Review of Significant Trade
Cycads

(November 2003)

1. Summary

Cycads are an ancient group of plants comprising three families (Cycadaceae, Stangeriaceae and Zamiaceae), 11 genera and ca. 300 species. They are distributed through 58 range States in tropical and subtropical parts of North America, South America, Central America and the Caribbean, Asia, Africa and Oceania. A large number of species (52%) are threatened with extinction in the wild and the two most prominent threats are habitat destruction and trade in wild collected plants.

This report summarizes information on the taxonomy, life history, distribution and diversity of cycad taxa and contains an analysis of trade between 1977 and 2002. The analysis of trade is based on the UNEP-WCMC database of CITES annual report data together with information obtained from 19 range States, cycad experts, the TRAFFIC network and the IUCN/ SSC Cycad Specialist Group. The main focus is on trade in wild collected specimens of Appendix II taxa and compliance with Article IV of the Convention, in the context of the implementation of Resolution Conf. 12.8 on Review of Significant Trade in specimens of Appendix-II species. Despite the fact that all cycads are listed in Appendix I or II, populations continue to decline in some range States as a consequence of unsustainable or illegal trade, and they may even be the first taxa to become extinct in the wild while listed on the CITES Appendices. As a result, the report includes information on a range of issues related to cycad trade.

The trade data show that the bulk of cycad trade is in artificially propagated specimens. In fact, out of the ca. 30 million plants that have been reported as exports in the 24-year period covered by the dataset, only 38,500 were reported to be of wild origin. The vast majority of these plants originated in Australia where permits have been issued primarily for salvage harvesting in which plants are removed from sites where they would be destroyed due to land clearing. The remaining trade in plants of wild origin from other range States comprises less than 1,500 plants and includes plants traded for scientific purposes or for botanical gardens.

There is no evidence that trade for scientific purposes or for botanical gardens is being misused to trade in wild collected plants. Only 458 plants of wild origin have been traded for these purposes since 1990.

It is also clear that there is a general lack of scientific information on cycad population dynamics and the impact of harvesting and management practices on cycad populations. Scientific Authorities base their non-detriment findings mostly on population size because there is no other data available on which to base harvest quotas. New studies on cycad population dynamics indicate that current harvesting practices may not always be appropriate. For example, recent research in Australia suggests that properly managed sustainable harvesting programmes may provide a better conservation outcome than salvage harvesting, which is currently widely used.

Despite the small amount of trade in wild collected plants that is reflected in CITES reports, cycad experts consider many cycads to be threatened by trade based on the ongoing decline in wild populations. This implies that there is a significant amount of trade that is not regulated by CITES (e.g. domestic trade), or that trade does not pass through formal borders (e.g. between neighbouring countries), or that trade willfully bypasses CITES regulations (illegal trade). It is of concern that some Critically Endangered cycad populations continue to decline due to trade and the role of CITES in cycad conservation needs to be critically evaluated. Species on Appendix I such as *Chigua restrepoi* and *C. bernali* (Colombia), *Encephalartos cerinus, E. hirsutus, E. inopinus, E. laevifolius, E. latifrons* (South Africa),*E. chimanimaniensis, E. munchii, E. pterogonus* (Mozambique) and *E. tegualaneus powysii* (Kenya) have continued to decline due to trade and several of these species are close to becoming extinct in the wild.

Provisional categorisations:

a) **Species of Concern for which the available information indicates that the provisions of Article IV, paragraph 2 (a), 3 or 6 (a), are not being implemented** – species of *Cycas* from Thailand and Viet Nam where there is some doubt about the taxonomy of the species in trade and where the basis for non-detriment findings is not known (i.e. *C. dolichophylla, C. elongata, C. inermis, C. lindstromii*, *C. micholitzii,C. multipinnata, C. pachypoda, C. pectinata, C. siamensis*).

b) **Species of Possible Concern for which it is not clear whether the provisions of Article IV, paragraph 2 (a), 3 or 6 (a) are being implemented** - includes *C. thouarsii* from Madagascar, where more information is required on the making of non-detriment findings.

c) **Species of Least Concern for which the available information appears to indicated that the provisions of Article IV, paragraph 2 (a), 3 or 6 (a) are being met** – included here are all the remaining species of cycad listed on Appendix II.

Issues identified in the course of the review that are not related to the implementation of Article IV, paragraph 2 (a), 3 or 6 (a)

In accordance with Paragraph 1) of Resolution Conf. 12.8, several other issues have been identified during the course of the review that are not related to the implementation of Article IV. These are outlined below for consideration by the Plants Committee.

There is information to suggest that there is unreported and unregulated trade between China and Viet Nam, and South Africa and Mozambique that should be further investigated.

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).

Several Parties currently report trade in cycads in their annual reports using only high level taxonomic information and it is therefore not possible to accurately monitor trade, particularly in threatened taxa, using this data. CITES Notification 2002/22 – Annual Reports includes the *Guidelines for the preparation and submission of CITES annual reports* states in section 3 b), that Parties are requested to enter the scientific name of the species or subspecies, using the binomial (genus and species) or trinomial (genus, species and subspecies). The scientific names used must be those recorded in the Appendices or, for species included in the Appendices as part of a higher-taxon listing, those included in the standard lists of names approved by the Conference of the Parties. The names of higher taxa should not be used to indicate the species traded unless the specimens can not be identified, in which case the name of the genus must be indicated. Parties should be urged to follow these guidelines to allow for improved trade monitoring and analysis of trade data.

The standard taxonomic reference as agreed by the Conference of Parties. Resolution Conf. 12.11 Standard Nomenclature adopts the *Checklist of CITES species*, compiled by the UNEP-WCMC, 2001 and its updates accepted by the Nomenclature Committee as the standard reference for species included in the Appendices. Given the relatively frequent revision of cycad taxonomy as new species are described, UNEP-WCMC should consider always using the most recent version of *A World List of Cycads* (which serves as the standard taxonomic reference) when preparing the *Checklist* as the 2003 *Checklist* uses the 1995 edition of *A World List of Cycads* when a more recent edition is available.

Trade in seeds and live plants is reported using a variety of units including 'kg', 'bags', 'individual specimens' and 'shipments'. According to Notification 2002/22 – Annual Reports, which includes the *Guidelines for the preparation and submission of CITES annual reports,* the standard unit for seeds should be the mass of seeds recorded in kilograms, and live plants should be reported as the number of live plants, or alternatively, the mass of live plants in kilograms. Parties should be urged to follow these guidelines to enable effective trade monitoring and analysis of trade data.

2. Species biology and conservation status

Cycads are an ancient group of woody perennial plants that originated about 300 million years ago. They were originally classified together with other ancient seed plants as gymnosperms but this is no

longer recognized as a natural group. The cycads are now regarded as a distinct group by themselves (Cycadophyta).

The cycads are defined by the presence of several characters, particularly cycasin (a chemical compound comprising methylazoxymethanol and glucose), girdling leaf traces, simple megasporophylls and a primary thickening meristem. Stevenson (1992) classified the cycads according to their evolutionary relationships, dividing the living cycads into three families (Cycadaceae, Stangeriaceae and Zamiaceae) and 11 genera (see **Table 1**).

Table 1 – The classification of the order Cycadales as proposed by Stevenson (1992) with an estimate of the number of species in each genus

Order	**Family**	***Subfamily***	***Genus***	***No. of species***
Cycadales	Cycadaceae		Cycas	98
	Stangeriaceae	Bowenioideae	Bowenia	2
		Stangerioideae	Stangeria	1
	Zamiaceae	Encephalartoideae	Dioon	11
			Encephalartos	68
			Lepidozamia	2
			Macrozamia	37
		Zamioideae	Ceratozamia	18
			Chigua	2
			Microcycas	1
			Zamia	57

There are approximately 300 recognized species of cycads. This number has risen steadily over the past two decades as new species have been discovered (ca. 170 species and subspecies were recognized in 1984). At the same time, taxonomic revisions have resulted in many synonyms. Taxonomic uncertainty could create problems with the names of plants in trade. To avoid confusion, CITES authorities have used the "World List of Cycads", usually published approximately every three years, as the list of definitive names for the group (Osborne and Hendricks, 1985; Osborne and Hendricks, 1986; Osborne, Stevenson and Hill, 1999; Stevenson and Osborne, 1993; Stevenson, Osborne and Hendricks, 1990; Stevenson, Osborne and Hill, 1995). However, the last available list was compiled in 1996 (Osborne, Stevenson and Hill, 1999) and this means that new species described after 1996 may be in trade but could be reported under outdated names. The taxonomy of the genus *Cycas*, in particular, has changed substantially since 1996 with 26 new species out of a total of ca. 94 species. Where necessary in this report, the names recognized by the IUCN/SSC Cycad Specialist Group (Donaldson, 2003; Hill, 1998; Walters and Osborne, 2003) have been used to reflect changes in taxonomy that have taken place since the last World List of Cycads was published.

2.1 Life history and ecology

Cycads are sometimes referred to as 'living fossils', which implies they have changed very little over millions of years, but they are actually a remarkably diverse group of plants. Cycad species differ from one another in growth form, coning behavior, cone size and number, seed size, longevity, pollination biology, dispersal agents, drought tolerance, shade tolerance and their ability to survive fire. These factors influence their abundance, where they grow, how widely they are distributed and how they respond to harvesting.

Despite the many differences between species, there are some features shared by all cycads:

a) They are relatively slow growing.

b) They have a pithy and starch-rich cortex, which makes them vulnerable to fungal attack. Most species therefore grow in well-drained soils. It also means that stems are easily

damaged when dug out or transplanted and high mortality occurs in plants that are not carefully handled.

c) They are dioecious (mature plants produce either male or female cones). This means that the effective population size of small populations is often less than half the number of mature plants in the population.

d) The seeds have no dormant period. The fertilized embryo develops slowly but continuously until germination, which usually happens within a few months after dispersal. This makes seeds relatively short-lived and subject to damage by desiccation.

e) They have specialized corraloid roots that contain symbiotic cyanobacteria. The cyanobacteria are able to fix atmospheric nitrogen and this allows cycads to survive in nutrient poor environments.

f) They all have contractile roots, at least as seedlings, which draw the sensitive growing apex below the soil surface where it is protected from drying out or burning as a result of drought and fires.

As would be expected from their varied life histories, cycads occur in a range of habitats from closed canopy tropical forests to open grasslands and semi-arid scrublands. Many species are restricted to particular substrates such as nutrient poor soils, limestone or serpentine outcrops, dunes and steep cliffs.

2.2.1 Growth and reproduction

Although cycad plant s are generally long-lived and slow growing, there are at least three different growth forms that differ in longevity and growth rate (i.e. plants with small to medium size subterranean stems, those with single aerial stems and plants with multiple stems). Species with a tendency to develop multiple stems (mostly from suckers/ offsets that develop at the base of the main stem) may have particularly long life spans with new suckers replacing old moribund stems. Field studies indicate that species with small single stems have shorter life spans than those with either larger stems or a tendency to produce suckers. The overall life expectancy of individual plants is difficult to measure. There are plants in cultivation that are known to be more than 1,000 years old (Whitelock, 2002) and estimates of the longevity of plants in the wild vary from 125 years for small forest understorey species such as *Encephalartos villosus* (Donaldson, 1995) to 900 years for larger species such as *Dioon edule* (Vovides, 1990). However, even quite large plants are not necessarily very old. Vogel *et al* (1995) estimated that 3 m tall specimens of *Encephalartos transvenosus* were only 150 years old.

Age to first reproduction varies considerably between species and is also dependent on growing conditions. Under garden conditions, some species of *Zamia* take only two to three years to grow from seed to reproductive age, whereas other cycads may take 12 to 15 years (Jones, 1993; Whitelock, 2002). Growth is generally slower under natural conditions. For example, field studies of *Encephalartos* species indicate that the age at first coning may vary from 15 years to 40 years depending on the species (Raimondo and Donaldson, 2003).

Seed production occurs sporadically in most cycad populations. Some species have long periods with no reproduction followed by an episode of high reproduction (mast seeding), which may be triggered by an event such as fire. Individual plants may cone every few years, but Vovides (1990) measured intervals as long as 52 years. During mast seeding events (when all plants reproduce synchronously), a population comprising a few hundred plants can produce tens of thousands of seeds. Usually only a few seeds that have been dispersed to safe sites will survive, while those in less favorable sites will desiccate or be eaten by rodents (Raimondo and Donaldson, 2003; Vovides, 1990). Other species produce cones more erratically with no apparent response to environmental events. These populations produce relatively few seeds during each reproductive event. In both cases, successful recruitment from seeds may be infrequent and population turnover is generally slow.

2.2.2 Pollination

Studies in the last 15 years have shown that insects are the principal pollinators of a diverse subsample of cycad taxa and insect pollination is probably the norm for cycads. Most of the beetles, as well as the thrips, that have been implicated in pollination, occur only on cycads and some are associated with only one cycad species. The specificity of these interactions has raised questions about whether pollination systems will collapse when cycad populations decline. Data from surveys of wild populations suggests that when cycad populations drop below 150 plants, pollinator abundance declines and plants frequently experience a drop in seed set. When populations drop below 50 plants, pollinators are often entirely absent.

2.2.3 Dispersal

Cycads have large seeds with a fleshy outer coat (sarcotesta), which is the ecological equivalent of a fruit. Animals such as birds, rodents, small marsupials and fruit-eating bats are attracted by the brightly colored sarcotesta and act as dispersal agents. In most cases, the fleshy coat is eaten off the seed. The distance that seeds get dispersed is limited by how far animals can carry the large seeds. One group of *Cycas* species (subsection Rumphiae) has seeds with a spongy layer, which means that they can float. Species in this group are widely distributed through islands in the Indian and western Pacific oceans, as well as parts of South-east Asia.

2.2.4 Response to harvesting

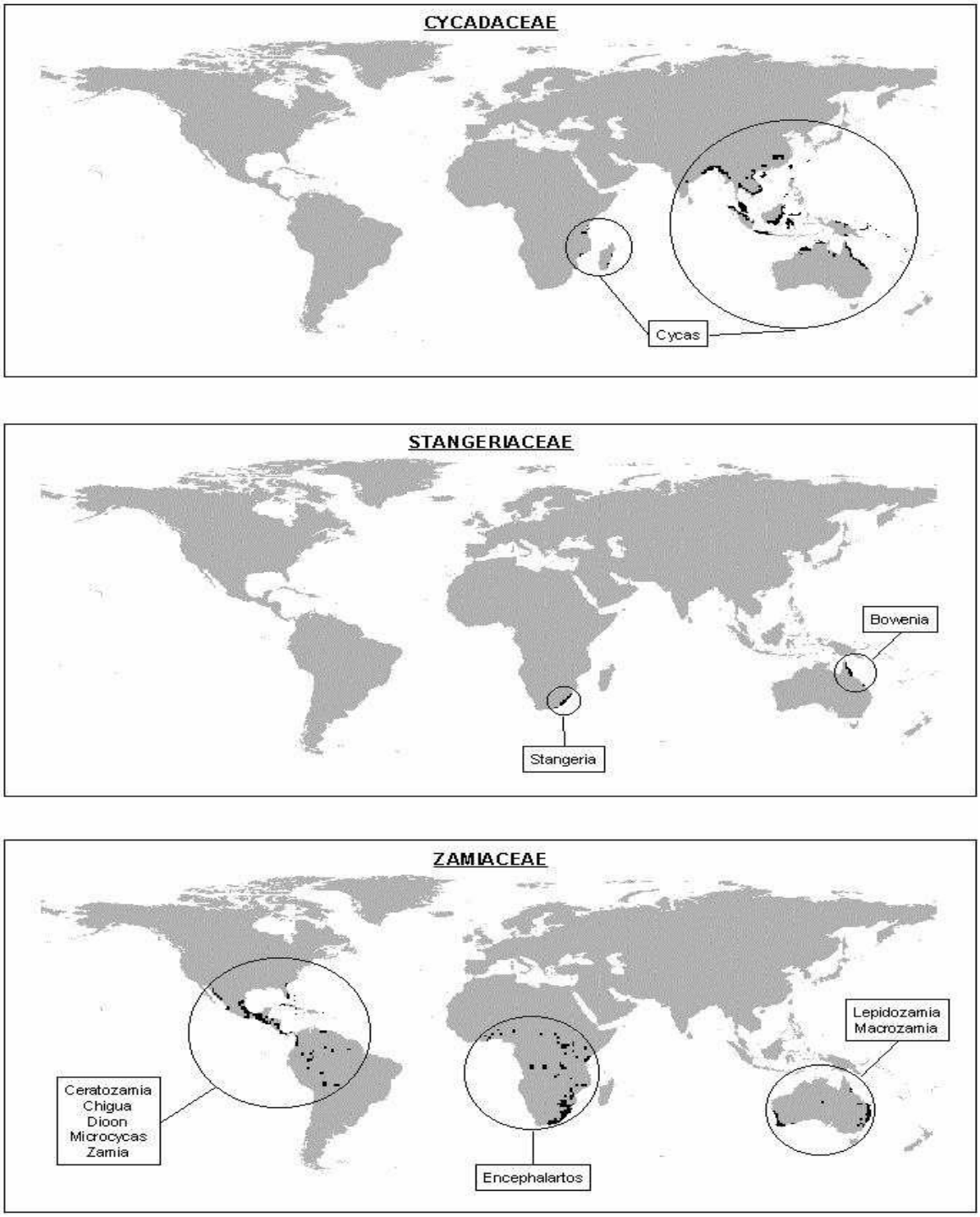
There is relatively little data on the response of cycads to harvesting. Species with different life histories may be expected to have different responses to harvesting. Simulation models, based on ten years of field data for two species with different life histories, showed that cycad populations are generally extremely sensitive to the removal of adult plants (Raimondo and Donaldson, 2003). This is due to the slow rate at which plants are replaced in the population. The study found that multi-stemmed or slow growing species take much longer to recover from the harvest of mature plants than small or faster growing species. For seeds, the models indicated that cycad populations can tolerate high levels of seed harvesting, especially in species in which mast seeding occurs. The implication is that harvesting of adult plants should only take place in large populations or those with a large proportion of juvenile plants. In contrast, seed harvesting could take place even in relatively small populations.

Cycads are distributed through the warmer tropical and sub-tropical areas of North, South and Central America, Africa, Asia and Australia, as well as a large number of oceanic islands. The cycad families tend to be widely distributed, but most of the genera have restricted distributions (see **Figure 1**).

The family Cycadaceae contains only one genus, *Cycas*, which occurs mostly in Southeast Asia (63 species and subspecies) and Australia (34 species and subspecies) with one species distributed along the east coast of Africa. The Stangeriaceae is a small family with one monospecific genus in Africa (*Stangeria*) and the genus *Bowenia,* which comprises two species, in Australia. In contrast, the Zamiaceae is the most diverse and widespread cycad family and is represented by *Encephalartos* in Africa, *Macrozamia* and *Lepidozamia* in Australia and, *Ceratozamia*, *Chigua, Dioon*, *Microcycas* and *Zamia* in the Americas.

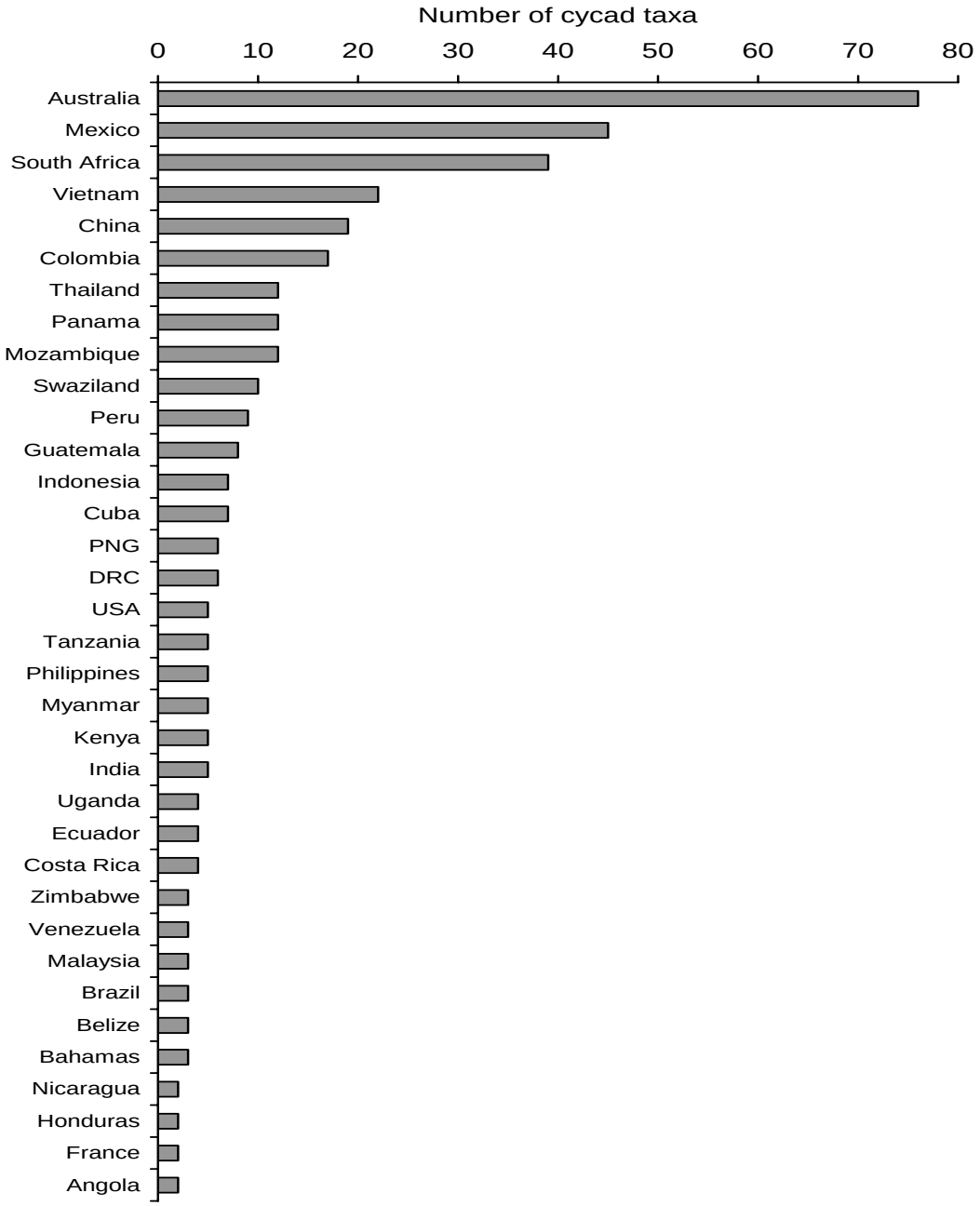
2.2 Global distribution – range States of the species

Figure 1 – The global distribution of the 11 genera and three families of Cycadales
Source: Donaldson, 2003



Although cycads are widespread, occurring in 58 range States, they are not evenly spread across their entire distribution. More than 50% of all cycad species occur in just three countries (Australia, Mexico and South Africa) (see **Figure 2**) and the ten countries with the highest diversity contain 89% of all cycad species. As a consequence, most range States have low cycad diversity and there are 18 countries that have only one species (see the **Annex**).

Figure 2 – Cycad species richness (including subspecies) in different range States
Source: IUCN/ SSC Cycad Specialist Group



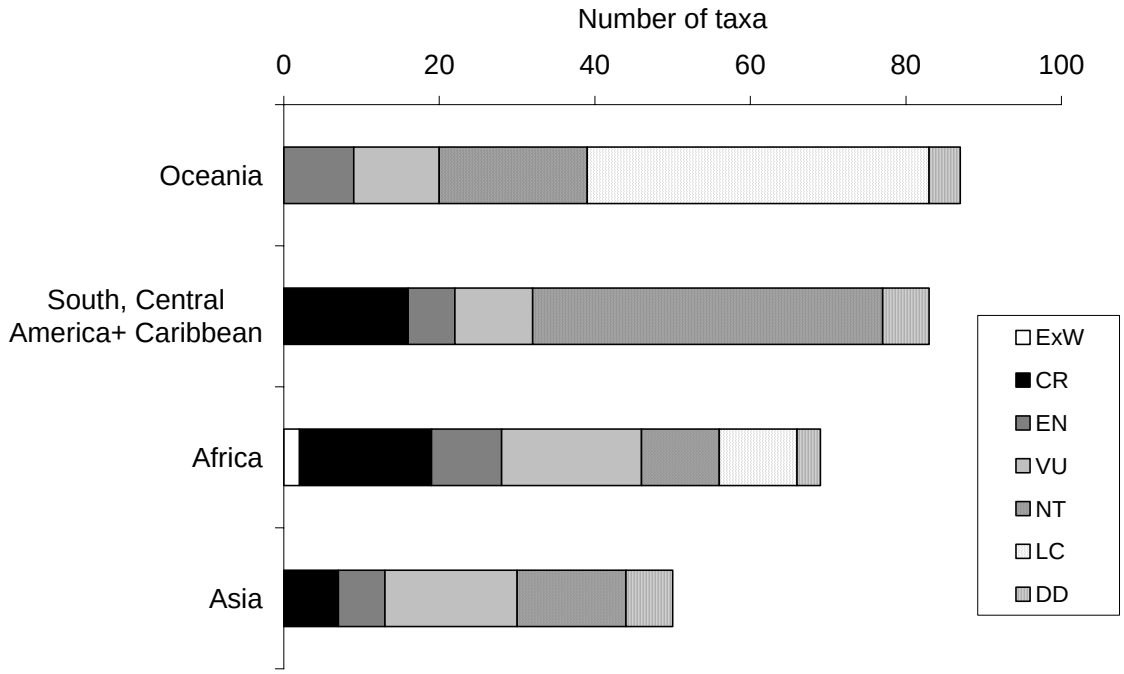
2.3 Population distribution, status, trend and threats by range State

Cycads are one of the world's most threatened groups of plants. Two species are classified as Extinct in the Wild by IUCN and 52% of the known cycad species are listed as threatened (Critically Endangered, Endangered, or Vulnerable) in the IUCN/ SSC Cycad Action Plan (Donaldson, 2003). The threatened status of cycads in the four major regions where they occur is summarized in **Figure 3** and the names and threatened status of all the cycads in each range State are listed in the **Annex** to the present report.

The main threats to cycads are habitat destruction and the harvesting of plants from the wild (Donaldson, 2003). These threats vary between different regions. Habitat destruction is the primary threat in Asia and South, Central America and the Caribbean, whereas harvesting from the wild is the primary threat in Africa. Cycads in Oceania are less threatened than elsewhere (see **Figure 3**) and the threats include habitat destruction and over collecting (Hill, 2003). Even

where habitat destruction is the primary threat, over collecting can be a threat and the **Annex** to the present report shows that trade is a potential or existing threat for a large number of cycads in all regions.

Figure 3 – Combined data on the threatened status of cycads in Oceania, South and Central America and the Caribbean, Africa and Asia
Source: IUCN/ SSC Cycad Specialist Group



The data analyzed here and elsewhere (Donaldson, 2003) indicate 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. Nevertheless, although non-sustainable trade in wild collected plants has decreased, 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. The most vulnerable taxa are species of *Encephalartos* from southern Africa (e.g. *E. cerinus, E. munchii, E. pterogonus*), which have continued to decline since they were listed on CITES Appendix I in 1975 and there are now only a few individuals known to exist in the wild. There are at least three possible reasons for ongoing decline. 1. There is a large domestic market in South Africa so that wild harvested plants can be smuggled into garden collections within South Africa or by passing through borders with neighbouring countries. 2. 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. 3. The lack of availability of plants in cultivation means that there is always a demand for wild harvested plants.

3. Conservation and management

Although species are normally reviewed individually, the ca 300 cycad species distributed through 58 range States, makes this task almost impossible. It is beyond the scope of this analysis to provide details of each species and each range State. The distribution and status of each species is therefore provided in the **Annex**. The analyses of CITES reports show that very few range States have been trading in cycads of wild origin and the reports that follow focus only on those range States that have reported trade in wild collected plants. The countries included in this report have been selected using the following criteria and process: analyze trade patterns, identify range States where trade in wild collected cycads listed on Appendix II is a regular feature of trade or that is a potential threat to cycad survival, provide details for these range States, and then provide details of other problems (e.g. Appendix I taxa). The countries included are Australia, Mexico, Thailand and Madagascar.

Australia (source: CITES Management Authority of Australia, IUCN Cycad Specialist Group)

Australia has the highest cycad diversity, with four genera (*Bowenia, Cycas, Lepidozamia* and *Macrozamia*) and ca. 74 species and subspecies, representing all three families (see the **Annex**). Australia also stands out as the one range State where a high proportion of the taxa have large and healthy populations (Hill, 2003). The IUCN Cycad Action Plan lists eight species as Endangered, 11 as Vulnerable, 11 as Near Threatened, and the remaining 44 taxa as Least Concern.

In Australian law, the primary responsibility for the management of natural resources lies with state and territory governments, although the Commonwealth (Federal) government plays a role in coordinating environmental issues. All Australian states and territories in which cycads occur have enacted new or revised plant protection legislation in the last 10 years, or are doing so at the moment. The legislation addresses current threats to Australian cycads. Responsibility for international trade lies with the Commonwealth Government and the management of cycads for international trade is implemented by state governments under oversight from the Commonwealth Government. (Queensland Government 2001)

Mexico (source: SEMARNAT, Lillo et al 2000, IUCN Cycad Specialist Group)

Mexico has the second highest diversity of cycad taxa, with three genera of Zamiaceae (*Ceratozamia, Dioon and Zamia*) and ca. 45 species (see the **Annex**). Cycads occur in a range of habitats from closed canopy forest to open savannas. Their survival has been affected by collecting from the wild but is also threatened by deforestation, which occurs at a rate of ca. 500,000 ha/year (A. Vovides in litt., 2000). Ten species are listed as Critically Endangered, 15 as Endangered, 13 as Vulnerable, and five as Near Threatened (Stevenson, Vovides and Chemnick 2003).

There is an active community of scientists and conservationists working on cycads in Mexico, comprising government agencies, non-governmental organizations, local communities, research institutions, botanic gardens and universities. The taxonomy of Mexican cycads is relatively well known and there have been several studies on the ecology and conservation of cycads. A comprehensive action plan for cycad conservation in Mexico was published in 2000 (Lillo *et al*., 2000).

Thailand (source: A. Lindström on behalf of CITES Management Authority)

Thailand has a ten species of *Cycas*, the only cycad genus found in Asia, and has the third highest cycad diversity in Asia (after Viet Nam and China). Extensive surveys, new descriptions and taxonomic revisions of Thai species have taken place in the past ten years. As a result, the diversity of Thai species is now relatively well known. The IUCN Cycad Action Plan lists two Thai species as Critically Endangered, five as Vulnerable, and three as Near Threatened (Hill, Chen and Loc 2003).

The CITES Management Authority confirmed that trade data summarized in the UNEP-WCMC GET database is an accurate reflection of trade from Thailand.

Madagascar (Source: TRAFFIC, IUCN Cycad Specialist Group)

Only one species of cycad occurs in Madagascar, i.e. C*ycas thouarsii.* This species is widespread along the east coast of Africa, also occurring in the Comores, Seychelles Kenya, Tanzania and Mozambique (where it may be introduced). Some of the largest known populations of *Cycas thouarsii* occur in Madagascar where it is relatively widespread and fairly common, particularly in eastern rainforest. It is not considered threatened.

Cycas thouarsii is cultivated in Madagascar with cultivated plants reported to be largely or entirely produced from seed. There are at least two commercial suppliers of seed for domestic and international markets. Several consignments of *C. thouarsii,* comprising 552 plants of wild origin, have been exported from Madagascar. Given the large number of plants in the wild, this level of harvesting does not seem excessive and there is no clear evidence of regular commercial trade in wild collected cycads. Nevertheless, the basis for non-detriment findings for wild trade is not clear.

3.1 Habitat protection

Australia

Populations of approximately 50 of the 74 Australian cycad taxa occur within one or more protected areas. Of the species that are harvested from the wild, only *Macrozamia miquelii* does not occur in a reserve.

Mexico

Habitat destruction is a significant problem for cycad species in Mexico. About 50% of species have at least one population in a protected area such as a Biosphere Reserve (Stevenson *et al*., 2003), but many populations are not well protected. One of the objectives of the conservation and recovery plan for Mexican cycads (Lillo *et al*., 2000) is to increase the protection and proper management of cycad habitats.

Thailand

Five Thai cycads are protected in reserves. Some species also occur in relatively inaccessible habitats, such as cliffs, which offers a measure of protection. Species associated with limestone outcrops, such as *C. tansachana* are threatened by limestone quarrying, which is destroying their habitat.

Madagascar

Destruction of rainforest is regarded as the major threat to *C. thouarsii* in Madagascar. Less than 2% of rainforest habitat is conserved in reserves and the majority of *C. thouarsii* populations occur outside reserves.

3.2 Regulation of wild harvesting

Australia

Harvesting programs must be approved by the CITES Scientific Authority. Approval requires that harvesting will not be detrimental to the survival or conservation status of the taxon and takes into account the potential impacts on the ecosystem, the effectiveness of management and monitoring operations and whether there is effective state legislation. There are currently five approved harvesting operations. In the Northern Territory, harvesting of live plants is limited to salvage harvesting (before land is cleared) and small-scale experimental harvesting. The principle applied to salvage operations is that horticulturally desirable plants that are capable of being transplanted should be removed and made available to growers before they are destroyed (the same principle was applied in South Africa in the mid 1960s when the Jozini Dam was built and several thousand specimens of *E. senticosus* were rescued). Due to the large cycad populations in Australia, it is one of the only countries where large scale harvesting of this nature is possible. Seeds and leaves can also be harvested from two *Cycas* species in the Northern Territory. In Queensland, wild harvesting may be approved for salvage operations and regulations also allow private landowners to apply for a license to harvest plants from uncleared land. Licenses are only issued where the harvest is shown to be sustainable. In West Australia, harvest of whole plants is limited to salvage operations.

Mexico

All cycads are listed as species in danger of extinction (Norma Oficial Mexicana NOM-059-ECOl-2001). The General Law of Ecological Balance and Protection of the Environment which was passed by Congress in 1986, determines the principles and regulations by which species of wild flora and fauna may be used in the country. All uses of wild flora are covered by this law and especially the law concerning threatened species passed in 1994 (NOM-059-ECOL-1994). Collecting permits are authorized by the Secretary of Environment and Natural Resources (Secretaría del Medio Ambiente, Recursos Naturales y Peces or SEMARNAP). Although permits are required for collecting, illegal harvesting remains a problem in some areas (Lillo *et al*., 2000), especially for rare species.

Thailand

Harvesting from the wild for export purposes occurs on a relatively small scale. No information is available on the regulation of wild harvesting but the species in trade (*C. pectinata* and *C. siamensis*) are listed as Vulnerable in the IUCN Cycad Action Plan due to a reduction in habitat (Hill, Chen and Loc, 2003).

Madagascar

Control of harvest is governed by general legislation for forest products (there is currently no legislation that protects individual plant species), under which collection for commercial purposes requires the collector to hold a "Convention de Collecte" issued by the Department of Water and Forests in the Ministry of Environment, Water and Forests (who are also the CITES Management Authority). Control of wild harvesting appears to be weak due to a shortage of personnel, poor training and corruption. Collection for subsistence use (usufruct rights) does not in general require any permit.

3.3 Regulation of trade

Australia

International trade is regulated by the CITES Management Authority. Specimens in trade must be sourced from one of four approved programs, i.e. artificial propagation programs, wildlife trade operations (see under harvesting), approved commercial import programs, or wildlife management plans (none of the latter have yet been approved).

Mexico

Trade is strictly regulated and permits are required for the export of any cycad species. The majority of trade is in artificially propagated plants. Provision has also been made for the artificial propagation of cycad species by registered nurseries. Mexico has been a leader in the development of pilot projects based on the sustainable use of wild populations. Typically, these nurseries involve local people who harvest seed from the wild and then propagate the plants in their own nurseries. These nurseries are registered through UMAS (Unidad de Manejo de vida Silvestre). Cycad experts consider Mexico to have some of the most stringent regulations for the export of cycads. However, illegal trade is still considered to be a problem by Mexican cycad experts.

Thailand

Trade in CITES listed species is regulated by the CITES Management Authority. Most of the trade is in cultivated specimens that are propagated in CITES registered nurseries.

Madagascar

Collection and export of wildlife products in Madagascar is controlled by several domestic laws and regulations. Recorded exports of cycads is generally low. There appears to be little clear evidence for ongoing trade in wild harvested *C. thouarsii* (M. Jenkins in litt. 2003), but CITES reports include exports of several hundred wild collected plants (in 1996 and 1998). *C. thouarsii* is also cultivated in Madagascar and plants in trade are reported to be very largely or entirely produced from seed. There are at least two commercial suppliers of seed for domestic and international markets.

3.4 Monitoring

Australia

Monitoring within states and territories is carried out by conservation officials. Harvesters are required to record harvests and submit returns and staff from state agencies such as the Queensland Parks and Wildlife Services may inspect properties where harvesting occurs and are also expected to monitor retail outlets. In the opinion of the CITES Management Authority, compliance with CITES regulations is good.

Mexico

Monitoring of harvesting of plants or seeds is the responsibility of the Federal Agency for the Protection of the Environment (PROFEPA).

Thailand

There appears to be no regular monitoring of cycad populations in the wild. **Madagascar**.

There appears to be no regular monitoring of cycad populations in the wild.

3.5 Basis of non-detriment findings

Australia

Most permits are issued for salvage harvesting, and non-detriment findings are based on the abundance of adult plants and the threatened status of populations. There have been only a few population studies of Australian cycads that are appropriate as a scientific basis for harvesting quotas, e.g. studies of *Cycas* species in the Northern Territory (Liddle, 2003). Most of the species that have been harvested in any quantity are classified as Least Concern according to IUCN categories of threat (Hill, 2003). However, some experts in Australia are concerned about harvests of species such *Cycas ophiolitica,* which now occurs in only a small part of its original range (due to land clearing).

Mexico

Most wild harvesting is restricted to seed harvesting for nurseries. The use of wild fauna and flora in Mexico is governed by the General Law of Ecological Balance and Protection of the Environment that was passed by Congress in 1986. Threatened species are also included in an act passed in 1994 (NOM-059-ECOL-1994) that makes provision for artificial propagation in registered sustainable management nurseries known as UMAS (Unidad de Manejo de vida Silvestre). The first sustainable management nursery for cycads was initiated in 1990 for a population of Dioon edule at Monte Oscuro in the Chavarillo district. Here, subsistence farmers (campesinos) were clearing sections of cycad habitat and also lopping the crowns off large cycads, which they sold off as apparently well established large plants. In Monte Oscuro, the community agreed to set up a nursery using wild-collected seed on the understanding that they would (i) conserve the natural habitat as a seed source and, (ii) carry out reintroduction of nursery produced plants to compensate for seed removal. The result has been that about 80 hectares of tropical thorn-forest habitat has been conserved.

Two further nurseries have been established in Veracruz province under the leadership of researchers from the Universidad Veracruzana. The first was established in 1992 at Cienega del Sur on the coast of Veracruz near Alvarado for *Z. furfuracea*. The second project was initiated with a campesino community at Tlachinola, near Xalapa, for the management of *Ceratozamia mexicana*. Four additional nurseries have been started in the state of Chiapas for the management of *Dioon merolae* and *Ceratozamia cf. norstogii*, situated in the buffer zone of the La Sepultura biosphere reserve, and *C. matudae* and *Zamia soconuscensis* situated in the buffer zone of the El Triunfo biosphere reserve.

Thailand

There is no quantitative data available on which to base non-detriment findings. There are apparently no estimates of population sizes for Thai species and research has been limited to sorting out the taxonomy of Thai species. It is therefore not clear on what basis non-detriment findings have been made.

Madagascar

The basis for non-detriment findings is not known but there are large populations of *C. thouarsii* in Madagascar.

4. Overview of trade

Historical accounts (e.g. Thunberg, 1793), together with several recent reviews (Donaldson, 2003; Gilbert, 1984; Jones, 1993; Norstog and Nicholls, 1997; Sacks, 1996; Whitelock, 2002; Whiting, 1963) show that cycads have probably been used by people since prehistoric times and they have been traded for many different purposes. The most common uses have been for food (seeds and stems), starch (stems), ceremonies and decoration (leaves), basket work (leaves) and medicine or magic (stems, roots, bark). Cycads also have a long history of use as ornamental plants in Asia and they have recently become popular garden and collector plants in other parts of the world.

Food

The use of cycads as a food source has been recorded mostly in times of famine (Jones, 1993; Whiting, 1963), or as an item reserved for special occasions (Sacks, 1996; Whiting, 1963). Both stems and seeds are used. In parts of Asia and Melanesia, where cycads are locally abundant, seeds may be used more regularly as a source of food (Jones, 1993; Sacks, 1996; Whitelock, 2002). Although local consumption of cycads may have an impact on wild populations (Whitelock, 2002), the available data indicates that the impact is limited and there is no evidence of ongoing international trade in cycads for this purpose.

Starch extraction

Commercial ventures to extract starch from cycad stems have operated in the United States of America (USA) and Australia. From about 1845, mills were set up in Florida (USA) to extract starch from *Zamia integrifolia*. Norstog and Nicholls (1997) estimated that the production of flour from one of these mills would have required a harvest of 8,000 to 12,000 *Zamia* plants per week. This high level of exploitation, together with the destruction of cycad habitat, led to a decline in cycad populations and the industry had collapsed by 1925 (Jones, 1993). A similar commercial venture was started in 1921 in Australia using the abundant *Macrozamia communis,* but this industry also failed (Jones, 1993). There is no known commercial trade in cycad starch at present.

Medicine and magic

The use of cycads for medicine and magic has been recorded in various range States, but the impact on wild populations is mostly unknown. South Africa is one of the range States where medicinal trade does seem to have a negative impact on wild populations. Populations of *Stangeria eriopus* are apparently declining due to intensive harvesting. Osborne *et al*., (1994) estimated that more than 3,000 wild collected *S. eriopus* plants were being traded each month from two markets in Durban, South Africa, and subsequent researchers noted that prices were increasing due to shortages in supply (Manders, 1997; Marshall, 1998). Similarly, botanists have noted that bark harvesting from *Encephalartos* species is resulting in the decline of several populations (Donaldson and Bösenberg, 1999*;* C. Dalzell, pers. comm., 2003). The medicinal trade in cycads takes place mostly within South Africa. International trade probably occurs between South Africa and Mozambique, but the informal nature of this trade makes it difficult to monitor and it is not captured by CITES reports.

Leaves

CITES records from 1983 to 2001 (UNEP-WCMC database) show that there has been a substantial trade in leaves, especially for species of *Cycas* (413,027 leaves plus 164 bags of leaves) and *Bowenia* (25,328 leaves plus 14,640 boxes of leaves). The leaves are used for floral arrangements and the bulk of the trade is from cultivated plants in Japan (the principal exporter). There is no evidence that leaf harvesting has a detrimental effect on wild populations.

Wood products

A small amount of trade occurs in items referred to as 'timber' or 'wood products' (the total trade in wood products is less than 7,000 items between 1987 and 2001). Cycads stems have a soft cortex and are not suitable for the production of timber, but parts of dried stems may be used for various purposes. The low volumes confirm that this trade is not significant. Similarly, the seeds are sometimes used to make ornaments, which may be traded as wood products, but this trade is not significant.

Ornamental plants

By far the greatest trade in cycads is as ornamental plants, with more than 30 million plants being traded between 1977 and 2001. Cycads have been used as ornamentals for a long time in several parts of Asia and they are highly valued in Chinese and Japanese cultures. Cultivated plants that are more than 800 years old have been reported from China and Japan. *Cycas revoluta* has been the mostly widely used species although other species of *Cycas* have been used in many places.

In more recent times, dwarf species of *Cycas* from southern China and northern Viet Nam have become popular as bonsai and pot plants in their native regions. Most of this trade occurs within the country of origin, or across regional borders (e.g. China and Viet Nam), but there appears to be little trade outside of the region where they originate.

During the 20th century, cycads became popular garden and landscape plants in countries outside Asia, particularly in South Africa, the USA, Australia and parts of Europe. At the same time, a market also developed for cycads as collectables. Wild populations were heavily exploited to satisfy the demand, especially in South Africa and Mexico. In some cases, tens of thousands of plants were removed from the wild (Whitelock, 2002) leading to widespread decline in many cycad populations (Donaldson and Bösenberg, 1999; Giddy, 1993; Whitelock, 1995). The rapid decline in cycad populations led to a series of listings on the CITES Appendices and all cycad taxa are now included in either Appendix I or Appendix II (see **Table 2**). The genera *Encephalartos, Microcycas,* and *Stangeria* were listed on CITES Appendix I in July 1975, followed in February 1977 by the listing of the entire families of Cycadaceae and Zamiaceae in Appendix II. The genus *Bowenia* was originally listed in the Zamiaceae but when the genus was included in the Stangeriaceae in 1990, *Bowenia* was listed separately in Appendix II. The genus *Ceratozamia* was upgraded to Appendix I in August 1985 and the genus *Chigua* was listed in Appendix I in January 1990. *Cycas beddomei* is the only species of *Cycas* to be listed in Appendix I.

Table 2 – The current status of cycads in the CITES Appendices

TAXON	YEAR OF LISTING	NOTES
APPENDIX I		
Ceratozamia	1985	Upgraded from Appendix II
Chigua	1990	Listed separately after the genus was described
Encephalartos	1975	
Microcycas	1975	
Stangeria	1975	
Cycas beddomei	1987	The only species of *Cycas* listed in Appendix I
APPENDIX II		
Bowenia	1990	Listed separately when the genus was placed in Stangeriaceae
Cycadaceae (*Cycas*)	1977	
Zamiaceae (*Dioon, Lepidozamia, Macrozamia, Zamia*)	1977	

To make sense of the trade in cycads as ornamental plants and its impact on wild populations, it is important to note that the plants in trade are catering for at least three different markets.

Large scale trade in ornamentals

The long tradition of using cycads as ornamentals in Southeast Asia, together with more recent interest in other parts of the world, has created a market for readily available plants for gardens. A key element of this market is that it requires a consistent supply of similar looking plants in large numbers. Although many cycads make attractive garden subjects, relatively few can be propagated in sufficient quantity to supply this market. *Cycas revoluta* has been cultivated for several centuries

and is one of the few species that is now cultivated 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 of its range State (Mexico). Other species, which are now being propagated for this market, are *Cycas taitungensis* and *C. panzhihuaensis,* but they are not yet available in large enough numbers to be economically viable.

In some countries, local species may be harvested from the wild in large numbers before they become intensively cultivated. Populations of *Z. furfuracea* in Mexico were heavily exploited prior to 1985 for export to the US, but they are now so common in cultivation that wild harvesting is unnecessary and uneconomical. It is important to examine trade patterns to identify species that may be heavily traded from wild populations prior to intensive cultivation.

Small scale trade in collectable species

Cycads have become popular with a relatively small group of plant collectors. Based on the membership of cycad societies, there are probably only a few thousand collectors around the world. These collectors seek a wide range of species, but only a few specimens of each taxon. As a result, the market is too small to justify large-scale commercial production. Most collectors obtain their plants from other collectors, but some will go to a great deal of trouble to acquire rare or unusual species as well as plants from specific localities. The scarcity of these plants in cultivation creates a market for wild-collected plants. This trade is most likely to only have an impact on rare species.

Trade in large landscape plants.

Cycads make attractive feature plants, especially large arborescent taxa that resemble palms. There is an ongoing demand for large landscape plants, even in low numbers. However, 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. The result may be illegal trade, such as the harvest of ca. 400 stems of *Encephalartos altensteinii* from a wild population in South Africa in 1995. However, some of this demand may also be met through sustainable harvesting of large plants such as *Macrozamia moorei* from Australia, which is gaining popularity as a large landscape plant.

4.1 International trade

Data analysis is based on the gross export, gross import and comparative tabulation data from the UNEP-WCMC comparative tabulation database together with submissions from 19 range States and information gathered from the TRAFFIC network and the IUCN/ SSC Cycad Specialist Group.

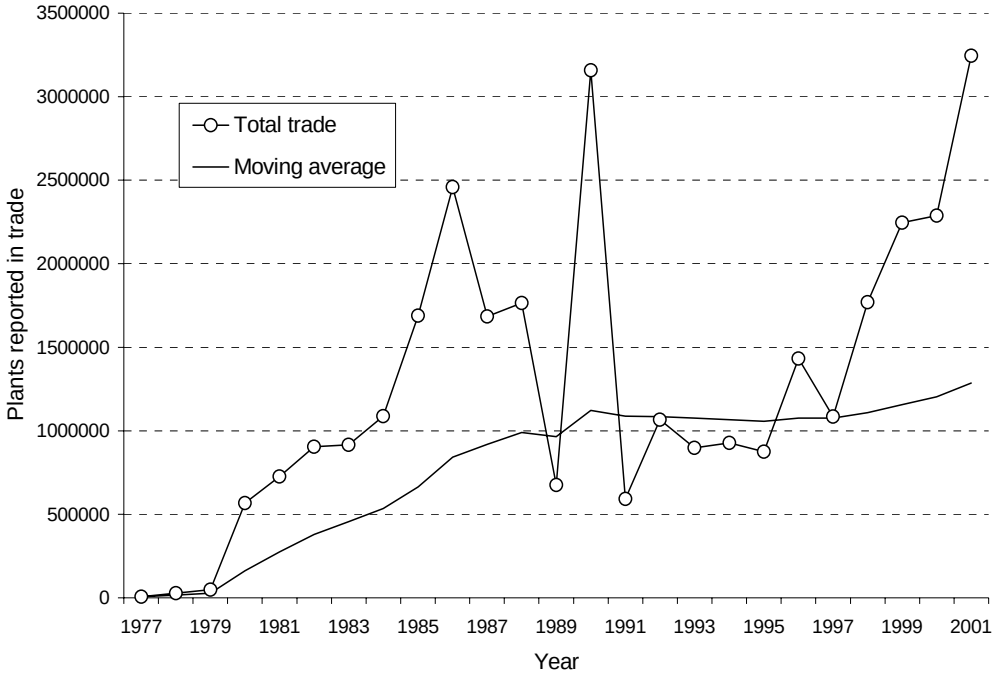
For the most part, the Gross Export Trade (GET) data supplied by UNEP-WCMC were consistent with the submissions received from range States. In a few instances, e.g. in the case of the USA, there were some small discrepancies between what the country had reported and the GET data. Most discrepancies involved small numbers and, therefore, the reported data appear to reflect actual trade.

When analyzing trade data for cycads, the terms used in CITES reports can be misleading. Trade in leaves and seeds are quite clear, but plants can be reported as roots, stems, logs, or live. Cycads that are traded as ornamental plants are often transported without leaves, and even without roots, and they could be reported as stems or even logs. Similarly, trade in small species with subterranean stems, as well as young plants, which have a large proportion of root, would probably be reported as trade in roots. All the information available indicates that trade in roots, stems and live plants are all variations of trade in live plants. Therefore, in the analyses of trade for this report, stems, roots and live plants have been treated as if they were the same term. By adhering to the terminology recommended by CITES (Notification 2002/022), the monitoring and analysis of data could be improved. This further impacts on making suitable management decisions.

CITES trade data from 1977 to 2001 (see **Figure 4**) show that from 1980 onwards, annual trade in cycads has varied between 500,000 and 3.5 million plants, with an average trade of more than one million plants per year since 1987 (UNEP-WCMC comparative tabulation database). The

vast majority of this trade was in cultivated specimens of a few species, notably *C. revoluta* and *Z. furfuracea* (see **Figure 5**).

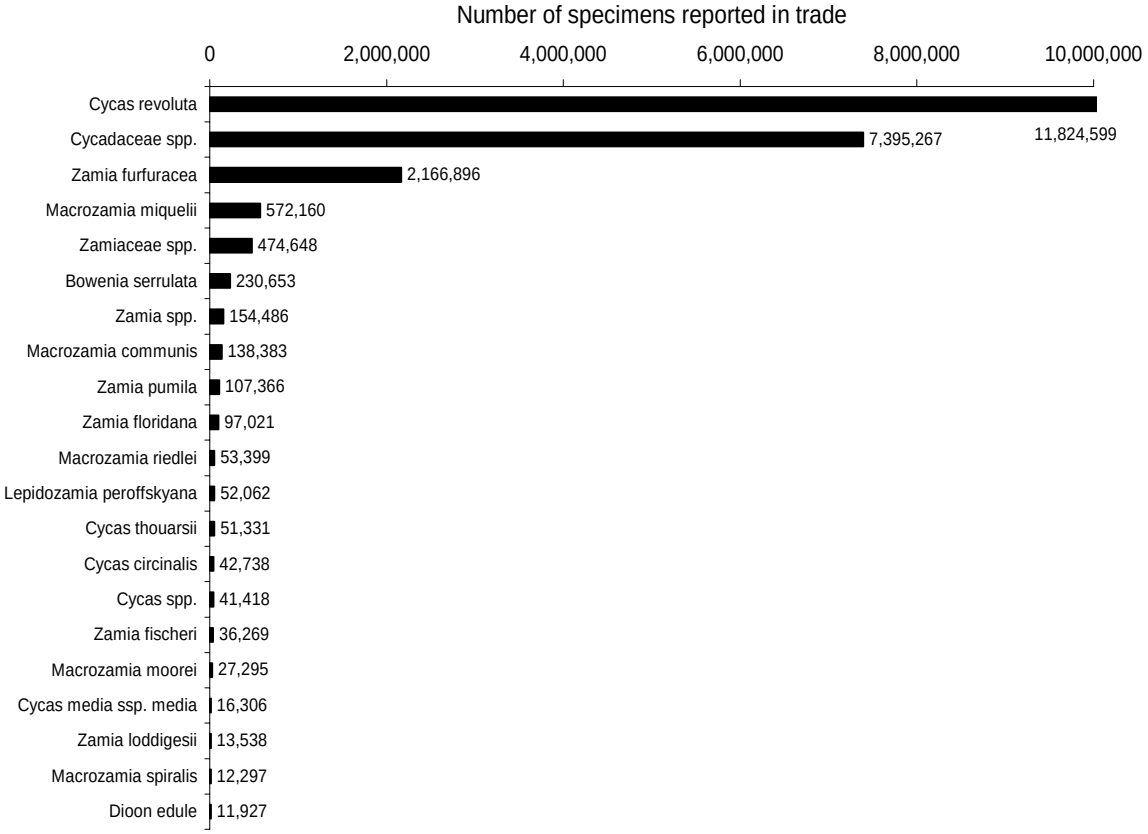
Figure 4 – Total number of cycads reported as exported between 1977 and 2001
Source: UNEP-WCMC database



A large volume of trade was also reported simply as Cycadaceae or Zamiaceae, or to a lesser extent, *Zamia* spp. or *Cycas* spp. (see **Figure 5**). Parties such as the USA submit reports on Appendix II taxa at the level they are included in the Appendices (ie. Cycadaceae and Zamiacae), which means that it is impossible to always tell which species are in trade from the reporting data. The trade in Cycadaceae could therefore include species other than *C. revoluta.* Reports of trade in Zamiacae are more complicated than in the case of Cycadaceae because they could refer to trade in any of the four genera listed in Appendix II. They should not refer to trade in any the four genera of Zamiacae listed in Appendix I because trade in these taxa should be reported at the genus level or lower.

The focus of the Review of Significant Trade is on plants of wild origin and it is important to note that this forms only a small fraction of total trade in cycads (ca. 1% of all trade between 1977 and 2001). According to UNEP-WCMC comparative tabulation database, trade in cycads of wild origin has been a small but regular feature of the overall trade since 1993 (see **Figure 6**). In most years, fewer than 1,000 plants have been traded but a large number were traded in 1995 and 1996 when Australia reported exports of 23,765 *Bowenia serrulata* plants (1995) and 10,000 *Macrozamia miquelii* plants (1996).

Figure 5 – The total number of plants reported in trade between 1987 and 2001 for cycad taxa listed on CITES Appendix II
Source: UNEP-WCMC database



Several of the records of wild trade in the UNEP-WCMC comparative tabulation database (i.e. all reports where the source code is given as 'W') and which are included in **Figure 7**, appeared to be incorrect. This is because the trading country is not the country of origin and the trade is not reported as a re-export. One explanation for these records is that they have correctly reported the species in trade but the source code is incorrect. Most of the trade in apparently wild harvested *C. revoluta* was exported from Honduras (58,320 plants between 1998 and 2001), which is not a range State and has no indigenous species of *Cycas*. However, Honduras is also an exporter of large quantities of cultivated specimens of *C. revoluta,* which suggests that the plants exported from Honduras have been given an incorrect source code.

Smaller quantities of *C. revoluta,* as well as other species such as *C. beddomei* and *C. pectinata,* which have been exported by non-range States, could have been reported with the correct source code, but the species in trade may have been incorrectly reported. There has been considerable confusion about the taxonomy of *Cycas* species and studies have only recently begun to make sense of the diversity of Asian cycad species. Many new species have been described from countries such as Thailand, Viet Nam and China and there is now a better understanding of species distributions (Hill and Yang, 1999; Lindstrom and Hill, 2002; Wang, 1999). As a result of earlier taxonomic confusion, specimens of *C. revoluta* exported from Viet Nam could be cultivated specimens of *C. revoluta* or wild specimens of *C. inermis*. Only China and Japan are currently regarded as range States for *C. revoluta,* but *C. inermis* from Viet Nam has been regarded as a synonym of *C. revoluta* in the past (Whitelock, 2002). Similarly, specimens of *C. beddomei* (see **Appendix I**) reported as exported from Thailand could have been confused with other Asian species. They are regularly confused with *C. sphaerica,* but this species is also not indigenous to Thailand and other species may therefore be involved.

Figure 6 – Total number of cycads traded between 1977 and 2001
Source: UNEP-WCMC database

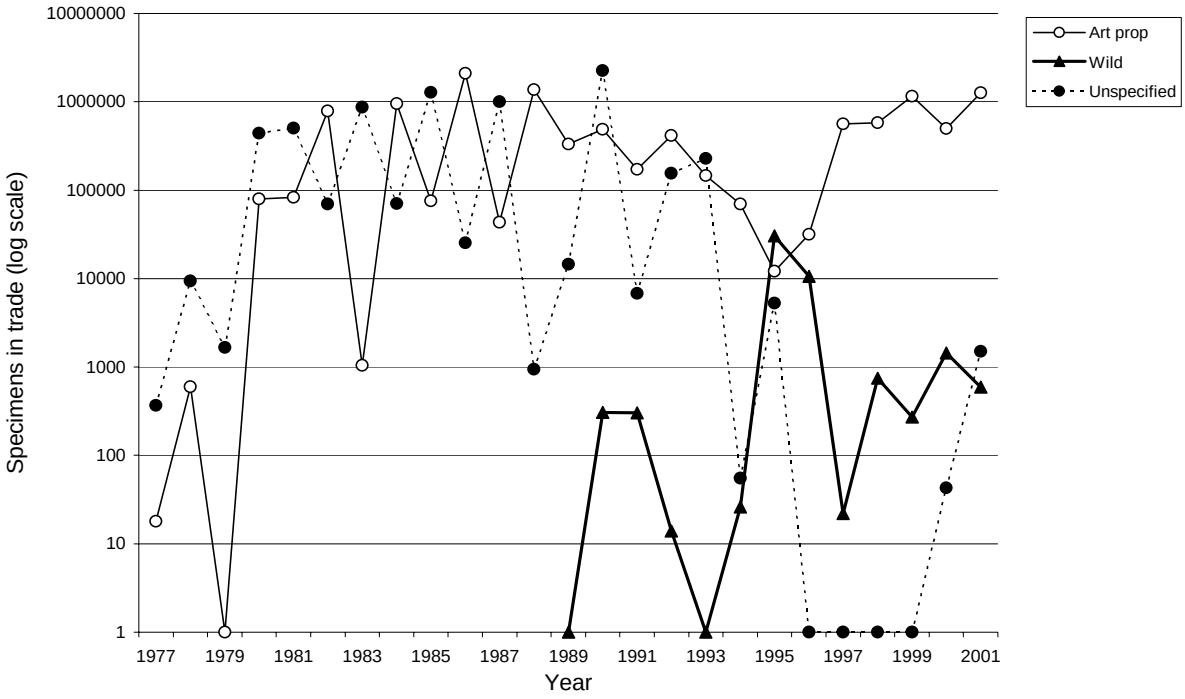
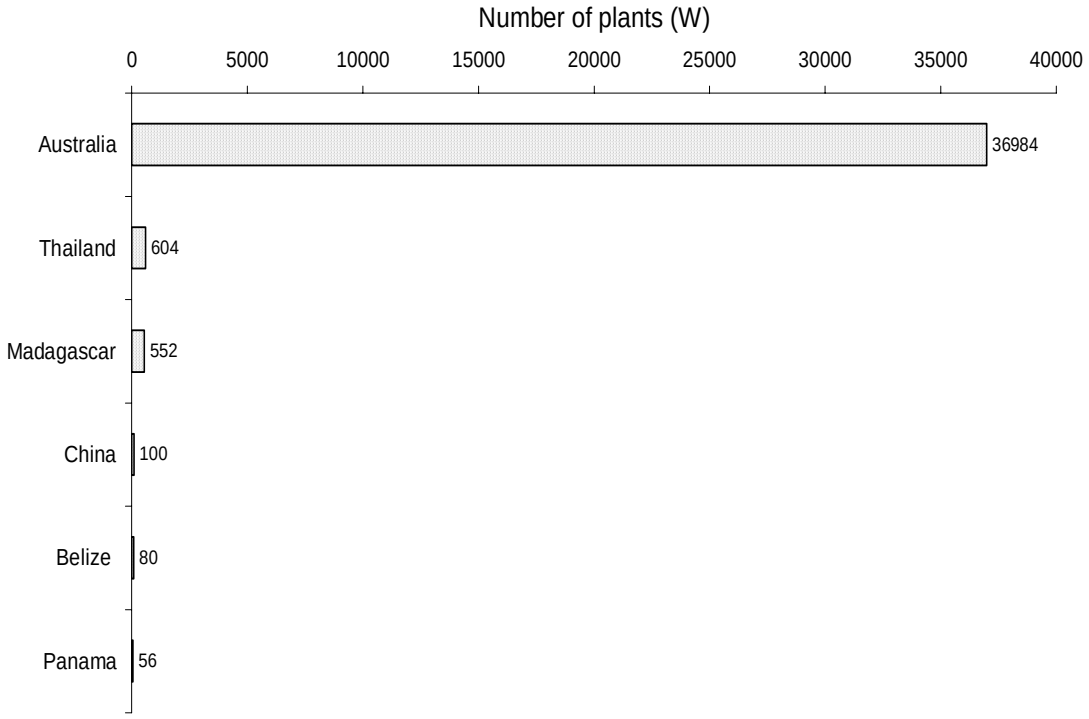


Figure 7 – Species of cycads listed on CITES Appendix I (*C. mexicana* & *S. eriopus*) and Appendix II in which trade in wild collected specimens has been recorded
Source: UNEP-WCMC database

Note: Asterisks indicate species where it is doubtful that the trade records are accurate. Species are ranked according to the number of plants recorded in trade between 1990 and 2002. *Cycad beddomei* (Appendix I) is included due to possible confusion with other species.

When large exports from non-range States are excluded from the analysis, all the trade in Appendix II cycads of wild origin can be attributed to six countries (see **Figure 8**). These data also exclude the record of a re-export of 5,800 *Z. furfuracea* plants from Malaysia in 1995, which was reported as originally wild harvested in Mexico. There is no record of any export of wild harvested plants from Mexico to Malaysia in the UNEP-WCMC database and no additional information could be obtained on the original export.

Figure 8 – Number of wild-collected cycads (CITES Appendix II) exported by range States between 1990 and 2001
Source: UNEP-WCMC database



Note: The actual number of plants is given to the right of each column. Exports exclude apparently incorrect records (e.g. where the species, or its close relatives, does not occur in the exporting country)

Trade in wild cycads from Australia is an order of magnitude larger than trade from any other range State (see **Figure 8**). Australia is also the only range State where the bulk of the trade is for commercial purposes. This is not surprising since Australia has the greatest diversity of cycad taxa (see **Figure 2**). More importantly, many of the cycad species in Australia are also exceptionally abundant and these populations are more likely to tolerate harvesting from the wild than rare species that occur elsewhere (see later under range State reports).

In contrast to Australia, a large number of the records of trade in wild collected cycads (CITES Appendix II) from other range States refers to plants collected for scientific purposes and for botanical gardens. The volume of trade stated in the reports is mostly less than 20 plants, which is what would be expected for scientific purposes or *ex situ* collections. Records from Thailand and Viet Nam are predominantly for the export of dried plants (herbarium specimens) to Australia and the UK. In recent years, there has been extensive fieldwork in Southeast Asia to survey and describe cycad species (Chen, 1999; Chen, 2000; Hill *et al.*, in press; Hill and Yang, 1999; Wang, 1996; Wang, 1999) and herbarium specimens from range States in this region have been sent to herbaria in the UK and Australia. Although trade in plants for scientific purposes, or for gardens, could be misused to smuggle through rare species for commercial purposes, the low numbers that have been traded under these source codes indicate that this is not happening. The total trade for garden and scientific purposes (CITES Appendix II species) from 1990 to 2001, comprising 21 species from nine range States, was only 484 plants.

There are 55 records in the UNEP-WCMC comparative tabulation database (for live plants and roots) where the source is given as unknown. This represents a significant amount of trade (901,894 plants). However, 41 of these records, comprising 898,942 plants, almost certainly refer to cultivated plants. These records are all exports of *C. revoluta* or *Z. furfuracea* from non-range States. The export countries that have reported large numbers of plants all have nurseries that cultivate these two cycads. The remaining 14 records, representing trade in 2,972 plants, are all species that are endemic to the exporting countries. This relatively small number of plants could therefore have been harvested from the wild.

In summary, the data on legal trade in wild harvested plants indicate that relatively few Appendix-II species are traded in significant numbers. The only countries where levels of trade are high enough to require further analysis of data on the management of wild populations or compliance with Article IV of the Convention are Australia, Thailand and Madagascar. Additional information has also been provided for Mexico because of the uncertain record of a re-export of wild harvested plants from Malaysia (see above). Madagascar is the subject of a separate detailed review, which will address all the issues relevant to plant trade, so only a brief overview of trade in cycads from Madagascar is provided in this analysis.

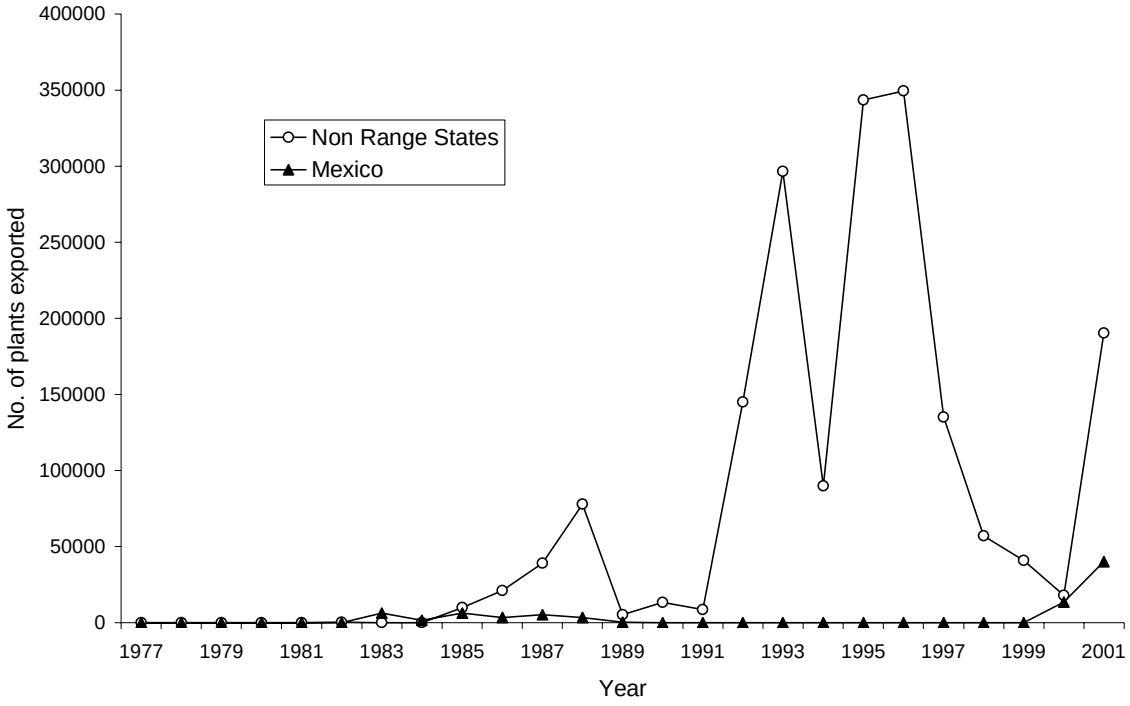
Australia

Most cycads exported from Australia are artificially propagated. The nursery trade is well established and several large nurseries propagate a wide range of cycad taxa. Plants from wild sources all originate from legal harvesting programmes that are managed by state agencies under the oversight of the federal CITES Management Authority.

Mexico

Exports from Mexico are primarily artificially propagated plants. The only record of wild harvested plants is a re-export from Malaysia of *Z. furfuracea* in 1995. There is a recurring trend in trade of many Mexican taxa showing a peak prior to 1985 and then relatively little export from Mexico since then. There are at least two possible explanations. First, the drop in trade coincided with the implementation of stricter CITES regulations and the upgrading of *Ceratozamia* to Appendix I in 1985. Second, many Mexican taxa had been collected in large numbers prior to 1985 and a sufficient number of plants exist outside Mexico to supply artificially propagated plants. *Z. furfuracea* is a classic case, where most trade since 1985 has originated outside of Mexico (see **Figure 9**).

Figure 9 – Trends in the trade in *Zamia furfuracea* between 1977 and 2001 for both the range State (Mexico) and non-range States
Source: UNEP-WCMC database



Thailand

Most trade from Thailand is in small quantities of exotic species. There are some inconsistencies in the data from Thailand, such as the export of *C. beddomei.* Experts on Thai cycad species have responded that the trade from Thailand is almost certainly not in *C. beddomei* but in other species that have been incorrectly labeled. Most of the trade from Thailand is in cultivated specimens that have originated in registered nurseries. Similarly, there are reports of trade in *C. hongheensis,* a very rare Chinese species and it is not clear whether these plants have been correctly identified.

Madagascar

Trade from Madagascar focuses on the single indigenous species, *C. thouarsii.* The majority of trade appears to be in artificially propagated specimens but there are records of trade in 552 specimens of wild origin (2 in 1992; 350 in 1996; 200 in 1998).

Viet Nam

According to the UNEP-WCMC database of CITES trade records, there has been relatively little trade in cycads from Viet Nam and the only species of wild origin is *C. revoluta* (15 in 1996 and 500 in 1998). This is slightly different from the records obtained from Viet Nam, which indicate that between 1994 and 2003 permits were granted for the export of wild specimens of *C. micholitzii* (200 plants), *C. pectinata* (85 plants), and *Cycas* spp. (89 plants). In the case of *Cycas* spp., they were all for scientific purposes. There are at least two companies in Saigon that are trading in Artificially propagated *C. revoluta,* although it is not clear whether these are indeed *C. revoluta.*

4.2 Domestic trade

Many range States have domestic trade. The actual numbers of plants involved in domestic trade are not known, but they can be substantial. Nature conservation agencies in South Africa estimated that more than a million indigenous cycads occurred in private gardens within the country (S. Fourie, pers. comm., 1994). It is also not always clear whether new plants are entering trade from wild populations or whether original wild harvesting has led to large-scale

propagation. Two important questions need to be asked about this trade. First, what impact does it have on wild populations? Secondly, do plants in domestic trade enter international trade either legally or illegally? There is no doubt that domestic trade has had a substantial impact on some cycad taxa, even more so than international trade. Cycad experts have identified domestic trade as a threat to cycad populations in Australia, China, Mexico, South Africa, Thailand, US and Viet Nam, amongst others (see the **Annex**). Large quantities of wild collected plants have been observed in domestic markets in China and Viet Nam within the last five years and law enforcement agencies in South Africa continue to arrest collectors for trading in wild collected cycads.

Entry of cycads into international trade from domestic trade is a complicated matter. In countries such as Viet Nam, most of the trade appears to occur within Viet Nam or with immediate neighbors (China), but most taxa have not entered markets in the USA or Europe. This appears to be true of most range States in Southeast Asia. In contrast, cycads from countries such as Mexico and South Africa have become popular in the USA, Europe and Australia. In countries such as Mexico, there is a relatively small domestic market, and it is the international market that has created the demand for local plants and local production in Mexico is aimed at meeting this demand. Where there is a strong domestic market, such as in South Africa, there is a continuous trade between domestic markets and international markets. These markets are perhaps the most difficult to regulate as plants entering international trade may be of wild origin, cultivated from wild stock, cultivated from garden plants, or even have been collected prior to CITES coming into force.

Australia

Australia has a growing domestic trade in cycads. Until quite recently, mostly non-indigenous cycads were traded, but Australian species have become more popular. This has led to an increase in harvesting from the wild. Although many Australian species are common, there are several species that are potentially threatened by a combination of wild harvesting and land clearing.

Mexico

Compared to the international trade in species of Mexican origin, the trade within Mexico is relatively small.

Thailand

Indigenous species such as *Cycas elephantipes, C. siamensis* and *C. pectinata* are traded within Thailand. These plants are often from wild populations and it has been proposed that *C. elephantipes* should be classified as Endangered due to harvesting from the wild for domestic trade. This is a newly described species so it is not clear whether it has also entered international trade.

Madagascar

There is relatively little domestic trade in Madagascar. Almost all cycads traded from either cultivated or wild sources are for export.

Viet Nam

Nine indigenous species are traded within Viet Nam (*Cycas dolichophylla, C. elongata, C. inermis, C. lindstromii, C. micholitzii, C. miquelii, C. pachypoda, C. pectinata*) (Nguyen Tien Hiep in litt, 2003). As with other parts of south-east Asia, cycads are popular pot subjects due to their well-defined growth form. The actual volumes in trade are not known but plants are frequently seen in cultivation and truckloads of cycads have been observed in various centres.

5. Other relevant information, including on artificial propagation

5.1 Artificial Propagation

Cycads are widely propagated either in commercial nurseries or by collectors and enthusiasts. Most cycads are propagated from seed or, increasingly, from offsets (suckers) that develop on

the stems of mature plants. Although there has been some success with the development of micropropagation (tissue culture) techniques (Chavez *et al.*, 1992a; Chavez *et al.*, 1998b; Chavez *et al.*, 1998; Jager and van Staden, 1996), there has been no large-scale production from tissue cultured material.

Seeds of most species of *Bowenia, Ceratozamia, Dioon, Encephalartos, Lepidozamia, Macrozamia* and *Stangeria* germinate easily and *Microcycas calocoma* seeds have also been successfully germinated in botanic gardens. The only difficulty with seed germination seems to be with some species of *Zamia* and *Cycas,* which experience what is referred to as "morphophysiological complex dormancy" (Dehgan and Johnson, 1983; Dehgan and Schutzman, 1989). Even here, horticultural research has overcome some of these difficulties and excellent germination has been obtained using various seed treatments (Dehgan and Johnson, 1983; Dehgan and Schutzman, 1983; Dehgan and Schutzman, 1989; Dehgan and Almira, 1993).

In general, cycads can be propagated from seeds relatively easily and the supply of plants in trade does not appear to be constrained by difficulty with seed germination. The main constraint is more likely to be a source of seeds for rare species and the demand for large plants.

Large cycad plants are always in demand. They can be obtained more quickly by propagating offsets or suckers from the main stem. These adventitious branches are usually limited in number and therefore cannot be used for large-scale production unless there is a large number of stock plants. However, research has shown that localized application of certain growth regulators (e.g. Promalin) can greatly increase the number of shoots in some species (Dehgan and Almira, 1993). Increased growth in seedlings can also be obtained by cutting the taproot and applying growth hormones. The induced branching and unusually rapid development of the caudex after treatment with growth regulators produces much larger plants than could be obtained from plants of a similar age in the wild. This technique seems to offer some hope for greater production of rare cycad species where seeds may be hard to come by, but it also has the potential for increasing the commercial production of larger plants.

Ex situ collections have become an increasingly important component of cycad conservation plans, especially for the many species that are threatened with extinction. In addition to their role as a repository for threatened gene pools, *ex situ* collections may also supply seeds of rare species to other gardens and growers and thereby reduce the pressure on wild populations. Important *ex situ* collections of specific populations have been set up in Australia, China, Mexico, South Africa, and Thailand, and the IUCN Cycad Specialist Group has set up a committee to co-ordinate *ex situ* collections.

Australia has several large scale cycad nurseries and numerous small scale propagators. Many Australian taxa are cultivated but there are also a large number of African and Asian species, as well as American species, in cultivation. Several landscape nurseries are experimenting with large scale propagation of species with high landscaping potential , e.g. *Cycas taitungensis.*

Mexico has been at the forefront of sustainable use nurseries for cycads. Projects have been set up in conjunction with GTZ in Germany, MAB-UNESCO and Flora and Fauna International as well national sources such as Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) and Fondo Mexicano para la Conservación de la Naturaleza (FMCN). There are now at least four species propagated in these nurseries.

5.2 Illegal trade

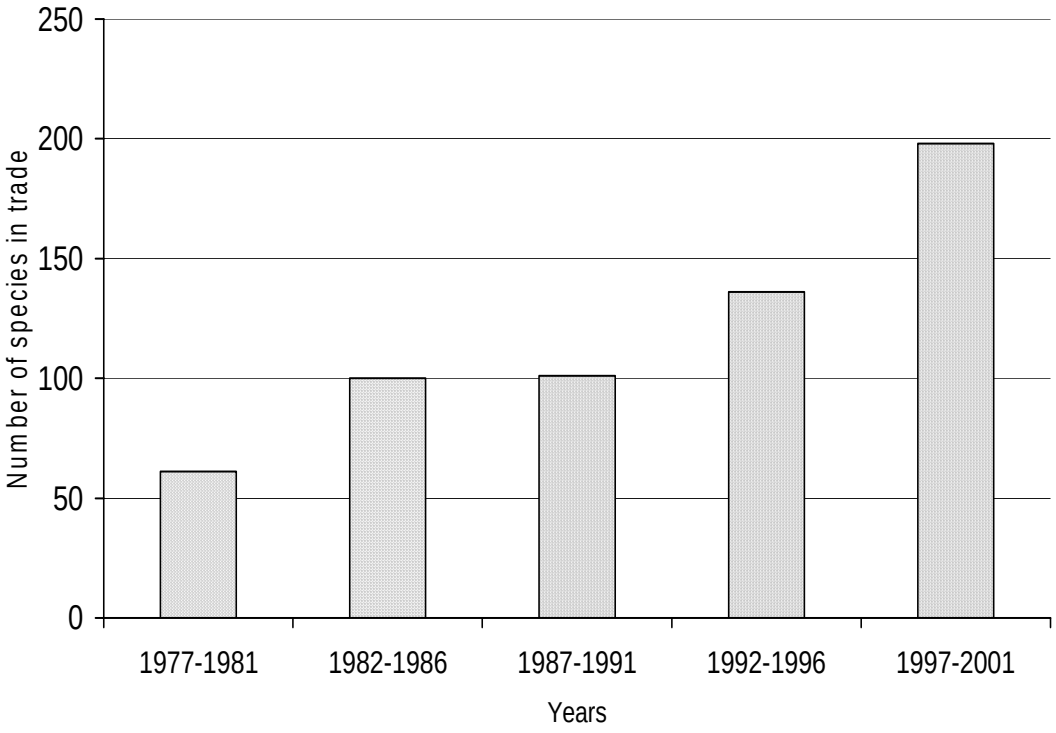
Illegal trade falls into two categories: 1) shipments that are not detected at all; and, 2) shipments that are detected, but that do not have permits. There is obviously no quantitative information available on the first category and range States provided little information on the second category. Nevertheless, almost all range States replied that compliance with CITES regulations was high. Cycad experts have raised concerns about certain taxa, noting that rare taxa are of greatest concern. Illegal trade in wild harvested plants, even in small quantities, can have a substantial effect on rare species with small population sizes.

The most compelling evidence for ongoing collecting from the wild is the continuing decline in wild populations, even in the absence of habitat destruction. Populations of highly sought after

species such as *Encephalartos inopinus, E. laevifolius* and *E. latifrons* have declined between 30% and 80% in the past 20 years due to collecting. What is not clear is whether collecting is purely for domestic markets or whether plants are traded illegally on international markets in contravention of CITES. Documented international trade in wild harvested plants is insignificant for the very large majority of species. The extent of a parallel black market in illegally traded plants is also not known. The total number of seizures of illegal exports or imports has not been determined although there have been seizures of several hundred plants within the past five years. It is possible that low level trade goes by undetected by customs officers. Within South Africa, crime syndicates are reported to be involved in cycad trade (J. Pienaar pers. com. 1998) and a spate of well organised thefts in the USA (California) during 2003 (San Diego Police Briefing to Cycad Society, June 2003) indicates that criminal elements are involved in cycad trade in the USA. Species such as *Encephalartos hirsutus* (Critically Endangered) have been reported from collections in the USA even though nature conservation officials in South Africa state that no permits have ever been issued for the harvest of *Encephalartos hirsutus* plants or seeds. It is important to note that continuous small scale trade in wild collected plants can be a significant threat - 23 species of cycad are known from <250 individuals (11 in Appendix I, 12 in Appendix II) (Donaldson 2003) and low levels of trade in these species will inevitably contribute to extinction in the wild.

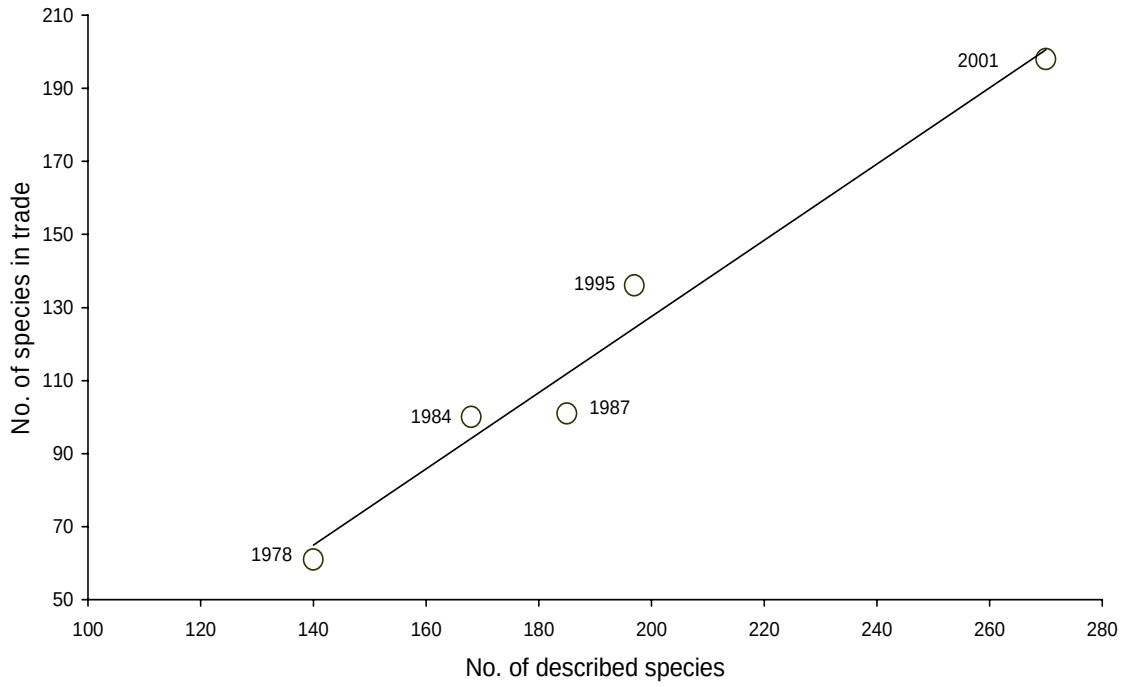
The demand for a wide range of cycad species is illustrated by examining the increase in the number of cycad taxa traded within the past 25 years (see **Figure 10**).

Figure 10 – The total number of cycad species reported in trade in five-year intervals between 1977 and 2001
Source: UNEP-WCMC database.



The main reason for the increase in the number of taxa in trade, is an increase in the number of new species that have been described (see **Figure 11**). It is clear that as new species are described, they enter international trade. Some of the trade is for scientific purposes and for botanical gardens, which are playing an important role in building up *ex situ* collections. However, many plants are also being traded for commercial purposes (see the **Annex**).

Figure 11 – Total number of cycad species recorded in trade between 1978 and 2001 relative to the number of species described at that time
Source: UNEP-WCMC database



Another area of concern is regional trade between neighboring countries 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 China and wild harvested plants have been observed on either side of the border. The Chinese Management Authority is aware of the trade and has attempted to clamp down on illegal trade. To improve the regulation of cycad trade, all cycads were entered on the Commodity Catalogue of Imported and Exported Wild Fauna and Flora, which came into force in 2000. It is not clear how this regulation has affected illegal trade in cycads.

5.3 Trade in seeds

There are only 22 records of cycad seed exports from wild sources. This is not surprising given that commercial trade in wild collected seed of Appendix I species is not permitted by CITES, nor does it regulate trade in Appendix II species. Most Parties only reported trade in Appendix II seeds if they were re-exports and the country of origin had issued a permit for the initial export. Most of the reported trade in wild harvested seed is therefore for Scientific Purposes (S), Botanic Gardens (G) or Captive Breeding (B). Volumes were between 9 and 125 seeds which is consistent with scientific use and use by botanic gardens.

There is considerable confusion about the legal status of trade in seeds and the IUCN/ SSC Cycad Specialist Group views the confusion as a serious impediment to the conservation of cycad species, especially to those species listed on Appendix I. Although trade in seeds of Appendix II cycads falls outside CITES, some Parties do require permits for seed exports. In addition, although trade in artificially propagated seed of Appendix I taxa is permitted by CITES, some range States (e.g. South Africa and Mexico) have placed restrictions on trade in seeds. In the case of South Africa, the reason is that it is impossible to tell the difference between wild-collected seed and artificially propagated seed. The restrictions on trade in seeds put in place by the range State often have implications for trade in those taxa from other range States.

The confusion surrounding trade in seeds can have negative consequences for wild populations. There are unconfirmed reports from Mozambique that mature plants of several Critically Endangered cycads have been harvested from the wild and transplanted to village gardens to

provide a source of 'cultivated' seed for export to the USA and Australia. The removal of mature plants from the wild in this way has no conservation value and conservation would be better served by harvesting seeds from wild plants.

The status of seeds in trade needs to be resolved as the way in which Parties apply regulations for trade in seed and these regulations do not always benefit species that are listed on the CITES Appendices. The IUCN/SSC Cycad Specialist Group has argued that restrictions on trade in seeds for highly threatened cycads in both Appendix I and II makes artificial propagation more difficult and contributes to the decline in wild populations. They argue that the international community needs to facilitate legitimate trade in seeds to prevent some cycad taxa from becoming extinct in the wild as a result of trade in mature specimens.

5.4 Review of Appendices

A review of the Appendices is required. There is no consistency in the listing of cycad taxa in Appendix I or Appendix II. There are many threatened species of *Zamia* and *Cycas* listed in Appendix II that are as threatened by trade as species of *Encephalartos* listed in Appendix I. At the same time, the conservation benefits of listing cycads on Appendix I need to be established. Species of *Encephalartos,* listed in Appendix I, have continued to decline despite trade restrictions and there is a high probability that several taxa will become extinct in the wild within the next ten years.

5.5 Reporting of species names

If trade data, as captured in the UNEP-WCMC database of CITES reports, are going to be used to monitor trade and compliance with aspects of the Convention, then trade reports submitted by range States must contain species level information. There are many Appendix II cycad species that are extremely threatened (Critically Endangered) and where even small volumes of trade in wild collected plants could harm wild populations. At present, for logistical reasons, several parties submit reports that contain only family level information.

Cycad taxonomy is changing continuously and it is important that CITES authorities use an up to date taxonomy for the names of plants in trade. The latest list of recognized names will be published early in 2004 (Walters and Osborne, 2004).

5.6 Terminology used on annual reports

Units of trade need to be standardized. At present, trade records for seeds and live plants include units of 'kg, bags, individual specimens' and 'shipments'. Actual volumes of trade in plants can only be measured from the number of specimens, whereas trade in seeds can be monitored using either number of seeds or units of mass (g, kg). Units such as bags and shipments are not standard measures and are basically meaningless for monitoring levels of trade.

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Annex

A summary of available data on cycad distribution, conservation status, threat posed by trade and records of trade in wild-harvested specimens. Cycad taxonomy, conservation status and population size (where known) are based on data supplied by the IUCN/SSC Cycad Specialist Group. The perception that trade is a threat to wild populations is based on submissions by cycad biologists and range States and identifies species where trade has or could contribute to population decline. Records of trade in specimens of wild origin were obtained from comparative tabulation data in the UNEP-WCMC database ('W' denotes that trade has taken place between 1987 and 2001, the purpose is designated as scientific (S) or commercial (T) and a country indicates export by a non-range State). The right hand column represents cycad taxa that are listed for sale in web-based catalogues. Generic abbreviations are given as *Ceratozamia (Ce.), Cycas (C.), Dioon (D.), Encephalartos (E.), Lepidozamia (L.), Macrozamia (M.) and Zamia (Z).*

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
Angola	*E. laurentianus*	DD				
	E. poggei	LC	50,000	-		Yes
Australia	*Bowenia serrulata*	LC	>10,000	-	W	Yes
	Bowenia spectabilis	LC	>10,000	-	W	Yes
	C. arenicola	NT	2,500-10,000	-		Yes
	C. armstrongii	LC	>10,000	-		Yes
	C. arnhemica ssp. arnhemica	LC	>10,000	-		Yes
	C. arnhemica ssp. muninga	LC	2,500-10,000	-		Yes
	C. arnhemica ssp. natja	LC	2,500-10,000	-		Yes
	C. badensis	NT	1,000-2,500	-		
	C. basaltica	LC		-		Yes
	C. brunnea	NT	2,500-10,000	-		Yes
	C. cairnsiana	NT	2,500-10,000	-		Yes
	C. calcicola	LC	2,500-10,000	-		Yes
	C. canalis ssp. carinata	LC	>10,000	-		Yes
	C. canalis ssp. *canalis*	EN	>10,000	-		Yes
	C. conferta	VU	2,500-10,000	-		Yes
	C. couttsiana	NT	2,500-10,000	-		
	C. desolata	VU	1,000-2,500	Yes		
	C. furfuracea	LC	>10,000	-		Yes
	C. lane-poolei	LC	>10,000	-		Yes
	C. maconochiei ssp. viridis	LC	2,500-10,000	-		Yes
	C. maconochiei ssp. lanata	LC	>10,000	-		Yes
	C. maconochiei ssp. maconochiei	NT	>10,000	-		Yes
	C. media ssp. banksii	LC	>10,000	-		
	C. media ssp. ensata	LC	2,500-10,000	-		
	C. media ssp. media	LC	>10,0000	-	W (T)	
	C. megacarpa	EN	2,500-10,000	Yes		
	C. ophiolitica	NT	2,500-10,000	-	W (T)	Yes
	C. orientis	LC	>10,000	-		Yes
	C. platyphylla	EN	2,500-10,000	Yes		
	C. pruinosa	LC	>10,000	-		Yes
	C. semota	NT	2,500-10,000	-		
	C. silvestris	VU	2,500-10,000	Yes		
	C. tuckeri	NT	2,500-10,000	-		

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
	C. xipholepis	LC	>10,000	-		
	C. yorkiana	NT	>10,000	-		
	L. hopei	LC	>10,000	-		Yes
	L. peroffskyana	LC	>100,000	-		Yes
	M. cardiacensis	LC	1,000-2,500	-		
	M. communis	LC	>100,000	-	W (T)	Yes
	M. concinna	LC	1,000-2,500	-		Yes
	M. conferta	EN	2,500-10,000	Yes		Yes
	M. cranei	VU	1,000-2,500	-		
	M. crassifolia	VU	1,000-2,500	-		Yes
	M. diplomera	LC	>10,000	-		Yes
	M. douglasii	LC	>10,000	-		Yes
	M. dyeri	LC	>10,000	-		Yes
	M. elegans	EN	2,500-10,000	Yes		
	M. fawcettii	LC	>10,000	-		Yes
	M. fearnsidei	LC	>10,000	-		Yes
	M. flexuosa	EN	2,500-10,000	Yes		
	M. fraseri	LC	2,500-10,000	-		Yes
	M. glaucophylla	LC	2,500-10,000	-		Yes
	M. heteromera	LC	>10,000	-		
	M. humilis	VU	1,000-2,500	Yes		Yes
	M. johnsonii	LC	>10,000	-		Yes
	M. lomandroides	VU	2,500-10,000	Yes		Yes
	M. longispina	LC	2,500-10,000	-		
	M. lucida	LC	>10,000	-		Yes
	M. macdonnellii	LC	>10,000	-		Yes
	M. miquelii	LC	>100,000	-	W (T)	Yes
	M. montana	LC	>10,000	-		Yes
	M. moorei	LC	>10,000	-	W (T)	Yes
	M. mountperriensis	LC	>10,000	-		Yes
	M. occidua	VU	1,000-2,500	Yes		
	M. parcifolia	VU	1,000-2,500	Yes		Yes
	M. pauli-guilielmi	EN	1,000-2,500	Yes		Yes
	M. platyrhachis	LC	2,500-10,000	-		Yes
	M. plurinervia	NT	1,000-2,500	-		
	M. polymorpha	LC	>10,000	-		Yes
	M. reducta	LC	>10,000	-		
	M. riedlei	LC	>100,000	-	W (T)	Yes
	M. secunda	VU	>10,000	Yes		
	M. spiralis	EN	1,000-2,500	-		Yes
	M. stenomera	LC	2,500-10,000	-		
	M. viridis	VU	1,000-2,500	Yes		Yes
Bahamas	*Z. angustifolia*	DD		?		Yes
	Z. integrifolia	NT	>10,000	Yes		Yes
	Z. lucayana	NT	<1,000	-		Yes
Belize	*Ce. robusta*	VU	2,500 –6,000	Yes		Yes
	Z. polymorpha	NT	10,000	-		Yes
	Z. prasina	CR	<100	-		
Benin	*E. barteri* ssp. *barteri*	VU	10,000-15,000	-		
Bolivia	*Z. boliviana*	NT	5,000	-		Yes
Brazil	*Z. amazonum*	NT	>10,000	-		
	Z. lecointei	NT	10,000 – 15,000	-		Yes
	Z. ulei	NT	4,000-5,000	-		

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
Cambodia	*C. clivicola*	NT		-		Yes
	C. pectinata	VU		-		Yes
	C. siamensis	VU		Yes		Yes
Central African Republic	*E. septentrionalis*	DD		-		Yes
China	*C. balansae*	NT		-		
	C. changjiangensis	EN		Yes		
	C. debaoensis	CR		Yes		
	C. diannanensis	VU		Yes		Yes
	C. dolichophylla	VU		Yes		
	C. ferruginea	NT		-		
	C. guizhouensis	NT		-		Yes
	C. hainanensis	EN		Yes		
	C. hongheensis	CR		Yes		
	C. multifrondis	VU		Yes		Yes
	C. multipinnata	EN		Yes		Yes
	C. panzhihuaensis	NT		-		Yes
	C. pectinata	VU		-		Yes
	C. revoluta	NT		-		Yes
	C. segmentifida	VU		-		
	C. sexseminifera	NT		Yes		Yes
	C. szechuanensis	CR		-		
	C. taitungensis	VU		-		Yes
	C. taiwaniana	EN		Yes	W Viet Nam	Yes
	C. tanqingii	NT		-		Yes
	C. yunnanensis	NT		-		
Colombia	*Chigua bernalii*	CR	<250	Yes		
	Chigua restrepoi	CR	<250	Yes		
	Z. amazonum	NT	>10,000	No		
	Z. amplifolia	CR	<1,000	Yes		
	Z. chigua	NT	7,000	-		
	Z. disodon	CR	<400	Yes		
	Z. encephalartoides	VU	5,000	-		Yes
	Z. hymenophyllidia	CR	<200	-		
	Z. lecointei	NT	10,000 – 15,000	-		Yes
	Z. manicata	NT	4,000	-		
	Z. melanorrhachis	EN	1,000-1,300	-		
	Z. montana	CR	<100	-		
	Z. muricata	NT	7,500	-		Yes
	Z. obliqua	NT	5,000 – 7,000	-		Yes
	Z. poeppigiana	NT	10,000-15,000	-		
	Z. roezlii	NT	4,000			Yes
	Z. ulei	NT	4,000-5,000	-		
	Z. wallisii	CR	<100	Yes		
Comores	*C. thouarsii*	LC		-		Yes
Costa Rica	*Z. acuminata*	NT	2,000 – 5,000	-		Yes
	Z. fairchildiana	NT	5,000 – 7,000	-		Yes
	Z. neurophyllidia	NT	4,000 - 5,000	-		Yes
	Z. pseudomonticola	NT	3,500-4,000			
Cuba	*Microcycas calocoma*	CR	300-500	Yes		
	Z. amblyphyllidia	VU	2,000 – 3,000	Yes		Yes
	Z. angustifolia	DD		?		Yes

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
	Z. integrifolia	NT	>10,000	-		Yes
	Z. kickxii	CR		Yes		Yes
	Z. pumila	?Locally extinct	0	-		Yes
	Z. pygmaea	DD		-		Yes
Democratic Republic of Congo	*E. ituriensis*	NT	> 999	-		
	E. laurentianus	DD		-		
	E. marungiensis	NT	> 1,000	-		
	E. poggei	LC	50,000	-		Yes
	E. schaijesii	VU	1,000 – 5,000	-		
	E. schmitzii	NT	5,000-10,000	Yes		No
	E. septentrionalis	DD		-		Yes
Dominican Republic	*Z. pumila*	NT	5,000-10,000	-	W (T) (*Z. debilis*)	Yes
Ecuador	*Z. gentryi*	VU	<500	-		Yes
	Z. poeppigiana	NT	10,000 – 15,000	-		
	Z. roezlii	NT	4,000	-		Yes
	Z. ulei	NT	4,000-5,000	-		
El Salvador	*Z. herrerae*	VU	500-1,000	-		Yes
Federated States of Micronesia	*C. micronesica*	NT		-		
France (New Caledonia)	*C. seemannii*	VU		-	W (S/G) (*C. circinalis*)	Yes
Ghana	*E. barteri* ssp. *barteri*	VU	10,000-15,001	-		
Guatemala	*C. euryphyllidia*	CR	450	Yes		
	C. matudae	EN	1,200-1,600	Yes		
	C. robusta	VU	2,500 –6,000	Yes		Yes
	Z. herrerae	VU	500 - 1,000	-		Yes
	Z. loddigesii	NT	> 20,000	-		Yes
	Z. monticola	CR	<250	Yes		
	Z. picta	CR	<250	Yes		Yes
	Z. Tuerckheimii	NT	1,000	No		
	Z. variegata	EN	250 - 500	Yes		
Honduras	*D. mejiae*	LC		-		Yes
	Z. herrerae	VU	500-1,000	-		Yes
	Z. standleyi	VU	<1,000	Yes		Yes
India	*C. "zeylanica"*	DD		-		
	C. beddomei	CR		Yes	W (Thailand)	
	C. circinalis	DD		Yes		Yes
	C. pectinata	VU		-		Yes
	C. sphaerica	DD		-		
Indonesia	*C. apoa*	NT				Yes
	C. falcata	DD		-		
	C. javana	DD		-		
	C. litoralis	NT		-		Yes
	C. papuana	NT		-		
	C. rumphii	NT		-		Yes
	C. scratchleyana	NT		-		

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
Jamaica	*Z. amblyphyllidia*	VU	2,000 – 3,000	Yes		Yes
Japan	*C. revoluta*	NT		-		Yes
Kenya	*C. Thouarsii*	LC		-		Yes
	E. bubalinus	LC	>20,001	-		
	E. hildebrandtii	NT	10,000-19,999	-		Yes
	E. kisambo	EN	5,200	Yes		Yes
	E. tegulaneus ssp. *powysii*	CR	200-400	Yes		Yes
	E. tegulaneus ssp. *tegulaneus*	LC	5,000 – 10,000	-		Yes
Laos	*C. chevalieri?*	NT		-		
	C. collina	VU		-		
	C. pectinata	VU		-		Yes
	C. simplicipinna	NT		-		Yes
Madagascar	*C. thouarsii*	LC		-		Yes
Malawi	*E. gratus*	VU	100,000	Yes		Yes
Malaysia	*C. clivicola*	NT		-		Yes
	C. litoralis	NT		-		Yes
	C. macrocarpa	VU		Yes		
Mexico	*Ce. alvarezii*	EN	600-1,000	-		
	Ce. beccarae	EN	300-450	-		
	Ce. euryphyllidia	CR	450	Yes		
	Ce. fusco-viridis	CR	<250	-		
	Ce. hildae	EN	500-1,000	Yes		Yes
	Ce. kuesteriana	CR	250-500	Yes		Yes
	Ce. latifolia	VU	6,000- 10,000	Yes		Yes
	Ce. matudae	EN	1,200-1,600	Yes		
	Ce. mexicana	VU	5,000 –10,000	-		Yes
	Ce. microstrobila	VU	5,000 –10,000	-		Yes
	Ce. miqueliana	VU	600 – 800	Yes		Yes
	Ce. mixeorum	DD		-		
	Ce. morettii	EN	500 – 1,000	Yes		Yes
	Ce. norstogii	CR	<600	Yes		Yes
	Ce. robusta	VU	2,500 –6,000	Yes		Yes
	Ce. sabatoi	EN	700 – 1,500	-		
	Ce. whitelockiana	EN	2,000 – 2,500	-		Yes
	Ce. zaragozae	CR	<200	Yes		Yes
	D. califanoi	VU	3,000 – 5,000	Yes		Yes
	D. caputoi	CR	200-400	Yes		Yes
	D. edule	NT	>10,000	-		Yes
	D. holmgrenii	EN	10,000 – 20,000	Yes		Yes
	D. merolae	VU	3,000 – 5,000	Yes		Yes
	D. purpusii	VU	2,500 – 3,000	Yes		Yes
	D. rzedowskii	VU	10,000	-	W (Belize)	Yes
	D. sonorense	EN	500 -1,000	Yes		Yes
	D. spinulosum	VU	>10,000	-		Yes
	D. tomasellii	EN	3,000 - 5,000	Yes		
	Z. cremnophila	EN	<1,000	Yes		Yes
	Z. fischeri	EN	1,000 -2,000	-		Yes
	Z. furfuracea	VU	10,000	Yes	W (T) re-export by MY	Yes
	Z. herrerae	VU	500-1,000	-		Yes

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
	Z. inermis	CR	300-500	Yes		Yes
	Z. lacandona	EN	<500	Yes		
	Z. loddigesii	NT	>20,000	-		Yes
	Z. paucijuga	NT	<10,000	-		Yes
	Z. picta	CR	<250	Yes		Yes
	Z. polymorpha	NT	10,000	-		Yes
	Z. purpurea	EN	<2,000	Yes		
	Z. soconuscensis	VU	<5,000	-		
	Z. spartea	CR	500-2,000	Yes		Yes
	Z. variegata	EN	249-500	Yes		
	Z. vazquezii	CR	<1,000	Yes		
	Z. verschaffeltii	NT	<1,000	Yes		
Mozambique	*C. thouarsii*	LC		-		Yes
	E. chimanimaniensis	EN	500 –1,000	Yes		
	E. ferox	LC	99,999	-		Yes
	E. gratus	VU	100,000	Yes		Yes
	E. manikensis	VU	10,000	Yes		Yes
	E. munchii	CR	17	Yes		Yes
	E. pterogonus	CR	10	Yes		Yes
	E. senticosus	VU	4998–10,000	Yes		Yes
	E. turneri	LC	10,000	-		
	E. umbeluziensis	VU	1,000-1,499	Yes		Yes
	E. lebomboensis	EN	5,000	Yes		
	E. ngoyanus	VU	4300-5,000	Yes		Yes
	Stangeria eriopus	NT	1,000,000	Yes		Yes
	E. aplanatus	VU	2,000- 4,000	Yes		Yes
Myanmar	*C. simplicipinna*	NT		-		Yes
Nepal	*C. pectinata*	VU		-		Yes
Nicaragua	*D. mejiae*	LC		-		Yes
	Z. acuminata	NT	2,000 – 5,000	-		Yes
	Z. neurophyllidia	NT	4,000 - 5,000	-		Yes
Nigeria	*E. barteri spp. allochrous*	EN	300- 1,000	Yes		
	E. barteri ssp. *barteri*	VU	10,000-15,002	-		
Panama	*Z. acuminata*	NT	2,000 – 5,000	-		Yes
	Z. chigua	NT	7,000	-		
	Z. cunaria	NT	3,000	-	W (S)	Yes
	Z. dressleri	EN	<1,000	-	W (S)	
	Z. fairchildiana	NT	5,000-7,000	-	W (S)	Yes
	Z. ipetiensis	VU	2,000	-		Yes
	Z. manicata	NT	4,000	-		
	Z. neurophyllidia	NT	4,000 - 5,000	-		Yes
	Z. obliqua	NT	5,000 – 7,000	-		Yes
	Z. pseudomonticola	NT	3500 – 4,000	-		
	Z. pseudoparasitica	NT	3,000 – 5,000	-		Yes
	Z. skinneri	EN	<500	Yes	W (S)	Yes
Peru	*Z. amazonum*	NT	>10,000	-		
	Z. disodon	CR	<400	Yes		
	Z. hymenophyllidia	CR	<200	Yes		
	Z. lecointei	NT	10,000 – 15,000	-		Yes
	Z. macrochiera	CR	<100	Yes		
	Z. melanorrhachis	EN	1,000-1,300	-		
	Z. poeppigiana	NT	10,001 – 15,000	-		

Range State	Taxon	IUCN status	Population size	Impacted by Wild trade	Available in catalogues
	Z. ulei	NT	4,000 – 5,000	-	
	Z. urep	CR	<250	Yes	
Philippines	*C. chamberlainii*	EN		Yes	
	C. curranii	DD		-	Yes
	C. edentata	DD		-	
	C. riuminiana	DD		-	Yes
	C. wadei	DD		-	Yes
Papua New Guinea	*C. apoa*	NT			Yes
	C. bougainvilleana	NT		-	Yes
	C. campestris	NT		-	Yes
	C. papuana	NT		-	
	C. schumanniana	NT		-	Yes
	C. scratchleyana	NT		-	
Seychelles	*C. Thouarsii*	LC		-	Yes
South Africa	*E. aemulans*	CR	65-200	Yes	Yes
	E. altensteinii	VU	8,000 –10,000	Yes	Yes
	E. arenarius	EN	850 –1500	Yes	Yes
	E. brevifoliolatus	CR	5	Yes	
	E. caffer	NT	10,000	Yes	Yes
	E. cerinus	CR	70	Yes	Yes
	E. cupidus	CR	500-950	Yes	
	E. cycadifolius	LC	15,000-30,000	-	
	E. dolomiticus	CR	175-250	Yes	
	E. dyerianus	CR	500-800	Yes	
	E. eugene maraisii	EN	600- 4,500	Yes	Yes
	E. ferox	LC	100,000	-	Yes
	E. friderici-guilielmi	NT	5,000-10,000	Yes	Yes
	E. ghellinckii	VU	9,000- 10,000	Yes	
	E. heenanii	CR	300-600	Yes	
	E. hirsutus	CR	<300	Yes	
	E. horridus	EN	3,000-7,000	Yes	Yes
	E. humilis	VU	4,500 – 10,000	Yes	
	E. inopinus	CR	250-300	Yes	
	E. laevifolius	CR	700-819	Yes	Yes
	E. lanatus	NT	70,000-80,000	-	Yes
	E. latifrons	CR	70-100	Yes	Yes
	E. lebomboensis	EN	5,000	Yes	Yes
	E. lehmannii	NT	5,000- 7,000	Yes	Yes
	E. longifolius	NT	7,000- 15,000	Yes	Yes
	E. middelburgensis	CR	420-450	Yes	Yes
	E. msinganus	CR	100-200	Yes	Yes
	E. natalensis	NT	8,300-12,000	Yes	Yes
	E. ngoyanus	VU	4,300-5,000	Yes	Yes
	E. nubimontanus	CR	50-100	Yes	Yes
	E. paucidentatus	VU	8,000- 12,000	Yes	Yes
	E. princeps	VU	3500-5,000	Yes	Yes
	E. senticosus	VU	4,999 – 10,000	Yes	Yes
	E. transvenosus	LC	20,000-50,000	-	Yes
	E. trispinosus	VU	3,500- 10,000	Yes	Yes
	E. villosus	LC	100,000	-	Yes
	E. woodii	ExW	0	-	
	Stangeria eriopus	NT	1,000,000	Yes	Yes

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
Sri Lanka	*C. nathorstii*	DD		-		
Sudan	*E. septentrionalis*	DD		-		Yes
Swaziland	*E. aplanatus*	VU	2,000- 4,000	Yes		Yes
	E. heenanii	CR	300-600	Yes		
	E. laevifolius	CR	700-820	Yes		Yes
	E. relictus	ExW	0	-		No
	E. senticosus	VU	5,000 – 10,000	Yes		Yes
	E. umbeluziensis	VU	1,000-1500	Yes		Yes
	E. lebomboensis	EN	5,000	Yes		
	E. paucidentatus	VU	8,000-12,000	Yes		Yes
	E. villosus	LC	100,000			Yes
Tanzania	*C. Thouarsii*	LC		-		Yes
	E. bubalinus	LC	>20,000	-		
	E. delucanus	VU	<1,000	Yes		
	E. hildebrandtii	NT	10,000-20,000	-		Yes
	E. sclavoi	VU	5,000-6,000	Yes		Yes
	E. kanga (ined)	DD		-		
	E. marungiensis	NT	>1,000	-		
Thailand	*C. chamaoensis*	CR		Yes		Yes
	C. clivicola	NT		-		Yes
	C. elephantipes	DD		Yes		
	C. litoralis	NT		-		Yes
	C. macrocarpa	VU		Yes	W (S)	
	C. nongnoochiae	VU		Yes		Yes
	C. pectinata	VU		-	W (T/S)	Yes
	C. pranburiensis	VU		-		Yes
	C. siamensis	VU		Yes	W (T/S)	Yes
	C. simplicipinna	NT		-	W (T)	Yes
	C. Tansachana	CR		Yes		Yes
Togo	*E. barteri* ssp. *barteri*	VU	10,000-15,002	-		
Tonga	*C. seemannii*	VU		-		Yes
Uganda	*E. equatorialis*	CR	100-375	Yes		
	E. ituriensis	NT	> 1,000	-		
	E. macrostrobilus	VU	300	Yes		Yes
	E. septentrionalis	DD		-		Yes
	E. whitelockii	VU	5,000- 10,000	-		Yes
United Kingdom (Cayman Islands)	*Z. integrifolia*	NT	>10,000	Yes		Yes
USA	*Z. integrifolia*	NT	>10,000	Yes		Yes
USA (Guam)	*C. micronesica*	NT		-		
USA (Puerto Rico)	*Z. amblyphyllidia*	VU	2,000-3,000	Yes		Yes
	Z. portoricensis	CR	<500	Yes		Yes
	Z. pumila	? Locally extinct	0	-		Yes
Vanuatu	*C. seemannii*	VU		-		Yes
Venezuela	*Z. amazonum*	NT	>10,000	-		
	Z. lecointei	NT	10,000 – 15,000	-		Yes
	Z. muricata	NT	7,500	-		Yes

Range State	Taxon	IUCN status	Population size	Impacted by trade	Wild trade	Available in catalogues
Viet Nam	*C. aculeata*	EN				
	C. balansae	NT		-		
	C. brachycantha	NT		-		
	C. chevalieri	NT		-	W (T)	
	C. clivicola	NT		-		Yes
	C. collina	VU		-		
	C. condaoensis	VU		Yes		
	C. dolichophylla	VU		Yes		
	C. elongata	VU		Yes		
	C. ferruginea	NT		-		
	C. fugax	CR		Yes		
	C. hoabinhensis	EN		Yes		
	C. inermis	VU		Yes		
	C. lindstromii	VU		Yes		
	C. litoralis	NT		-		Yes
	C. micholitzii	VU		Yes	W (T/S) Thailand, China	Yes
	C. multifrondis	VU		Yes		Yes
	C. multipinnata	EN		Yes		Yes
	C. pachypoda	VU		-		
	C. pectinata	VU		-	W (T/S)	Yes
	C. sexseminifera	NT		Yes		Yes
	C. siamensis	VU		Yes		Yes
	C. simplicipinna	NT		-		Yes
	C. Tropophylla	NT		-		
Zambia	*E. schmitzii*	NT	5,000-10,000	Yes		No
Zimbabwe	*E. chimanimaniensis*	EN	500 –1,000	Yes		
	E. concinnus	EN	300- 1,000	Yes		Yes
	E. manikensis	VU	10,000	Yes		Yes

COMMENTS RECEIVED FROM RANGE STATES

ECUADOR

From: Sergio Lasso [mailto:slasso@ambiente.gov.ec]
Sent: Monday, January 19, 2004 22:54
To: Tom De Meulenaer
Subject: Review of Significant Trade Cycads

Doctor
Tom De Meulenaer
Jefe Interino
Unidad de Apoyo Científico
Secretaría CITES

De mis consideraciones:

En atención a su gentil comunicación del 12 de diciembre de 2003, sobre la Revisión del Comercio Significativo de Cycadales, me permito adjuntar la información que en su momento se remitió, y que no aparece en el informe por usted enviado adjunto a dicha comunicación.

Atentamente,

Sergio Lasso B.
Autoridad Administrativa Nacional CITES

Año	**Especie**	**País de importación**	**Cantidad**	**Observaciones**
1998	*Chigua restrepoi*	USA	9 (nueve)	Exportador: EcuaGénera (www.ecuagenera.com)
1998	*Cycas revoluta*			No se ha exportado
1998	*Zamia lindenii*	USA	12 (doce)	Exportador: EcuaGénera
1998	*Zamiaceae spp.*			No se ha exportado con este nombre del taxón
1999	*Zamia lindenii*	USA	20 (veinte)	Exportador: EcuaGénera
1999	*Zamia* spp.	USA	30 (treinta)	Exportador: EcuaGénera
1999	*Zamiaceae* spp.			No se ha exportado con este nombre del taxón
2000	*Chigua restrepoi*	USA	46 (cuarenta y seis)	Exportador: EcuaGénera
2000	*Cycas circinalis*			No se ha exportado
2000	*Cycas revoluta*			No se ha exportado
2000	*Cycas* spp.	Reino Unido	700 (setecientas)	Hojas (no plantas vivas) Exportador: "Flores y Follajes Tropicales" por una sola ocasión
2000	*Zamia chigua*			No se ha exportado con este nombre del taxón
2000	*Zamia encephalartoides*			No se ha exportado con este nombre del taxón
2000	*Zamia lindenii*	USA	35 (treinta y cinco)	Exportador: EcuaGénera
2000	*Zamia* spp.	USA	301 (trescientos uno)	Exportador: EcuaGénera

2000	*Zamiaceae* spp.			No se ha exportado con este nombre del taxón
2001	*Zamia chigua*	USA	34 (treinta y cuatro)	Exportador: EcuaGénera
2001	*Zamia encephalartoides*	USA	2 (dos)	Exportador: EcuaGénera
2001	*Zamia lindenii*	USA	84 (ochenta y cuatro)	Exportador: EcuaGénera
2001	*Zamia wallisii*	USA	29 (veinte y nueve)	Exportador: EcuaGénera
2001	*Zamiaceae* spp.			No se ha exportado con este nombre del taxón

MALAWI

FROM: **Dr. R. Bhima email sadc. Wstcu@malawi.net**
TO : Tom De Meulenaer, Acting Chief, ssu, cites@unep.ch
SUBJECT: Comments on REVIEW of Significant Trade Cycads.

Dear Sir,

Here are Malawi's comments on the "Review of Significant Trade Cycads.

Comments:

3.1 **Habitat protection**

Malawi: The formation of the Mulanje Mountain Conservation Trust for Mulanje Mountain where the *Encephalartos gratis* is found in 2002 will play an important role in the protection of the habitat and species.

Additional information:

The *Encephalartos gratis* has a small distribution in Malawi at the foot of Mount Mulanje and its lower slopes such as Likhubula valley the foot of Chilemba Cliff, foot of Chalube Peak and Nanchidwa valley. It is a favourite for ornamental planting (white *et al*, 2001). Msekandiana and Mlangeni (2002) in the Southern African Plant Red Data lists classify *Encephalartos gratis* as critically endangered (250) with a small distribution, either declining or fluctuating and severely fragmented (occurs at less than one location). Area and quality of habitat is continuing to decline and so are mature individuals. All sub populations are less than 50. In the summary table of available data on cycad distribution, conservation status, threat posed by trade and records of trade in wild-harvested specimens information on Malawi can be altered as follows:

IUCN Status : CR

Population size : 250

References:

White F., Dowsett-Lemaire F. and Chapman J.D (2001)

Evergreen Forest Flora of Malawi. Royal Botanic Gardens, Kew, UK.

Msekandiana, G. and Mlangeni, E. (2002). Southern African Plant Red Data Lists Malawi In: holding, J.S. (Ed) Southern Africa Botanical Diversity Network Report No. 14.

Thank you,

Roy Bhima, PhD

For: **DIRECTOR OF NATIONAL PARKS AND WILDLIFE**