zamia pumila L.

SEYCHELLES

Cycas thouarsii R.Br. ex Gaudich.

SINGAPORE

Cycas edentata de Laub.

SOLOMON ISLANDS

Cycas bougainvilleana K.D.Hill

SOUTH AFRICA

Encephalartos aemulans Vorster
Encephalartos altensteinii Lehm.
Encephalartos arenarius R.A.Dyer
Encephalartos brevifoliolatus Vorster
Encephalartos caffer (Thunb.) Lehm.
Encephalartos cerinus Lavranos & D.L.Goode
Encephalartos cupidus R.A.Dyer
Encephalartos cycadifolius (Jacq.) Lehm.
Encephalartos dolomiticus Lavranos & D.L.Goode
Encephalartos dyerianus Lavranos & D.L.Goode
Encephalartos eugene-maraisii I.Verd.
Encephalartos ferox G.Bertol.
Encephalartos frideici-guilielmi Lehm.
Encephalartos ghellinckii Lem.
Encephalartos heenanii R.A.Dyer
Encephalartos hirsutus P.J.H.Hurter
Encephalartos horridus (Jacq.) Lehm.
Encephalartos humilis I.Verd.
Encephalartos inopinus R.A.Dyer
Encephalartos laevifolius Stapf & Burtt Davy
Encephalartos lanatus Stapf & Burtt Davy
Encephalartos latifrons Lehm.
Encephalartos lebomboensis I.Verd.
Encephalartos lehmannii Lehm.
Encephalartos longifolius (Jacq.) Lehm.
Encephalartos middelburgensis Vorster, Robbertse & S.van der Westh.
Encephalartos msinganus Vorster
Encephalartos natalensis R.A.Dyer & I.Verd.
Encephalartos ngoyanus I.Verd.
Encephalartos nubimontanus P.J.H.Hurter

Encephalartos paucidentatus Stapf & Burtt Davy
Encephalartos princeps R.A.Dyer
Encephalartos senticosus Vorster
Encephalartos transvenosus Stapf & Burtt Davy
Encephalartos trispinosus (Hook.) R.A.Dyer
Encephalartos villosus Lem.
Encephalartos woodii Sander
Stangeria eriopus (Kunze) Baill.

SRI LANKA

Cycas nathorstii J.Schust.
Cycas zeylanica (J.Schust.) A.Lindstr. & K.D.Hill

SOUTH SUDAN

Encephalartos mackenziei L.E.Newton
Encephalartos septentrionalis Schweinf.

SWAZILAND

Encephalartos aplanatus Vorster
Encephalartos heenanii R.A.Dyer
Encephalartos laevifolius Stapf & Burtt Davy
Encephalartos lebomboensis I.Verd.
Encephalartos ngoyanus I.Verd.
Encephalartos paucidentatus Stapf & Burtt Davy
Encephalartos relictus P.J.H.Hurter
Encephalartos senticosus Vorster
Encephalartos umbeluziensis R.A. Dyer
Encephalartos villosus Lem.

TANZANIA

Cycas thouarsii R.Br. ex Gaudich.
Encephalartos bubalinus Melville
Encephalartos delucanus Malaisse, Sclavo & Crosiers
Encephalartos hildebrandtii A.Braun & C.D.Bouché
Encephalartos sclavoi A. Moretti, D.W.Stev. & De Luca

THAILAND

Cycas chamaoensis K.D.Hill
Cycas clivicola K.D.Hill
Cycas edentata de Laub.
Cycas elephantipes A.Lindstr. & K.D.Hill
Cycas macrocarpa Griff.
Cycas nongnoochiae K.D.Hill
Cycas pectinata Buch.- Ham.
Cycas petraea A.Lindstr. & K.D.Hill
Cycas praburiensis S.L.Yang, W.Tang, K.D.Hill & Vatch.
Cycas siamensis Miq.
Cycas simplicipinna (Smitinand) K.D.Hill
Cycas tansachana K.D.Hill & S.L. Yang

TOGO

?*Encephalartos barteri* Carruth. ex Miq.

TONGA

Cycas seemannii A.Braun

UGANDA

Encephalartos equatorialis P.J.H.Hurter
Encephalartos macrostrobilus S.Jones & Wynants
Encephalartos septentrionalis Schweinf.
Encephalartos whitelockii P.J.H.Hurter

UNITED STATES OF AMERICA

Zamia integrifolia L. f.

VANUATU

Cycas seemannii A.Braun

VENEZUELA

Zamia amazonum D.W.Stev.
Zamia lecointei Ducke
Zamia muricata Willd.

VIETNAM

Cycas aculeata K.D.Hill & T.H.Nguyễn
Cycas balansae Warb.
Cycas bifida K.D.Hill
Cycas brachycantha K.D.Hill, T.H.Nguyễn & P.K.Lôc
Cycas chevalieri Leandri
Cycas clivicola K.D.Hill
Cycas collina K.D.Hill, T.H.Nguyễn & P.K.Lôc
Cycas condaoensis K.D.Hill & S.L.Yang
Cycas diannanensis Z.T.Guan & G.D.Tao
Cycas dolichophylla K.D.Hill, T.H.Nguyễn & P.K.Lôc

Cycas edentata de Laub.
Cycas elogata (Leandri) D.Yue Wang
Cycas ferruginea F.N.Wei
Cycas fugax K.D.Hill, T.H.Nguyễn & P.K.Lôc
Cycas hoabinhensis P.K.Lôc & T.H.Nguyễn
Cycas inermis Lour.
Cycas lindstromii S.L.Yang, K.D.Hill & T.H.Nguyễn
Cycas micholitzii Dyer
Cycas multipinnata C.J.Chen & S.Y.Yang
Cycas pachypoda K.D.Hill
Cycas pectinata Buch.- Ham.
Cycas segmentifida D.Yue Wang & C.Y.Deng
Cycas sexseminifera F.N.Wei
Cycas siamensis Miq.
Cycas simplicipinna (Smitinand) K.D.Hill
?*Cycas tanqingii* D.Yue Wang
Cycas tropophylla K.D.Hill & P.K.Lôc

ZAMBIA

Encephalartos schmitzii Malaisse

ZIMBABWE

Encephalartos chimanimaniensis R.A.Dyer & I.Verd.
Encephalartos concinnus R.A.Dyer & I.Verd.
Encephalartos manikensis (Gilliland) Gilliland