

The Red List of  
**Theaceae**

Emily Beech, Megan Barstow & Malin Rivers





## **BOTANIC GARDENS CONSERVATION INTERNATIONAL (BGCI)**

is the world's largest plant conservation network, comprising more than 500 botanic gardens in over 100 countries, and provides the secretariat to the IUCN/SSC Global Tree Specialist Group. BGCI was established in 1987 and is a registered charity with offices in the UK, US, China, Taiwan and Kenya.



**FAUNA & FLORA INTERNATIONAL (FFI)**, founded in 1903 and the world's oldest international conservation organization, acts to conserve threatened species and ecosystems worldwide, choosing solutions that are sustainable, are based on sound science and take account of human needs.



**THE GLOBAL TREES CAMPAIGN (GTC)** is undertaken through a partnership between BGCI and FFI. GTC's mission is to prevent all tree species extinctions in the wild, ensuring their benefits for people, wildlife and the wider environment. GTC does this through provision of information, delivery of conservation action and support of sustainable use, working with partner organisations around the world.



## **THE IUCN/SSC GLOBAL TREE SPECIALIST GROUP (GTSG)**

forms part of the Species Survival Commission's network of over 7,000 volunteers working to stop the loss of plants, animals and their habitats. SSC is the largest of the six Commissions of IUCN – The International Union for Conservation of Nature. It serves as the main source of advice to the Union and its members on the technical aspects of species conservation. The aims of the IUCN/SSC Global Tree Specialist Group are to promote and implement global red listing for trees and to act in an advisory capacity to the Global Trees Campaign.

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### **AUTHORS**

**Emily Beech** is a Conservation Officer at BGCI.

**Megan Barstow** is a Red List Conservation Assistant at BGCI.

**Malin Rivers** is the Head of Conservation Prioritisation at BGCI.

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Back cover: *Camellia saluenensis* (Fiona Inches, RBGE)

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**Theaceae**

December 2017

Emily Beech, Megan Barstow  
& Malin Rivers



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*Polyspora longicarpa* (Robert Blackhall-Miles)

## FOREWORD

Efforts to assess the conservation status of all tree species worldwide are gaining pace with the 2020 deadline for the Global Tree Assessment not far away. This *Red List of Theaceae* demonstrates exactly why the task of cataloguing the status of the world's tree species is so important. Theaceae is a fascinating family of woody plants with many horticultural species of *Camellia* that are enjoyed by gardeners worldwide. And, of course, the world's most popular beverage, tea is derived from *Camellia sinensis*. Species of Theaceae have a wide variety of economic, cultural and ecological values and yet as this report so ably demonstrates one third of all species are threatened with extinction in the wild. Red List conservation assessments provide a warning of what might be lost and also the baseline information for prioritising and planning conservation action.

This report highlights the *ex situ* conservation situation for Theaceae which underpins the longterm survival of threatened species and provides material for potential restoration of species in their natural habitats. Unfortunately it is too late for the iconic *Franklinia alatamaha*. A member of the Theaceae family, the monotypic *Franklinia* has been extinct in



*Camellia saluenensis* (RBGE)



*Polyspora gardneri* (Anuradha Gunathilake)

the wild for over 200 years but is well represented in botanic gardens. Since the demise of this attractive species, and especially over the past fifty years, plant conservation science and action have developed globally. Every threatened plant species can now be saved given the will and resources.

The case studies in this Red List illustrate both innovative partnerships that are working to ensure the survival of threatened Theaceae species and the importance of these species to humans. At the same time it highlights the gap in knowledge with 74 out of the 254 species assessed recorded as Data Deficient. This is valuable information showing where targeted fieldwork is needed to collect more data on the distribution, abundance and threats to poorly known species.

The *Red List of Theaceae* should increase awareness of the threats to *Camellia* and related species and help to stimulate conservation action. The information augments the number of tree assessments included in the IUCN Red List of Threatened Species and will support area-based conservation. Thank you to all involved in the data gathering, assessments and publication. The report is a most valuable addition to the tree conservation literature which hopefully will encourage tree conservation assessments for other families and genera and lead to successful conservation outcomes. Please help us meet the 2020 target for the Global Tree Assessment!

Sara Oldfield  
SSC Group Secretary/Chair

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To achieve an evaluation of conservation assessments for Theaceae, a wide range of people have contributed their knowledge and shared their expertise about this fascinating group of species and the habitat in which they grow. Without their generous assistance, we would have been unable to complete this global Red List of Theaceae, and everyone's contributions are gratefully acknowledged.

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## IUCN RED LIST CATEGORIES

- EX** Extinct
- EW** Extinct in the Wild
- CR** Critically Endangered
- EN** Endangered
- VU** Vulnerable
- NT** Near Threatened
- LC** Least Concern
- DD** Data Deficient
- NE** Not Evaluated

## LIST OF ACRONYMS

<b>BGCI</b>	Botanic Gardens Conservation International
<b>CBD</b>	Convention on Biological Diversity
<b>FFI</b>	Fauna & Flora International
<b>GSPC</b>	Global Strategy for Plant Conservation
<b>GTA</b>	Global Tree Assessment
<b>GTC</b>	Global Trees Campaign
<b>GTSG</b>	Global Tree Specialist Group
<b>IUCN</b>	International Union for Conservation of Nature
<b>SSC</b>	Species Survival Commission



*Stewartia serrata* (Arboretum Wespelaar)

## EXECUTIVE SUMMARY



*Stewartia rostrata* (Arboretum Wespelaar)

Theaceae is an iconic family of woody plants with clear importance to humans as a source of drinks and timber. Equally, many species are coveted for their showy flowers, making them a horticultural favourite.



*Stewartia pseudocamellia* (Rob Cubey, RBGE)

The Red List of Theaceae contains IUCN Red List conservation assessments for 254 species of the Theaceae family. A third of all species of Theaceae are threatened with extinction and a further 29% are considered Data Deficient, indicating a lack of information. There are two species that are already considered Extinct in the Wild, with the only remaining individuals found in *ex situ* collections. The remaining 37% are considered not threatened.

The centre of diversity for Theaceae is east Asia, with the largest number of species found in China and Viet Nam. These two countries also have the majority of the threatened Theaceae. Sri Lanka and Singapore have fewer species, but the highest proportion of threatened species.

Theaceae species are primarily threatened by habitat loss due to expansion of agricultural and urban areas. Logging is also a key threat as many Theaceae species are sought-after

timbers. An increase in *in situ* protections is key to ensuring the survival of Theaceae species in the wild.

A survey of *ex situ* collections of Theaceae species indicates that 51% of threatened species are held in a collection. This falls short of the requirements of Target 8 of the Global Strategy for Plant Conservation, which states that at least 75% of threatened species should be conserved *ex situ*. The majority of these threatened species occur in fewer than five *ex situ* collections, which is unlikely to represent the genetic diversity needed for restoration or reintroduction programmes.

The Red List of Theaceae provides information to prioritise conservation action to protect threatened Theaceae species from extinction. Equally it aims to inspire action to improve the conservation status of these species and promote the importance of this unique and interesting group of woody plants.

# PART 1

## BACKGROUND

Theaceae is a family of trees and shrubs, with centres of diversity in the Americas and east Asia. The family consists of ten genera and 254 species. *Camellia* is the most well-known of the genera, which includes *Camellia sinensis*, the source of tea, a beverage cultivated and consumed widely across the world. *Camellia sinensis* is not the only species used for tea making; many other Theaceae species are highly sought-after to produce health teas (Case study 1).

The family has high ornamental value due to their iconic flowers and are favourites of horticulturalists and gardens across the world. In temperate zones, the plants provide a burst of winter colour. Hundreds of cultivars of the genus *Camellia* have been created for the horticultural market (Case study 4).


Despite, and sometimes because of, the iconic nature of Theaceae species, some species are threatened with extinction. Plants are removed from the wild to meet the growing demand for health teas and attractive garden plants, with little regard for the species' survival. Equally, logging and deforestation for agricultural expansion or urban developments are destroying the habitats of many Theaceae species, increasing their risk of extinction. This Red List report represents the first assessment of the conservation status of all species of Theaceae, and it is hoped that this will inform and inspire conservation action to protect them.

This Red List report also contributes to the Global Tree Assessment (Box 1).

Red List	Year published
The Red List of Magnoliaceae	2007
The Red List of Oaks	2007
The Red List of Maples	2009
The Red List of Trees of Central Asia	2009
The Red List of Mexican Cloud Forest Trees	2011
The Red List of Rhododendrons	2011
A Regional Red List of Montane Tree Species of the Tropical Andes	2014
The Red List of Betulaceae	2014
The Red List of Magnoliaceae – revised and extended	2016
The Red List of US Oaks	2017
The Red List of Theaceae	2017

Table 1. Summary of Red List reports produced by Botanic Gardens Conservation International in partnership with Fauna & Flora International and the Global Tree Specialist Group

**Global Tree Assessment (GTA)**



There are about 60,000 tree species globally, but the majority of species have not had their conservation status assessed.

A new initiative, the Global Tree Assessment, aims to provide conservation assessments of the world's tree species by 2020.

Despite the importance of trees, many are threatened by over-exploitation and habitat destruction, as well as by pests, diseases, drought and their interaction with global climate change. In order to estimate the impact of such threats to trees there is an urgent need to conduct a complete assessment of the conservation status of the world's tree species – the Global Tree Assessment.

The Global Tree Assessment, led by BGCI and the IUCN SSC Global Tree Specialist Group, prioritises the tree species at greatest risk of extinction. The Global Tree Assessment provides information to ensure that conservation efforts are directed at the right species so that no tree species becomes extinct [www.globaltreeassessment.org](http://www.globaltreeassessment.org).



## METHODOLOGY



*Camellia nitidissima* (Ouyang Pei)

### TAXONOMIC SCOPE AND CONCEPTS

The aim was to assess all species in the family Theaceae as defined in APG IV, that were validly published prior to 2016. We focused on species level assessments. Intraspecific taxa were not included, as the IUCN Red List of Threatened Species only accepts intraspecific conservation assessments if a species level assessment has also been carried out.

Plant authority names follow those from The International Plant Names Index (IPNI, 2017).

The family consists of ten genera: *Apterosperma*, *Camellia*, *Dankia*, *Franklinia*, *Gordonia*, *Laplacea*, *Polyspora*, *Pyrenaria*,

*Schima* and *Stewartia* (Table 2). Three genera are monotypic, consisting of only a single species. *Camellia* is the most speciose genus with 152 species.

In this report we have assessed 254 species. More species are being discovered every year, especially in Viet Nam. Taxonomic work is also fast developing in this family. We have followed the taxonomic treatment as outlined in Prince (2007), which means that *Laplacea* and *Gordonia* are New World genera, and all species in southeast Asia with these genus names, are currently considered *Polyspora*. Additionally, we have only assessed a single species from the genus *Schima*, *Schima wallichii*, however more species are likely to occur, but due to taxonomic

difficulties it was not possible to establish a reliable species list for this genus, and even harder to ensure the correct information would be used in the assessments of those species.

### CONSERVATION ASSESSMENT METHODOLOGY

For each species, information was collected on geographic distribution, population data, population trends, habitat and ecology, use and trade, threats, and conservation measures (in place and required). Information for the assessments was collated from published and unpublished sources including national and regional floras, scientific papers, published and unpublished reports, herbarium records, and expert knowledge. National red lists were consulted when available. For a full list of references used for each species, see the individual species red list assessment available online at the IUCN Red List website ([www.iucnredlist.org](http://www.iucnredlist.org)). Using all the available information, a conservation category and criteria were assigned using the 2001 IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2012).

Genus	Number of Species
<i>Apterosperma</i>	1
<i>Camellia</i>	152
<i>Dankia</i>	1
<i>Franklinia</i>	1
<i>Gordonia</i>	6
<i>Laplacea</i>	2
<i>Polyspora</i>	41
<i>Pyrenaria</i>	28
<i>Schima</i>	1
<i>Stewartia</i>	21
TOTAL	254 species

Table 2. The number of species assessed in each genus of Theaceae

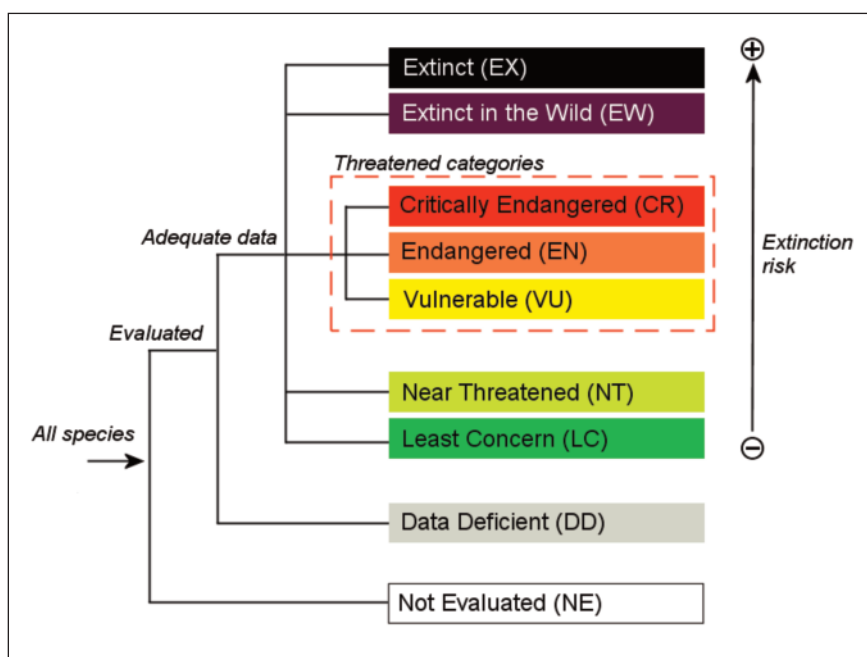


Figure 1. Structure of the IUCN Red List Categories (version 3.1) (Credit: IUCN)

Species are assigned one of nine categories (Figure 1): Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC) and Data Deficient (DD) (Figure 1). CR, EN and VU are the three threatened categories. Taxa that do not qualify for a threatened category, but are close to qualifying for or are likely to qualify for a threatened category in the near future, can be assigned to the category NT. LC is used for species that are assessed but are not considered threatened including widespread species and rare but stable species. The use of the category DD may be assigned to poorly known taxa. Species not yet evaluated are classified as NE. In this report, DD, NT and LC are grouped as “Not threatened”.

In order to assess whether a species belongs to a threatened category (CR, EN, VU) the species are evaluated in relation to five criteria: A) Population reduction; B) Geographic range; C) Small population size and decline; D) Very small or restricted population; and E) Quantitative analysis. The criteria are

based on a set of thresholds and subcriteria. Extensive guidelines are available to facilitate the process for the conservation assessors (IUCN Standards and Petitions Subcommittee, 2017).

Assessors evaluate taxa using all five criteria, but a taxon only needs to fulfil one of the five criteria to qualify for a threatened category. When several criteria are met resulting in different categories, the precautionary principle is applied and the most threatened category should be assigned (IUCN, 2012). Once completed and reviewed the assessments are sent to the IUCN Red List for publication on the IUCN Red List of Threatened Species (IUCN, 2017). It is recommended that species on the list are reevaluated at least once every 5-10 years (IUCN, 2012).

All species in this report were assessed on a global scale.

### REVIEW AND EVALUATION

Wherever possible, expert opinions were sought for all species assessed. Sometimes experts carried out the

conservation assessment (assessors), and sometimes they contributed data for the conservation assessment to be carried out (contributors). In accordance with IUCN Red List regulations, all assessments were also reviewed, often by a member of the Global Tree Specialist Group (reviewer).

In this report, assessors are only specified for the threatened species, and when the assessors were not the authors of this report, BGCI staff or interns. For full details of the assessors, contributors and reviewers see the IUCN Red List of Threatened Species website ([www.iucnredlist.org](http://www.iucnredlist.org)).

### RED LIST REPORT FORMAT

This report lists all species with their authors, country distribution and the conservation assessment ratings. The threatened species are also listed with the rationale for the conservation assessment. All other information (including synonyms, full distribution information, habitat, ecology, conservation measures, threats, uses and references) are listed on the website for the IUCN Red List of Threatened Species 2017 (IUCN, 2017, [www.iucnredlist.org](http://www.iucnredlist.org)).

The Extinct in the Wild species are listed in alphabetical order in Part 2A.

The threatened (Critically Endangered, Endangered and Vulnerable) species are listed alphabetically in Part 2B.

The Near Threatened species are listed alphabetically in Part 2C.

The Data Deficient species are listed alphabetically in Part 2D.

The Least Concern species are listed alphabetically in Part 2E.

## CASE STUDIES

### CASE STUDY 1: A CUP OF TEA - CAMELLIA SINENSIS

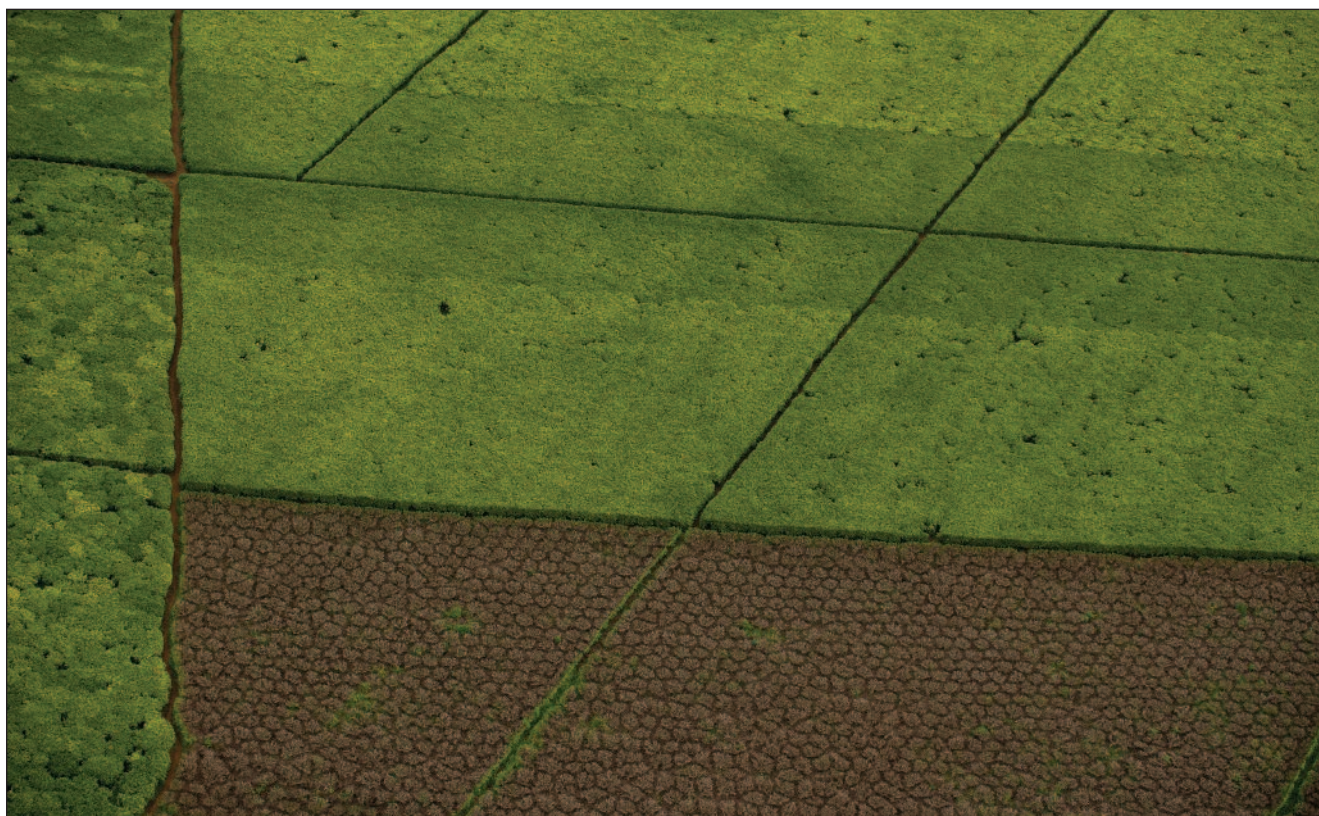
Tea, the world's most popular drink, comes from the tea plant, *Camellia sinensis* (L.) Kuntze. *Camellia sinensis* is an evergreen, insect-pollinated species of the Theaceae family.

Tea has been utilised in China for about 4,000 years and used not only as a beverage, but also as medicine. Tea cultivation in China started about 200 BC, and by 600 AD it had spread to Japan with travelling Buddhist monks. Tea then quickly spread throughout South-East Asia and then into Europe, and beyond, during the 17th century as trade began with China. Tea is today cultivated in

more than 40 countries worldwide, and though the origin of the species is thought to be in southwest China, its wild distribution and extent is still unknown.

Many of the very old specimens and records of the species can be traced back to the cultivation in ancient (sometimes abandoned) tea plantations. Due to its long history in cultivation, distinguishing between the wild population and naturalized plants from cultivated sources would be very difficult. Therefore, *Camellia sinensis* has been assessed with the conservation status Data Deficient - because the native wild distribution is not known, and hence the population size, trends and threats to the wild populations are not known.

The world production in 2014 was 5.5 million tons and has been increasing steadily over the last few years (FAO, 2017). There is now great variation in tea available in supermarkets across the world, with several varieties of black tea, green tea and flavoured tea. These differences in market choice are due to the tea varieties grown, where they are grown and post-picking processing. In addition to *C. sinensis*, other closely related *Camellia* species (such as *Camellia taliensis*) are also used for tea, these crop wild relatives are also predominantly originating in southwest China.



Tea Farming (Barney Wilczak)

**CASE STUDY 2: DEVELOPMENT OF RECOVERY TECHNIQUES FOR THREATENED GOLDEN CAMELLIAS IN FANGCHENG GOLDEN CAMELLIA NATIONAL NATURE RESERVE, GUANGXI**

*Camellia nitidissima* (EN) and *C. euphlebia* (EN) are endemic to the province of Guangxi, southeast China. These plants have high ornamental, medicinal and nutritional values, and are sold under the trade name Golden Camellia. Despite their socio-economic importance, the species are threatened by overharvesting of flowers and leaves, extensive removal of seedlings in the wild, as well as by logging, grazing, insect pests and other diseases. While low fruit set and poor seed germination have been observed in the wild, the steadily decreasing overall population size is affecting the reproductive capacity of the species further, thereby limiting natural regeneration.

Since 2012, BGCI has been working with Guilin Botanical Garden and Guangxi Institute of Botany (GXIB) to secure these species in *ex situ* collections, restore their habitats and reinforce populations *in situ* as well as improve local livelihood. Three nurseries were created over an area of 2,500 m<sup>2</sup>. A stock of some 4,000 seedlings, 15,000 cuttings and 1,000 grafted plants was established. Two *ex situ* conservation collections were developed holding around 2,500 seedlings of *C. nitidissima*. *In situ*, in the periphery of Fangcheng Golden Camellia National Nature Reserve, a 12 ha restoration demonstration plot was demarcated to enhance the recovery of the vegetation near the protected area. Several thousand seedlings and cuttings of the Golden Camellias as well as associated plant species were planted in the restoration site to assist natural regeneration.



*Camellia nitidissima*



Fengshui Forest with naturally growing *C. nitidissima*

To expand the cultivation area of Golden Camellia, local communities were incentivized to engage in a multi-institutional partnership comprised of researchers, the private sector and farmers. Some 365 interested households signed agreements with a corporate enterprise which raises and provides seedlings to local people free of charge for cultivation on privately-owned land. The farmers collect the Golden Camellia flowers and leaves from these plants once mature, these are then purchased and processed by the company.

Experts from GXIB provided technical advice on propagation and cultivation of Golden Camellias. This knowledge was disseminated through a series of capacity building activities and the distribution of training materials to local communities and enterprise staff. Various local farmers who benefitted from the training activities have planted Golden Camellias on their land and are earning an income from



Local project managers in Camellia nursery



Golden Camellia tea

selling Golden Camellia leaves and flowers. As a result, they have seen their living standards and livelihoods greatly improved. Further households are eager to become partners in the project which is also expected to have encouraging effects on reducing migration of local villagers to urban centres in search of other income opportunities.

This model of a multi-institutional partnership has been successful. It solved the shortage of raw materials of Golden Camellias, enhanced social security of local farmers and their families, as well as increased their income by some 30%. As regards conservation, the project alleviated the pressure on populations in the wild while promoting sustainable harvest of planted Golden Camellias.

### CASE STUDY 3: FRANKLINIA ALATAMAHA, FRANKLIN TREE

North American botanists, John and William Bartram encountered *Franklinia alatamaha*, October 1, 1765 in a sandhill bog along the Altamaha River in southeast Georgia, about 30 miles from the coast. It was apparently out of flower and without seed, so could not be classed. William Bartram returned to the same location on several documented trips 1773-1776. He first collected specimens of the plant in bloom, described and drew the flowers for his patron Dr. John Fothergill, and shipped live plants to London, where they were introduced to the horticulture trade by William Malcom. *Franklinia* (generally under the name *Gordonia pubescens*) was cultivated on a small scale as a greenhouse plant in a number of elite European gardens into the 1850s. It apparently never produced viable seed in Europe and was propagated only by cuttings—perhaps from a single original plant.



*Franklinia alatamaha*, illustrated by Pierre Joseph Redouté for F. A. Michaux's *North American Sylva* published in 1819.

(The John Bartram Association)



*Franklinia alatamaha* (Joel T. Fry)

William Bartram collected *Franklinia* seed at the end of his southern travels in 1776, and grew the plant on in his father's botanic garden, Bartram's Garden in Philadelphia beginning in 1777. Letters indicated he raised five plants from seed, and kept two examples in the botanic garden. He named the new plant *Franklinia alatamaha* in 1785. It is probable all modern examples of *Franklinia* derive from the two plants grown at Bartram's Garden after 1777.

A small number of naturalists visited the original grove following the Bartrams—Moses Marshall collected there in the summer of 1790, and John Lyon visited and described the site in 1803. The last documented scientific collector to the wild stand of *Franklinia* was Stephen Elliott, who collected *Franklinia* specimens in 1814. But there are rumors others knew or visited the *Franklinia* site. Charles Lyell described a trip to Darien, Georgia and the Altamaha River in 1846 in his *Second Visit to the United States...* — mentioning both *Franklinia alatamaha* and its Theaceae relative *Gordonia lasianthus* in a way that suggests that *Franklinia* was then still known as a wild native along a 20 mile stretch of the coastal Altamaha River. It remains unknown when the wild stand went extinct, but by 1881 there was no trace of wild plants of *Franklinia* in Georgia.

*Franklinia* seems to have evolved as a plant of the eastern coastal barrens of North America. It grows best in very acidic, moist sandy soils and is dependent on a mycorrhizal association for healthy growth. Plants can be raised freely from seed or cuttings, but young plants are susceptible to fungal diseases. There is anecdotal evidence that single, isolated specimens of *Franklinia* rarely produce viable seed.

The John Bartram Association, at Bartram's Garden undertook a voluntary "Franklinia Census" in 1998-1999, looking for plants under cultivation in gardens. Not exactly a scientific sample, 2000 responses were received with cultivated plants scattered around the globe. The majority of responses were from the United States, and particularly the Mid-Atlantic states of the eastern US. But *Franklinia* were also recorded growing in Austria, Belgium, Canada, Germany, Ireland, Italy, New Zealand, Switzerland, and the UK. *Franklinia* plants seems to thrive best in the coastal, sandy soils of Maryland, Delaware, New Jersey, New York, and Massachusetts.

Joel T. Fry  
Curator  
Bartram's Garden



*Camellia japonica* (RBGE)

#### CASE STUDY 4: CULTIVATED CAMELLIAS

Several of the genera in Theaceae contain species that are popular ornamental plants, none more so than *Camellia*.

*Camellia* species and cultivars have been grown for their ornamental values for millennia, and more than 40,000 ornamental varieties have been originated in that time. The most common ornamental species are *Camellia japonica*, *Camellia sasanqua*, *Camellia saluenensis*, and *Camellia reticulata*. More recently new species and cultivars that bloom in the summer, and naturally yellow-flowering species and varieties, are entering the horticultural scene (see Case study 1).

*Camellias* are popular winter/spring-flowering shrubs, providing colour in gardens when little else is in bloom. Thanks to the beauty of their flowers, and their easy maintenance, ornamental *Camellias* have spread from their centre of origin in Asia to gardens across the world.

An interesting collection of historical cultivars of *Camellia japonica* can be seen at Chiswick House in London. Their collection includes 33 different varieties, including examples of many of the earliest varieties introduced to Britain. This *Camellia* collection was created by the 6th Duke of Devonshire and his gardener, William Lindsay, at a time when exotic camellia plants were a luxury commodity.

The Duke also had a purpose-built glass house created to protect this valuable collection of plants (chiswickhouseandgardens.org.uk).

The International Camellia Society is an international non-profit membership organisation with nearly 1,900 members worldwide. It also maintains the official international register of *Camellia* cultivar names.



*Marchioness of Salisbury*  
(International Camellia Society)



*Flashlight* (International Camellia Society)



*Tama Glitters* (International Camellia Society)

## RED LIST RESULTS

### THREAT STATUS OF THEACEAE

253 species of Theaceae published before 2016 were assessed during this project. Globally 85 species are listed as threatened (Critically Endangered, Endangered or Vulnerable), two species are Extinct in the Wild, 74 are Data Deficient and 93 species are not threatened (Near Threatened or Least Concern) (Figure 2, Table 3). Data Deficient species do not have enough data available to accurately assess their conservation status, therefore these species could be either threatened or not threatened when full information becomes available. Due to this uncertainty the percentage of threatened species lies between 33% and 62%.

The high number of Data Deficient species is likely due to the lack of information especially outside of the genus *Camellia*. There are high proportions of Data Deficient species in *Stewartia* (52%), *Polyspora* (41%) and *Pyrenaria* (43%), compared to 21% of *Camellia*. Even species that have been cultivated extensively are occasionally assessed as Data Deficient, as although

they are common in cultivation, little is known about their wild populations. For example, *Camellia sinensis* has a long history of human use and cultivation for the production of tea but is classified as Data Deficient as the location of any wild populations are not known (Case study 1).

The two species considered Extinct in the Wild are *Franklinia alatamaha* (Case study 3) and *Camellia amplexicaulis*.

### CRITERIA USED IN THE RED LIST OF THEACEAE

The majority of the 85 threatened Theaceae species (72%) are assessed using criterion B, indicating these species are threatened due to their restricted range. Twenty-five species (29%) were listed under criterion D, threatened due to their small population sizes. Only 15 species were listed under criterion A (1%), threatened by population declines, or criterion C (1%), threatened by declines and small population numbers, indicating that population decline is difficult to estimate as information is lacking for many tree species. No species were assessed under criterion E (Table 4).

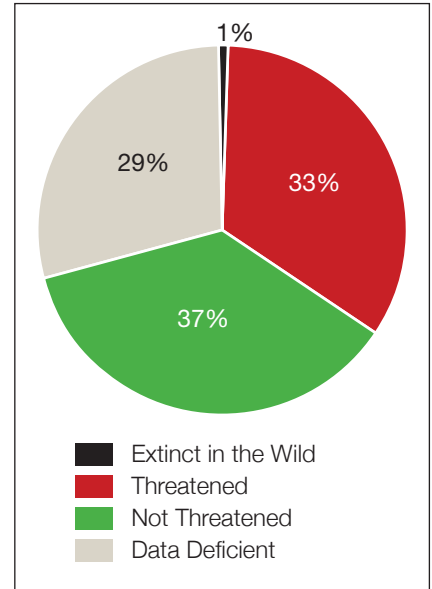


Figure 2. Summary of threat status of Theaceae

IUCN Red List category	Number of species
Extinct	0
Extinct in the Wild	2
Critically Endangered	32
Endangered	29
Vulnerable	24
Near Threatened	15
Least Concern	78
Data Deficient	74

Table 3. The number of Theaceae species in each conservation category

Criterion A	7
Criterion B	61
Criterion C	8
Criterion D	25
Criterion E	0

Table 4. The number of threatened Theaceae conservation assessments using the five different Red List criteria



*Stewartia pseudocamellia* (Gavin Harris, RBGE)



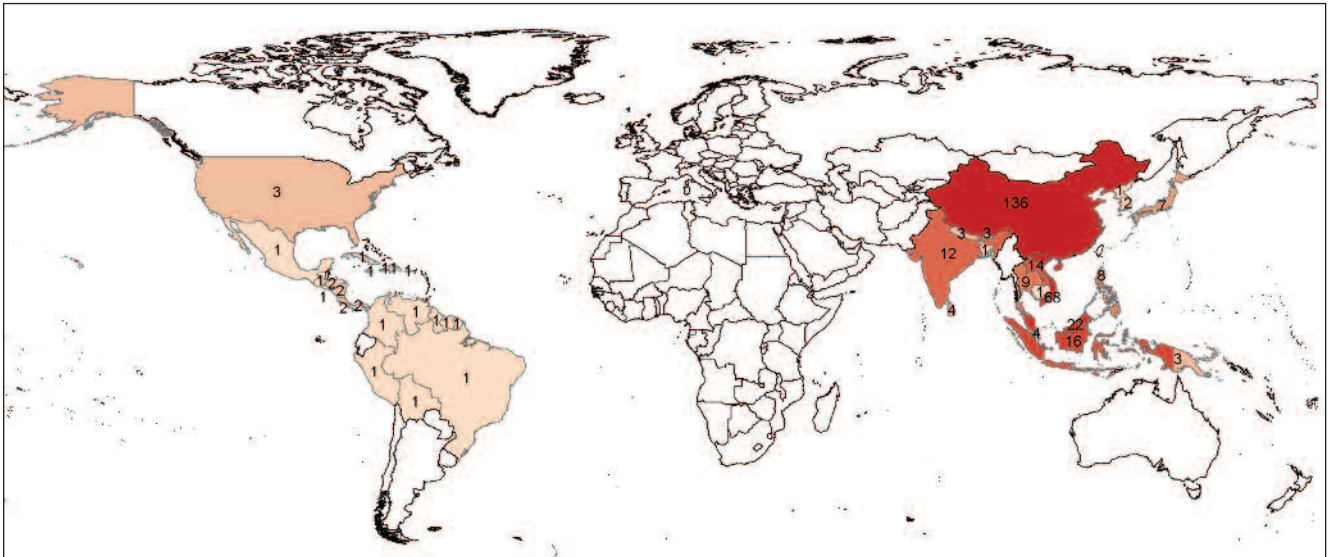


Figure 3. Theaceae species richness per country

**SPATIAL ANALYSIS**

Theaceae species are found in 42 countries across both temperate and tropical biomes, however the centres of diversity are China (136 species) and Viet Nam (68 species) with the majority of species found in these two countries. Seventy-seven percent of species of

Theaceae (195) are single country endemics. All of the most species rich countries occur in east or southeast Asia. The threatened species of Theaceae are also found predominantly in China and Viet Nam. However, Sri Lanka and Singapore have the highest proportion of threatened species (Figure 4).

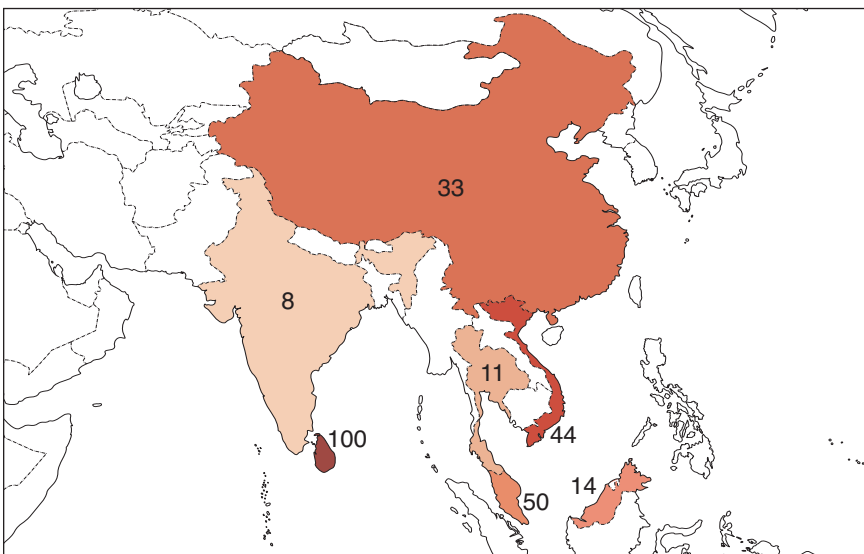


Figure 4. The percentage of threatened Theaceae species for each country



*Stewartia serrata* (Arboretum Wespelaar)



*Camellia fluviatilis* (Arboretum Wespelaar)

**MAJOR THREATS TO THEACEAE**

The main threat to Theaceae species, affecting a third of all species assessed, is the expansion of agriculture. This general threat leads to the clearing of native habitat in order to grow crops (Figure 5).

The second largest threat is the expansion of urban areas which often leads to deforestation, as well as an increase in disturbance and pollution to the existing habitat through the creation of infrastructure and roads. The causes of this urban expansion can be for residential, tourist or commercial areas. This leads to loss of habitat, destruction of mature individuals reducing the reproductive capacity of Theaceae species. This threat is most prevalent in southeast Asia.

Logging for timber, poses a major threat to many Theaceae species, as their

timber is highly sought-after. The trees can be threatened by direct extraction or by disturbance due to the harvest of surrounding timber tree species. Theaceae species can be specifically targeted for timber for use for construction and handicrafts as well as more generally for firewood.

Another key threat to Theaceae species is the gathering of plants for ornamental purposes or for food and drink. Often plants are removed directly from the wild, with a focus on saplings or seedlings, reducing reproductive potential of populations and the overall population size.

Other key threats include infrastructure, pollution from urban areas, water management changes and loss of habitat due to the expansion of industrial plantations.



Camellia lutchuensis (Arboretum Wespelaar)

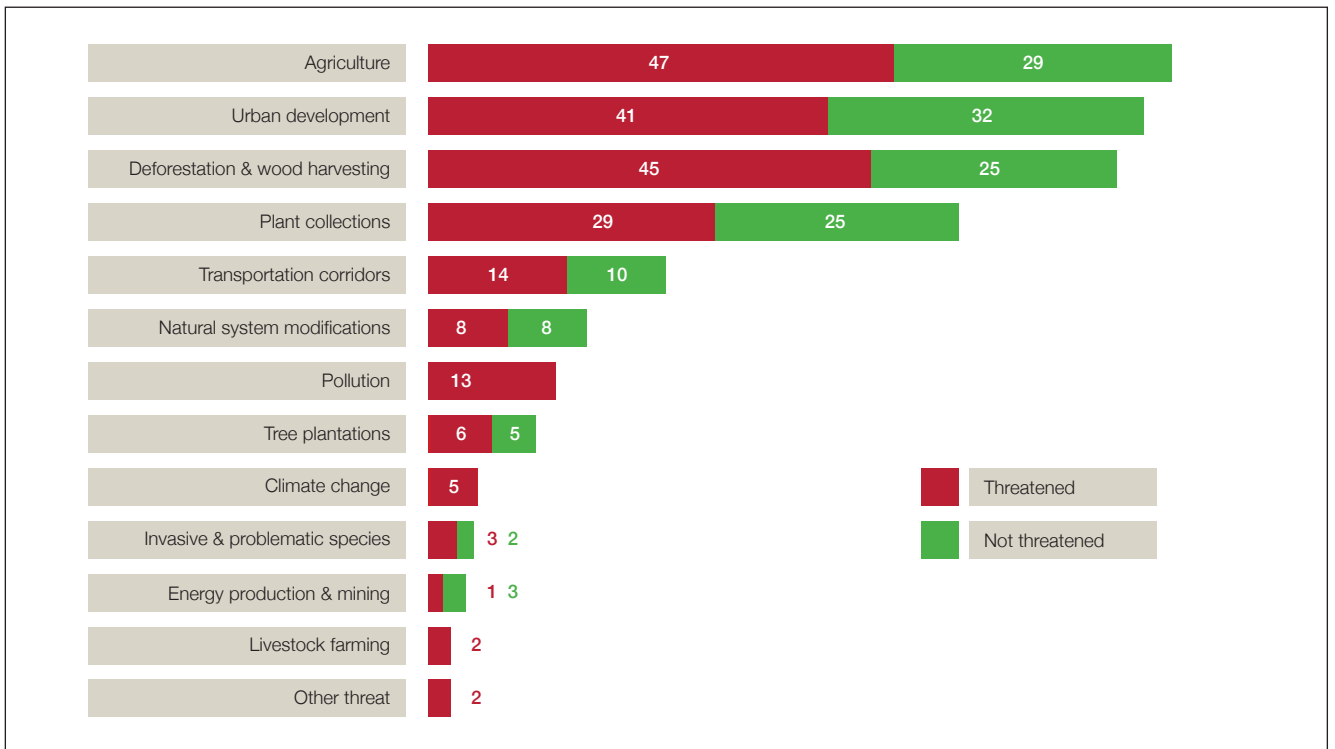


Figure 5. Threats to threatened and not threatened Theaceae species

**POPULATION TRENDS**

Twenty-five percent of Theaceae species (64) are experiencing population declines, with only 6% of species (14) with populations considered stable. For more than half of the species (69%, 174), their population trends are unknown. This can lead to species being assessed as Data Deficient (Figure 6).

**USES**

Theaceae species have a range of uses, from timber, food and drinks to ornamental uses.

The most highly used Theaceae species is the source of tea, *Camellia sinensis* (Data Deficient) (Case study 1). *Camellia nitidissima* (Endangered) was also extensively extracted from the wild for use to make health teas. BGCI has been working with local partners, Guangxi Institute of Botany and Nanning Arboretum, to improve the conservation status of this species by establishing *ex situ* collections and implementing *in situ* reinforcement. Community nurseries were established to take the harvest pressure off wild populations (for more information see Case study 2).

The International Camellia Society is a key source of information about *Camellia* species in cultivation, over 40,000 ornamental varieties (Case study 4).



*Stewartia serrata* (Arboretum Wespelaar)

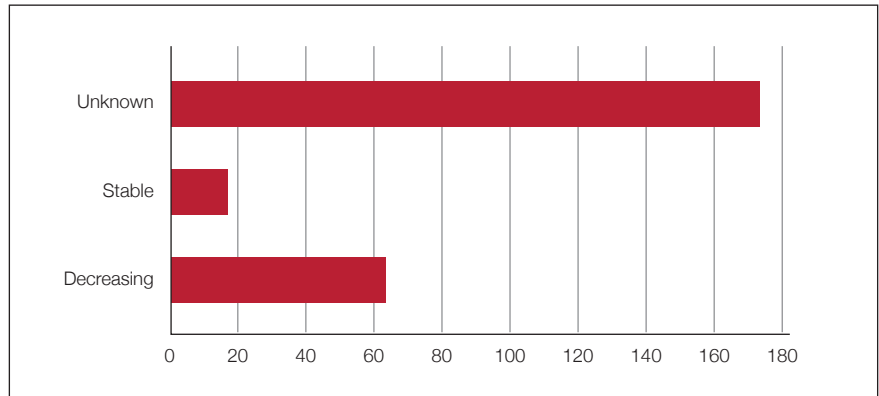


Figure 6. Population trends of Theaceae species.

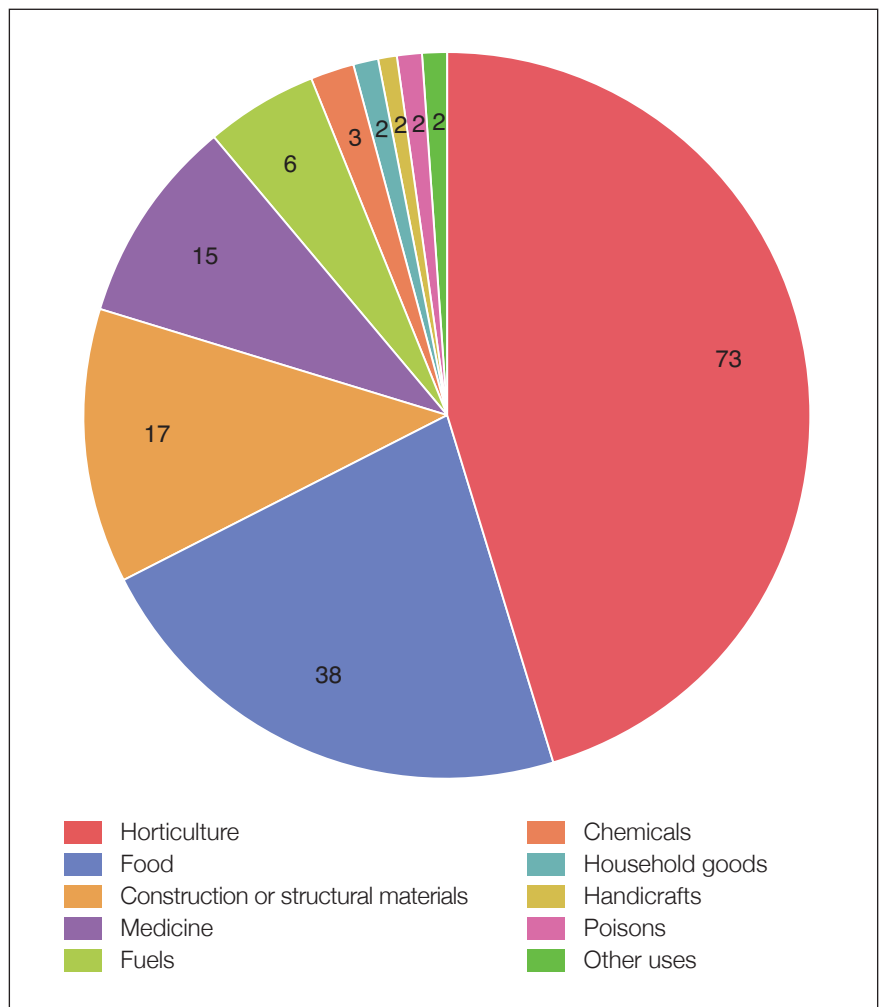


Figure 7. The recorded uses of Theaceae species

## EX SITU SURVEY OF THEACEAE

An *ex situ* survey allows us to assess the coverage of species within botanic gardens, arboreta and seed banks. *Ex situ* collections provide an important back up to protect species from extinction. Using BGCI's PlantSearch database (Box 2), we analysed the presence of Theaceae collections in botanic gardens, arboreta and seed banks across the world. Additionally, we included records from the Chinese checklist of *ex situ* cultivated flora (Huang, 2014). Theaceae species are a favourite of amateur horticulturalists, with an extensive array of cultivars and hybrids readily available. For this reason it is unsurprising that 77% (8,065) of records for the family are cultivars. In Case study 4, we highlight the importance of these collections.

For this *ex situ* survey to inform conservation action, cultivar and hybrid records were excluded in this analysis; infraspecific records were included and assigned to their appropriate species. In total there are 2,367 records of Theaceae species in collections, from 350 institutions in 49 countries (Table 5, see Annex 2 for a full list of institutions).

### SPECIES IN EX SITU COLLECTIONS

Fifty percent (126) of Theaceae species are found in *ex situ* collections. Of the threatened species, 51% (43) are found in *ex situ* collections (Figure 8). The 42 threatened species currently not found in an *ex situ* collection should be brought into collections as a priority (Table 6).

A high percentage of Data Deficient species (85%, 63) are not found in *ex situ* collections. As it is not possible to know if these species are threatened or not, it is important to collect more information about them and their conservation status and to also bring them into collections.

### PlantSearch

BGCI's PlantSearch database is the only global database of plants in cultivation. It is available online, and it is free to contribute to and access. PlantSearch connects around 2,000 researchers and horticulturists to collections every year. Locations and gardens are not publicly revealed and requests can be made via blind email messages. PlantSearch is an easy way for *ex situ* collection holders to contribute to broader *ex situ* assessments, such as this survey. By uploading a taxa list to PlantSearch, collection holders can connect their collections to the global botanical community and find out the conservation value of their taxa, including the number of locations each taxon is known from globally and its current global conservation status. It is important for institutions with *ex situ* collections to share accurate data and keep it updated, and PlantSearch relies on collection holders to upload up-to-date taxa lists on an annual basis to ensure accuracy and enhance usability of the data.



[www.bgci.org/plant\\_search.php](http://www.bgci.org/plant_search.php)

	2017 <i>ex situ</i> survey
Number of records	2367
Number of institutions	350
Number of countries	49

Table 5. Summary statistics for the Theaceae *ex situ* survey

<i>Apterosperma oblata</i>	<i>Camellia gracilipes</i>	<i>Camellia stuartiana</i>
<i>Camellia bugiamapensis</i>	<i>Camellia inusitata</i>	<i>Camellia thailandica</i>
<i>Camellia candida</i>	<i>Camellia ligustrina</i>	<i>Camellia tonkinensis</i>
<i>Camellia capitata</i>	<i>Camellia longii</i>	<i>Camellia xanthochroma</i>
<i>Camellia cattienensis</i>	<i>Camellia luteocerata</i>	<i>Polyspora ceylanica</i>
<i>Camellia corallina</i>	<i>Camellia maiana</i>	<i>Polyspora dassanayakei</i>
<i>Camellia crassiphylla</i>	<i>Camellia mileensis</i>	<i>Polyspora elliptica</i>
<i>Camellia cupiformis</i>	<i>Camellia oconoriana</i>	<i>Polyspora gardneri</i>
<i>Camellia dalatensis</i>	<i>Camellia parviflora</i>	<i>Polyspora gioii</i>
<i>Camellia dilinhensis</i>	<i>Camellia paucipunctata</i>	<i>Polyspora huongiana</i>
<i>Camellia dongnaiensis</i>	<i>Gordonia penangensis</i>	<i>Polyspora scortechinii</i>
<i>Camellia duyana</i>	<i>Camellia pubicosta</i>	<i>Pyrenaria cherrapunjeana</i>
<i>Camellia fleuryi</i>	<i>Camellia punctata</i>	<i>Pyrenaria kwangsiensis</i>
<i>Camellia gilbertii</i>	<i>Camellia rubriflora</i>	<i>Pyrenaria maculatoclada</i>

Table 6. Threatened Theaceae species not found in *ex situ* collections

Target 8 of the Global Strategy for Plant Conservation calls for 75% of threatened plants to be held in *ex situ* collections (CBD, 2012), therefore Theaceae (with 51%) fall short of this target. However, Theaceae does perform better than trees on average, where a study in 2015 (Rivers *et al.*, 2015) show that only a quarter of threatened trees are found in *ex situ* collections.

**NUMBER OF EX SITU COLLECTIONS**

Roughly one in four of species found in *ex situ* collections are held at a single institution (Figure 9). This often represents a single individual or individuals with low genetic diversity. Small numbers of *ex situ* collections are unlikely to provide adequate protection for threatened taxa against stochastic events that may wipe out wild populations. For restoration or reintroduction purposes, *ex situ* collections should be genetically diverse and small numbers of collections are unlikely to hold sufficient diversity.

In contrast some species are found in a large number of collections (Table 7). For the Theaceae, these are species of high ornamental value or of other significance to humans.



*Polyspora axillaris* (Fiona Inches, RBGE)

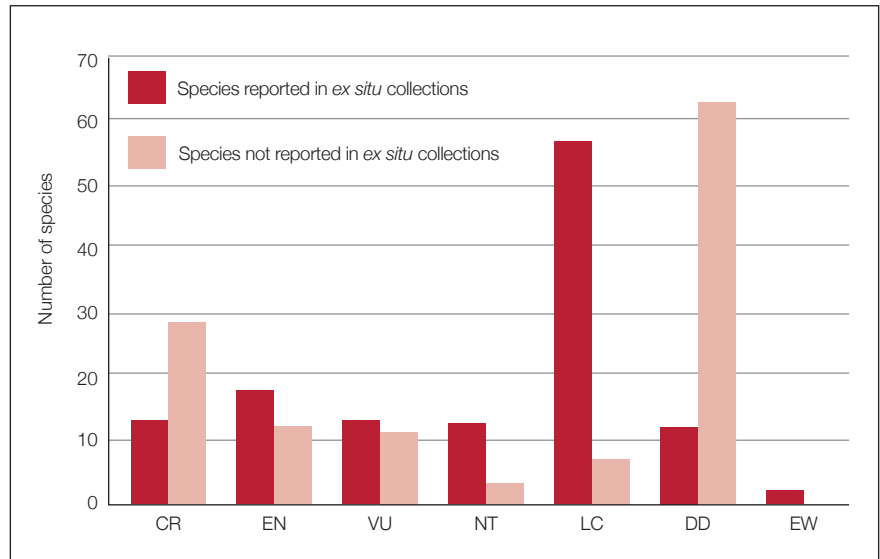


Figure 8. Presence and absence of Theaceae species in *ex situ* collections per IUCN Red List Category.

Species	<i>Ex situ</i> collections	Red List Category
<i>Stewartia pseudocamellia</i>	170	LC
<i>Camellia japonica</i>	161	LC
<i>Camellia sinensis</i>	158	DD
<i>Franklinia alatamaha</i>	99	EW
<i>Camellia sasanqua</i>	88	LC
<i>Stewartia sinensis</i>	80	LC
<i>Stewartia monadelphica</i>	75	LC
<i>Camellia oleifera</i>	66	LC
<i>Camellia reticulata</i>	55	DD
<i>Stewartia rostrata</i>	54	DD

Table 7. 10 species with the largest numbers of *ex situ* collections

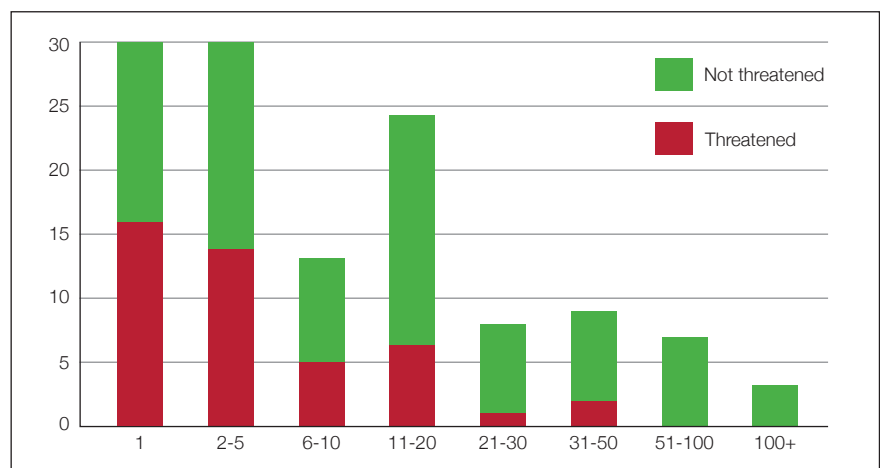


Figure 9. The number of collections of Theaceae species

## CONCLUSIONS AND RECOMMENDATIONS



*Camellia hongjiaoensis* (Anthony Curry)

### POLICY RELEVANCE

This new *Red List of Theaceae* contributes directly to the Global Strategy for Plant Conservation's Target 2, which calls for "an assessment of the conservation status of all known plant species, as far as possible, to guide conservation action" by 2020 (CBD, 2012). This Red List also contributes to the Global Tree Assessment, an initiative to assess the conservation status of all the world's tree species by 2020. The Global Tree Assessment, led by BGCI and the IUCN SSC Global Tree Specialist Group, prioritises the tree species at greatest risk of extinction. The Global Tree Assessment provides information to ensure that conservation efforts are directed at the right species so that no tree species becomes extinct.

*The Red List of Theaceae* aims to inspire and encourage conservation action by prioritising those species most at risk of extinction. BGCI, through Global Trees Campaign, are working to protect several threatened Theaceae species from extinction but further resources need to be mobilised by other organisations in order to ensure that no further Theaceae species go extinct.

### RECOMMENDATIONS

#### Gather more information about Data Deficient species.

The results indicate that 30% of Theaceae species are classified as Data Deficient. For many of these species, there is little information, other than type specimens. For this reason it is possible that many other Theaceae species are threatened with extinction or already extinct.

- Targeted survey effort is needed to collect data about those species classified as Data Deficient, to increase the information about these species to assess their conservation status.
- Report any further information about these species to BGCI at [redlist@bgci.org](mailto:redlist@bgci.org) and the conservation assessments can be modified to include new information.
- BGCI is currently working on several projects to protect Theaceae species both *in situ* and *ex situ*. For more information about these projects please see the Global Trees Campaign website ([www.globaltrees.org](http://www.globaltrees.org)).



*Stewartia malacodendron* (Arboretum Wespelaar)

#### Ensure threatened species of Theaceae are protected both *in situ* and *ex situ*

- The 42 threatened species that are not currently found in *ex situ* collections should be brought into collections as a priority.
- Species should be found in more than one *ex situ* institution and location if possible.
- Consider genetic diversity when curating *ex situ* collections.
- Assess the extent to which species are contained within protected areas and expand to include localities of Theaceae species where possible.
- Develop integrated conservation action plans for the most threatened species.

#### Raise awareness, build local capacity and mobilise action.

- Empower and inform local communities about the importance of threatened Theaceae species in their vicinity.
- Use local nurseries to produce material for both conservation action and to ease the pressure on local wild populations.
- Build capacity in horticulture, propagation and conservation techniques to empower local partners and communities.

*The Red List of Theaceae* provides a baseline for the status of Theaceae species worldwide. It aims to provide information to prioritise conservation action to protect threatened Theaceae species from extinction. Equally it aims to inspire action to improve the conservation status of these species and promote the importance of this unique and interesting group of woody plants.

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*Stewartia monadelphica* (Robert Cubey, RBGE)



*Stewartia sinensis* (Arboretum Wespelaar)



*Polyspora sp.* (Sri Lanka, Anuradha Gunathilake)

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## PART 2

### THEACEAE SPECIES EVALUATED AS EXTINCT IN THE WILD

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#### *Camellia amplexicaulis*

(Pit.) Cohen-Stuart

Viet Nam

*Camellia amplexicaulis* is a shrub or small tree that was found in the Tam Dao National Park in North Viet Nam. The last remaining wild subpopulation has since disappeared. It is also cultivated as an ornamental throughout Viet Nam and beyond.

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#### *Franklinia alatamaha* Marshall

United States

*Franklinia alatamaha* is Extinct in the Wild. It has not been seen in the wild since 1803 despite numerous attempts to relocate it. It is successfully grown in many botanic gardens and arboreta around the world.



*Franklinia alatamaha* (Arboretum Wespelaar)



*Franklinia alatamaha* (Arboretum Wespelaar)



## GLOBALY THREATENED THEACEAE SPECIES

***Apterosperma oblata*** Hung T.Chang  
CR B2ab(i,ii,iii,iv,v)  
China

*Apterosperma oblata* is a shrub or a tree that can only be found in Ehuangzhang Natural Reserve in Guangdong, China. The population now only consists of 250-300 mature individuals, covering an area of 2.4 km<sup>2</sup>. The species has faced dramatic population declines (>50%) in recent years due habitat destruction and deforestation. Conservation efforts are now underway both to augment populations in its natural habitat as well as establishing new populations *ex situ*. The species is listed as Critically Endangered.

***Camellia amplexifolia*** Merr.& Chun  
EN A2c; B1ab(i,iii)  
China

*Camellia amplexifolia* is a species known only from southern Hainan, China. It has an extent of occurrence (EOO) of 1,700-2,300 km<sup>2</sup>. It is known from fewer than five localities, each representing a location. The forest habitat has been declining due to agricultural expansion (both large and small scale) for rubber, oil palm and coffee over the last 60 years. The forest decline in the region where *Camellia amplexifolia* grows is estimated to be approximately 59%. It is not immediately clear how the deforestation is impacting *Camellia amplexifolia*. However, a loss of habitat is likely to translate directly to a loss of the species. The generation time of this species is not known but is assumed to be at least 10 years. Therefore, the deforestation and suspected population reduction of 59% is assumed to have occurred over three generations (or less). The remaining forest patches are all small, most measuring less than 0.1 km<sup>2</sup>. The threats are likely to continue, and any reforestation attempts to date have been made using exotic species. Therefore, this species is listed as Endangered A2c; B1ab(i,iii).

***Camellia aurea*** Hung T.Chang  
VU B1ab(i,ii,iii)  
Viet Nam

*Camellia aurea* is a yellow-flowering species of *Camellia* found in northern Viet Nam. The species has an extent of occurrence of less than 20,000 km<sup>2</sup>. It is at risk from specialist collectors, as well as general habitat destruction due to increased pressure on the habitat from an expanding human population. The number of locations is estimated to two and there is a decline in extent of occurrence, area of occupancy and quality of habitat. The species is listed as Vulnerable.

***Camellia azalea*** C.F.Weier  
CR B1ab(i,ii,iii,v)+2ab(i,ii,iii,v)  
China

*Camellia azalea* is endemic to Guangdong Province, China, where it has a very restricted range (both the area of occupancy (AOO) and extent of occurrence (EOO) are 4 km<sup>2</sup>) and is only known from one location. It is listed as Critically Endangered, due to the restricted range and a continuing decline in the range, in the quality and extent of the habitat and in the number of mature individuals. Although conservation action (*in situ* and *ex situ*) have been put in place, there is demand for this species as an ornamental plant and wild individuals are still being collected.



*Camellia azalea* (Ton Hannink)

***Camellia bugiamapensis*** Orel, Curry,  
Luu & Q.D.Nguyen  
CR D

Viet Nam  
This is a recently described species, known only from the type locality in Bu Gia Map National Park, Viet Nam. It consists of fewer than 50 mature individuals over a very small area of occupancy. The National Park offers some protection to the species and its habitat. It is listed as Critically Endangered D due to its very small population size.

***Camellia candida*** Hung T.Chang  
EN A2c

China and Viet Nam (?)  
*Camellia candida* is found in southeast China (Yunnan and Guangxi) and possibly in Viet Nam. Experts have estimated a 50% population reduction for this species over 60 years (about three generations). The main threat to this species is deforestation due to logging for wood collection and habitat loss for urbanisation and infrastructure. This is estimated to be causing a continuing decline in area and quality of habitat for this species. This species has been assessed as Endangered.

***Camellia capitata*** Orel, Curry & Luu  
CR D

Viet Nam  
This is a recently described species, known only from the type locality in Bu Gia Map National Park, Viet Nam. It consists of only five known mature individuals over a very small area of occupancy. The National Park offers some protection to the species and its habitat. It is listed as Critically Endangered D due to its very small population size.

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***Camellia cattienensis*** Orel

VU D2

Viet Nam

*Camellia cattienensis* is found within and outside Cat Tien National Park, Viet Nam. There is little information on its current population size or trend. It is listed here as Vulnerable D2, based on its estimated small area of occupancy (<20 km<sup>2</sup>). The main threat to this species is habitat destruction due to the expansion of agricultural practice (inside and outside the National Park) as well as over collection. Due to its presumed small population size and extent, these threats could drive this species to extinction in a very short period of time.

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***Camellia chrysanthoides*** Hung T.Chang

EN B1ab(iii); D

China

*Camellia chrysanthoides* has an estimated extent of occurrence of 226 km<sup>2</sup> and is found in fewer than five locations. There are only around 20 to 100 mature individuals left and the habitat quality and area is declining due to deforestation for agriculture and plantations. This species is thought to be harvested for firewood and yellow flowers however more research is needed on the harvest trends and impact to the species. This species has been assessed as Endangered.

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***Camellia corallina*** (Gagnep.) Sealy

EN B1ab(iii)

Viet Nam

*Camellia corallina* is a small tree endemic to Viet Nam. It was described from Ba Na and the Bach Ma National Park, near Da Nang. It may, however, only still persist at Bach Ma, although local rangers have not rediscovered the species. If still present the extent of occurrence is likely to be 750 km<sup>2</sup> or less. It is only recorded from one location, and the habitat is declining in extent and quality surrounding the National Park. The species is not currently used or traded, although it has been identified as a potentially useful plant in the horticultural industry. It is currently not present in any *ex situ* collections. It is listed here as Endangered due to its restricted range, but more information is needed to establish if species is still present in the park.

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***Camellia crapnelliana*** Tutcher

VU A2c

China

*Camellia crapnelliana* is found in five provinces of China. It is no longer considered to occur in the wild in Hong Kong, where it was first described. The geographic range of this species is large and exceeds the criteria for a threatened category under Criterion B. Across this range population is subject to reduction due declining habitat quality as well as cutting of the species. It is suspected that habitat area and quality has declined by over 30% in the last 90 years. The species is here assessed as Vulnerable. This species requires greater habitat protection and it would be beneficial to obtain more data on the threats to this species.

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***Camellia crassiphylla*** Ninh &

N.Hakoda

CR B1ab(i,ii)+2ab(i,ii); D

Viet Nam

*Camellia crassiphylla* is endemic to the Tam Dao National Park in Viet Nam. It is only known from one location (there are small subpopulations in very close proximity to each other) and has a very small area of occupancy (AOO) and extent of occurrence (EOO). There is a decline in the AOO and EOO. There are only 8-10 known mature individuals. However, more subpopulations might exist in the National Park. Threats include collection of wood by locals and the overharvesting of yellow *Camellia* flower buds for trade. Also, a city is being built in the park which is a potential future threat to this species. It is listed as Critically Endangered.

Assessors: Rivers, M.C. & Orel, G.

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***Camellia cucphuongensis*** Ninh &

Rosmann

CR D

Viet Nam

*Camellia cucphuongensis* is endemic to a national park in Viet Nam. There are no more than 20-30 mature individuals. The plants are very scattered. Outside the National Park the habitat is quickly disappearing, and cuttings of this species are collected for ornamental usage. It is listed as Critically Endangered due to its very small population size.

Assessors: Orel, G., Nguyen, M.C. & Rivers, M.C.

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***Camellia cupiformis*** T.L.Ming

CR B1ab(ii,iii)

China

*Camellia cupiformis* is endemic to Yunnan province, China. The reported estimated extent of occurrence (EOO) for this species is less than 100 km<sup>2</sup> and it has only been found in one locality (near a village and tea plantation), representing a single location. The species is threatened by deforestation due to the expansion of tea plantations which leads to a decline in area of occupancy and quality and extent of the habitat. It is therefore listed as Critically Endangered.

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***Camellia dalatensis*** V.D.Luong , Ninh

& Hakoda

CR B1ab(iii)

Viet Nam

*Camellia dalatensis* is a small tree with yellow flowers from southern Viet Nam. It is named after the location where it is found - the Da Lat Plateau. The species is found in a single location and has an extent of occurrence of less than 100 km<sup>2</sup>. It is known that the Da Lat Plateau has suffered from habitat loss, degradation and fragmentation in places, and deforestation is directly impacting the range of *Camellia dalatensis*. Further information is needed on this species including population distribution, size and trends. The species is listed as Critically Endangered.

Assessors: Rivers, M.C. & Luu, H.T.

***Camellia dilinhensis*** Ninh & V.D.Luong  
EN B2ab(iii,v)

Viet Nam

This newly described species of yellow-flowering *Camellia* was described in 2013. *Camellia dilinhensis* is only known from a single location and is listed as Endangered, due to its restricted range. Moreover, the small population has low natural regeneration. The area of occupancy is estimated to be less than 500 km<sup>2</sup>. Agricultural expansion, forest plantations and illegal logging all contribute to the continuing decline in the area, extent and quality of the evergreen forest habitat of this species. Due to the popularity of *Camellia* for the horticulture trade, there is also a plausible future threat that could drive this taxon towards extinction.

Assessors: Dung, L.V., Cuong, T. & Rivers, M.C.

***Camellia dongnaiensis*** Orel

CR B1ab(i,ii,iii)+2ab(i,ii,iii)

Viet Nam

*Camellia dongnaiensis* is only known from a single location in Viet Nam. Both the area of occupancy (AOO) and extent of occurrence (EOO) are estimated to be less than 1 km<sup>2</sup>. While the current population size is unknown it is thought to be very small. Habitat destruction due to farming and agriculture is the main threat to this species. It is experiencing a continuing decline in the area of occupancy, extent of occurrence and the quality of its habitat. It is listed as Critically Endangered.

Assessors: Rivers, M.C. & Orel, G.

***Camellia duyana*** Orel, Curry & Luu

CR D

Viet Nam

The current distribution of *Camellia duyana* is very small (< 1 km<sup>2</sup>), and despite a further search only three mature individuals were found. Therefore, the species is here listed as Critically Endangered D. Both *in situ* protection of the species as well as *ex situ* collections would be highly desirable to protect this species from extinction.

***Camellia elongata*** (Rehder &

E.H.Wilson) Rehder

EN B1ab(iii)

China

*Camellia elongata* occurs in Sichuan and Guizhou, China. The estimated extent of occurrence (EOO) for this species is 4,814 km<sup>2</sup> and it occurs in three or fewer locations. This species is threatened by agricultural expansion and development of urbanisation and tourism which is likely to be causing a continuous decline in quality and area of habitat. Therefore, this species is assessed as Endangered B1ab(iii).

***Camellia euphlebia*** Merr. ex Sealy

EN B1ab(i,ii,iii,iv)

China and Viet Nam

*Camellia euphlebia* is distributed in Guangxi, China and in Viet Nam. It has an estimated extent of occurrence of 1,561 km<sup>2</sup> and occurs in fewer than five locations. A lot of *Camellia euphlebia* plants have been removed from the wild for ornamental uses. The rate of decline in forest quality and area seems to be continuous due to fringe clearing of the forest to accommodate commercial crops and fire wood collection which is indiscriminate and constant. These threats are causing a decline in the AOO, EOO, area and quality of habitat and number of mature individuals of this species. Therefore *Camellia euphlebia* has been assessed as Endangered B1ab(i,ii,iii,v).



Camellia euphlebia

***Camellia fangchengensis*** S.Ye Liang &

Y.C. Zhong

CR B1ab(iii)

China

*Camellia fangchengensis* has a restricted distribution with an estimated extent of occurrence of less than 100 km<sup>2</sup> and a single location. It is threatened by deforestation and logging in the area which is estimated to be causing a decline in area and quality of habitat. The last known herbarium specimen was collected in 1994 and several botanists have failed to relocate the species in the wild at its type locality since then (D. Zhao pers. comm. 2015). *Camellia fangchengensis* is assessed as Critically Endangered.

***Camellia fascicularis*** Hung T.Chang

CR A2c

China

*Camellia fascicularis* is endemic to Yunnan, China. It has a limited distribution and small population size. This species is threatened by over-collection due to its yellow flowers, and threatened by deforestation within its range for infrastructure and plantations. The estimated extent of occurrence for this species is 4,303 km<sup>2</sup> and it is found in fewer than five locations. Experts have suspected an 80% population reduction for this species based on a decline in the area and quality of habitat over the last 20 years (GTSG 2012, S. Yang pers. comm. 2015). Although the generation time of this species is not fully known, it is thought that three generations would span over more than 20 years. The population is thought to have been stable or decreasing prior to this decline. Therefore, there is suspected to have been an 80% population decline over three generation lengths. This species is listed as Critically Endangered.

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***Camellia flava*** (Pit.) Sealy

CR C2a(i)

Viet Nam

*Camellia flava* is endemic to Viet Nam, where it is found in the confines of Cuc Phuong National Park and Tam Dao National Park. There are thought to be fewer than 250 wild mature individuals in total and the largest subpopulation consists of no more than 25 mature individuals. A city is being constructed in the Tam Dao National Park, causing a continuing decline in the population and the quality and extent of the habitat. It is listed as Critically Endangered.

Assessors: Orel, G., Nguyen, M.C. & Rivers, M.C.

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***Camellia flavida*** Hung T.Chang

VU B1ab(i,iii)

China

This species has an estimated extent of occurrence under 20,000 km<sup>2</sup> and is found in fewer than five locations. It is threatened by desertification of the karst ecosystem in Guangxi and by deforestation in Duxin county for the plantation of sugar cane. These threats are causing a continuing decline in extent of occurrence and area/quality of habitat. Therefore this species has been assessed as Vulnerable B1ab(i,iii).

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***Camellia fleuryi*** (A.Chev.) Sealy

EN B1ab(iii)

Viet Nam

*Camellia fleuryi* has not been collected despite repeated efforts to relocate the species. It is known from five or fewer locations in the Hon Ba Nature Reserve which measures 190 km<sup>2</sup>. The species is under threat due to a decline in habitat quality and extent due to expansion in agriculture and forestry plantations. If rediscovered, it is also likely to be a target for specialist plant collectors. It is listed here as Endangered.

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***Camellia formosensis*** (Masam. &

Suzuki) M.H.Su, C.F.Hsieh & C.H.Tsou

VU B1ab(iii,v)

China

*Camellia formosensis* is endemic to Taiwan. The estimated extent of occurrence (EOO) is 6,096 km<sup>2</sup>. There are five to 10 locations. It has undergone decline in the past due to deforestation and is still at threat due to collection of mature individuals for transplantation for tea. This species is therefore listed as Vulnerable.

Assessors: Su, M., Rivers, M.C. & Wheeler, L.

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***Camellia gaudichaudii*** (Gagnep.) Sealy

VU B2ab(iii)

China and Viet Nam

This species is shrub or small tree found in China and Viet Nam. The species occurs in few locations and in a restricted area. It is threatened by changes in habitat quality because of high deforestation rates in Yunnan. It is present in *ex situ* collections. It is here assessed as Vulnerable.

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***Camellia gilbertii*** (A. Chev.) Sealy

VU B1ab(iii)

China and Viet Nam

*Camellia gilbertii* is found in Yunnan, China and northern Viet Nam. The estimated extent of occurrence is less than 20,000 km<sup>2</sup> and it occurs in fewer than 10 locations. This species is threatened by deforestation throughout its range due to urbanisation and agriculture which is causing a continuing decline in area and quality of habitat. Therefore *Camellia gilbertii* has been assessed as Vulnerable B1ab(iii).

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***Camellia gracilipes*** Merr. ex Sealy

VU B1ab(iii)

China and Viet Nam

There is some uncertainty in the distribution of this species however it is thought to occur in Guangxi, China and in northern and southern Viet Nam. However repeated searches in the field and of several local produce markets near the township of Hakoi, N. Viet Nam (where the type specimen was described) failed to find a single specimen suggesting this species is no longer extant here. It has been reported that this species may be extremely rare, or even extinct. The estimated extent of occurrence is 10,937 km<sup>2</sup> and it is thought to occur in fewer than five locations. The area and quality of habitat of this species is declining due to deforestation for urbanisation and agriculture. It has been assessed as Vulnerable B1ab(iii).

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***Camellia granthamiana*** Sealy

VU C2a(i)

China

*Camellia granthamiana* is a naturally rare species found in Hong Kong and Guangdong, China. It is assessed as Vulnerable C2a(i) as the population size has been estimated at around 3,000 mature individuals which are sparsely distributed in the mountains meaning the number of individuals in each subpopulation will have fewer than 1,000. This species is threatened by illegal collection from the wild and logging for wood and charcoal.

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***Camellia hekouensis*** C.J.Wang &

G.S.Fan

CR B1ab(iii)

China

*Camellia hekouensis* is endemic to the Hekou region of Yunnan, China. It has a limited distribution and is only found in one location. The estimated extent of occurrence for this species is less than 100 km<sup>2</sup>. Deforestation throughout the Yunnan region is likely to have caused a continuing decline in area and quality of habitat for this species. This species has been assessed as Critically Endangered B1ab(iii).

***Camellia hongkongensis*** Seem.

EN B1ab(iii)

China

*Camellia hongkongensis* occurs in Hong Kong and on other coastal islands of China. The estimated extent of occurrence of this species is between 949-2,786 km<sup>2</sup> and it is found in a maximum of four locations. Urbanisation, fruit tree plantations and felling for charcoal are all potential threats to this species and have been projected to cause a decline in the area and quality of habitat. Therefore, this species is assessed as Endangered B1ab(iii).

***Camellia huana*** T.L.Ming & W.J.Zhang

EN D

China

*Camellia huana* is thought to have a restricted population size of fewer than 250 mature individuals (GTSG, 2012). It is only known from three or four localities and has an estimated extent of occurrence (EOO) of 3,000 km<sup>2</sup>. However, there are currently no known threats to this species. It is listed as Endangered due to the low population size.

***Camellia ilicifolia*** Y.K.Li

CR B1ab(iii,v)

China

*Camellia ilicifolia* has a restricted range. It has an extent of occurrence of less than 100 km<sup>2</sup> and is only known from one location. Only 3,000 individuals are thought to remain. Available habitat for wildlife in the Chishui River Basin is shrinking as more and more land is converted for agriculture and fragmented by industrial, urban and infrastructure development. About 30% of land in this area is prone to soil erosion, among which 10% is heavily eroded due to farming on sloping lands. Therefore, this species is assessed as Critically Endangered.

***Camellia impressinervis*** Hung

T.Chang &amp; S.Y.Liang

CR B1ab(iii,v); C2a(i); D

China

This species has an extent of occurrence of 74 km<sup>2</sup> and is only found in one location. It is threatened by desertification of the karst ecosystem, which is causing a continuing decline in the quality of habitat, and by collection from the wild for the horticultural trade causing a decline in mature individuals. The trade and harvest levels need to be researched to determine the effect this has on the population. The overall population of this species is no more than 45 individuals. *Camellia impressinervis* has been assessed as Critically Endangered.

***Camellia inusitata*** Orel, Curry & Luu

CR B1ab(iii,v)+2ab(iii,v); C2a(ii)

Viet Nam

*Camellia inusitata* is a newly described species that consists of fewer than 100 individuals in a single subpopulation. It is only found in a single locality of an area of occupancy of less than 1 km<sup>2</sup>, and the extent of occurrence of less than 100 km<sup>2</sup>. It is suffering from a continuing decline in habitat quality and extent due to recent road construction that has divided the current population in two. Despite being present in a national park, the population is not protected (as evidenced by recent road construction). Also *ex situ* collections ought to be established to safeguard this species.

***Camellia ligustrina*** Orel, Curry & Luu

EN B1ab(iii)

Viet Nam

This is a recently described, highly range-restricted species, known only from the type locality in Lam Dong Province, Viet Nam. Its extent of occurrence is less than 1100 km<sup>2</sup>. It currently grows within the Bidoup-Nui National Park which offers some *in situ* protection, however there is a general decline in habitat quality and extent. It is therefore listed as Endangered. Assessors: Rivers, M.C. & Luu, H.T.

***Camellia longii*** Orel & Luu

EN B1ab(iii)+2ab(iii)

Viet Nam

This species is known only from Cat Tien National Park in Viet Nam. Its extent of occurrence (EOO) is estimated to 350 km<sup>2</sup> and the area of occupancy (AOO) is not more than 150 km<sup>2</sup>. The forest habitat is declining due to agricultural expansion in the area. There was also a severe potential threat due to the plan to build a hydroelectrical dam in the area, that would have inundated *Camellia longii*'s entire habitat. The species is listed as Endangered.

*Camellia longii* (Anthony Curry)***Camellia longipedicellata*** (Hu) Hung

T.Chang &amp; D.Fang

EN B1ab(iii)

China

The extent of occurrence of *Camellia longipedicellata* is 2,176 km<sup>2</sup> and the species occurs in fewer than five locations. This species is under threat from desertification of the karst ecosystem in the region which is causing a continuing decline of the quality of the habitat. This species has been assessed as Endangered B1ab(iii).



*Camellia luteocerata* (Anthony Curry)

***Camellia longzhouensis*** J.Y.Luo

EN B1ab(iii)

China

The extent of occurrence has been calculated as 2,217 km<sup>2</sup> and the species is likely to be found in fewer than five locations. This species is threatened by deforestation in the Fusui area which is causing a continuing decline in area and quality of habitat. Therefore, this species is assessed as Endangered B1ab(iii).

***Camellia luteocerata*** Orel

VU D1

Viet Nam

*Camellia luteocerata* is endemic to the vicinity of the Cat Tien National Park in Viet Nam. It has a very restricted distribution, an area of occupancy (AOO) of no more than 10 km<sup>2</sup>, and there are no more than 500 mature individuals. The populations may be stable within the national park, but is suffering from a decline in habitat quality and extent outside the protected area. It is listed as Vulnerable due to the relatively small population size.

***Camellia luteoflora*** Y.K.Li ex Hung

T.Chang & F.A.Zeng

CR B1ab(iii)+2ab(iii)

China

*Camellia luteoflora* has a very restricted range. The extent of occurrence and the area of occupancy are both 4 km<sup>2</sup>. It is only known from one location. Available habitat for wildlife in the Chishui River Basin is shrinking as more and more land is converted for agriculture and fragmented by industrial, urban and infrastructure development. About 30% of land in this area is prone to soil erosion, among which 10% is heavily eroded due to farming on sloping lands. Therefore, this species is assessed as Critically Endangered.

Assessors: Orel, G., Luu, H.T. & Rivers, M.C.

***Camellia maiana*** Orel

CR B1ab(i,ii,iii)+2ab(i,ii,iii); D

Viet Nam

*Camellia maiana* is only known from one location near Da Lat City, Viet Nam. It has a very restricted distribution and there are no more than 30 known mature individuals. The area of occupancy (AOO) and extent of occurrence (EOO) are both estimated to be less than 1 km<sup>2</sup>. It is experiencing a decline in the area of occupancy and extent of occurrence due to habitat destruction (farming and agriculture). It is therefore listed as Critically Endangered. More surveys are needed to confirm the population size and trends of this species, and to establish effective conservation action.

Assessors: Rivers, M.C. & Orel, G.

***Camellia micrantha*** S.Yun Liang &

Y.C.Zhong

EN B1ab(v)

China

*Camellia micrantha* is a range restricted species found only in Guangxi, China. Its maximum extent of occurrence is 6,000 km<sup>2</sup> and is known from fewer than 10 locations. The main threat is from exploitation of the yellow (or golden) flowers which are in high demand due to their potentially medicinal properties. Further research into the harvest levels and the threats to this species are needed. It is listed here as Vulnerable.

***Camellia mileensis*** T.L.Ming

VU D2

China

*Camellia mileensis* is endemic to the Mile county, Yunnan, China. The estimated extent of occurrence is less than 5,000 km<sup>2</sup> and it is only known from a single location. The type locality is in close proximity of a village, and the risk of deforestation and habitat alteration for human benefit is very likely in the near future. As a result this species has been assessed as Vulnerable D2 as there is one location in which a plausible future threat could drive this species to be Critically Endangered or Extinct in the Wild within a short amount of time. More research is needed into the full distribution, population size, trends and threats for *Camellia mileensis*.



Camellia nitidissima

**Camellia nitidissima** C.W.Chi

EN B1ab(iii,v); C2a(i)

China

*Camellia nitidissima* is endemic to southern Guangxi, China. It has an estimated extent of occurrence of 838 km<sup>2</sup> and is thought to occur in fewer than 10 locations. This species is threatened by habitat loss and destructive human collection of seedlings which is likely to be causing a continuing decline in both area and quality of habitat for this species. Eleven out of 12 subpopulations of this species have fewer than 200 individuals suggesting that the total population is likely to be fewer than 2,500 mature individuals. The population size of *C. nitidissima* is in continuing decline due to deforestation and destructive collection of seedlings. *Camellia nitidissima* has been assessed as Endangered B1ab(iii,v); C2a(i).

**Camellia oconoriana** Orel, Curry & Luu

CR D

Viet Nam

This species consist of only ten known mature individuals, despite a detailed search of the area, only the single population was found. Therefore this species is considered Critically Endangered (CR D). Conservation work (*in situ* and *ex situ*) is desired for such a rare species.

**Camellia parviflora** Merr. & Chun ex

Sealy

EN B1ab(i,iii)

China

*Camellia parviflora* is known only from southern and southwestern Hainan, China. It has an extent of occurrence (EOO) of 4,653 km<sup>2</sup>. It is known from five locations. The forest habitat has been declining due agricultural expansion (both large and small scale) for rubber, oil palm and coffee over the last 60 years. The remaining forest patches are all small and fragmented with most of them measuring less than 0.1 km<sup>2</sup>. The threats are likely to continue, and any reforestation attempts to date have been made using exotic species. The species is listed as Endangered B1ab(i,iii).

**Camellia paucipunctata** (Merr. & Chun)

Chun

EN A2c; B1ab(ii,iii)

China

*Camellia paucipunctata* is a species known only from southern Hainan, China. It has an extent of occurrence (EOO) of c. 2,000 km<sup>2</sup>. It is known from fewer than five locations. The forest habitat has been declining due agricultural expansion (both large and small scale) for rubber, oil palm and coffee over the last 60 years. The forest decline in the region where *Camellia paucipunctata* grows is estimated as up to 80% (over approximately three generations) and based on this there is a suspected past population decline of 50-80%. The remaining forest patches are all small, with most measuring less than 0.1 km<sup>2</sup>. The threats are likely to continue and any reforestation attempts to date have been made using exotic species. The species is listed as Endangered A2c; B1ab(ii,iii).

**Camellia petelotii** (Merr.) Sealy

EN B1ab(ii,v)+2ab(ii,v)

Viet Nam

*Camellia petelotii* is endemic to Tam Dao National Park, Viet Nam. It has a restricted range, with an area of occupancy (AOO) and an extent of occurrence (EOO) of less than 500 km<sup>2</sup> and 380 km<sup>2</sup> respectively. The population is currently stable. It is found in a national park; however a city is being built in the park. A recent road construction has severely impacted the habitat and population of *C. petelotii* already. It is listed as Endangered due to its restricted geographic range.

Assessors: Rivers, M.C. &amp; Orel, G.

**Camellia pingguoensis** D.Fang

EN B1ab(iii)

China

This species is assessed as Endangered B1ab(iii). It is thought to occur in fewer than five locations and its extent of occurrence is 2,200 km<sup>2</sup>. This species is threatened by a decline in habitat quality and area due to desertification of the karst ecosystem in which this species is found.

***Camellia piquetiana*** (Pierre ex Lanessan.) Sealy  
 CR D  
 Viet Nam  
*Camellia piquetiana* was only recently rediscovered. It was collected near Da Lat Cit in southern Viet Nam. It is only known from small areas and there are fewer than 50 mature individuals. Habitat destruction due to agriculture is the main threat to this species. It is listed as Critically Endangered due to its small population size.

***Camellia ptilophylla*** Hung T.Chang  
 VU B1ab(iii,v)  
 China  
*Camellia ptilophylla* is a shrub or small tree endemic to central Guangdong Province and in southern Hunan, China. The extent of occurrence is estimated to 12,500 km<sup>2</sup>. The species is in decline as local people have dug the wild plants out and planted them to use as a source of tea. Over-harvesting of wild trees is also a potential threat if this tea becomes popular on the global market. The species is listed as Vulnerable.

***Camellia pubicosta*** Merr.  
 EN B1ab(iii)  
 Viet Nam  
 This species is a range restricted species found in northern Viet Nam. It is found in three distinct locations, and the extent of occurrence measure 3,600 km<sup>2</sup>. There is evidence of continuing decline outside the protected areas in both quality and extent of habitat. The species is therefore listed as Endangered. *Camellia pubicosta* is found in a protected area Tam Dao (although one small, but known, population in Tam Dao has been devastated by ecotourism roads and infrastructure), and the type specimen is from Mount Ba Vi (also protected), but there are no recent records from here. There is little or no information on the population size and trends and more information on this would be desirable.

***Camellia pubifurfuracea*** Y.C.Zhong  
 EN B1ab(iii)  
 China  
 The extent of occurrence of *Camellia pubifurfuracea* is less than 2,600 km<sup>2</sup> and it is thought to occur in fewer than five locations. This species is threatened by human disturbance within Dayaoshan Nature Reserve and deforestation for maize plantations within the Jinxui County. These threats are likely to be causing a continuing decline in habitat quality and area. There are reports of a 50% decline in the population over three generations; however it is unknown over what time period this was measured, the cause of this decline and the generation length used. This species has been listed as Endangered B1ab(iii).

***Camellia pubipetala*** Y.Wan & S.Z.Huang  
 EN B1ab(iii)  
 China  
*Camellia pubipetala* is endemic to Guangxi Province, China. The estimated extent of occurrence is 495 km<sup>2</sup> and it is thought to occur in fewer than five locations. This species is threatened by cutting and habitat clearance which is likely to be causing a continuing decline in area and quality of habitat for this species. *Camellia pubipetala* has been assessed as Endangered.

***Camellia punctata*** (Kochs) Cohen-Stuart  
 VU B1ab(iii)  
 China  
*Camellia punctata* is a shrub endemic to Sichuan. It has an estimated extent of occurrence of 13,720 km<sup>2</sup> and is found in fewer than 10 locations. There is a high rate of deforestation within Sichuan province which is likely to be causing a continuing decline in area and quality of habitat for this species. It has been assessed as Vulnerable.

***Camellia pyxidiacea*** Z.R.Xu, F.P.Chen & C.Y.Deng  
 EN B1ab(iii)  
 China  
*Camellia pyxidiacea* is restricted to the border of eastern Yunnan, southern Guizhou and northwestern Guangxi. It has an estimated extent of occurrence of 3,019 km<sup>2</sup> and is thought to occur in fewer than five locations. This species is threatened by deforestation through its range in Yunnan which is likely to be causing a continuing decline in both area and quality of habitat. Therefore *Camellia pyxidiacea* has been assessed as Endangered B1ab(iii).

***Camellia renshanxiangiae*** C.X.Ye & X.Q.Zheng  
 VU D2  
 China  
*Camellia renshanxiangiae* is known only from the type material quoted in the description of the species. It is a newly described species from Guangdong, Southeast China, known only from one locality in Yangshan County. The area of Yangshan County is approximately 3,500-4,000 km<sup>2</sup>, used as a proxy for the extent of occurrence (EOO). There is very little other information on this species. There is a plausible future threat to the area in which this species is found as it could be deforested for fruit tree or tea plantations. As a result this species has been assessed as Vulnerable D2 as there is one location in which a future threat could drive this species to be Critically Endangered or Extinct in the Wild within a short amount of time. More research is needed into the full distribution, population size, trends and threats for *Camellia renshanxiangiae*.



***Camellia rosmannii*** Ninh

CR B1ab(iii,v)

Viet Nam

*Camellia rosmannii* is endemic to northern Viet Nam. It is currently only known from one locality. There have been two more finds in the past, however it is unclear where these finds were made (possibly the same location). The population is declining in the known location. This species is collected for sale on the black market. It is currently listed as Critically Endangered due to the restricted extent of occurrence. More surveys and cultivation in Viet Nam are needed.

***Camellia rubriflora*** Ninh & N.Hakoda

CR D

Viet Nam

*Camellia rubriflora* is endemic to Tam Dao National Park, Viet Nam. The population is thought to be stable but there are fewer than 20 mature individuals. It is restricted to two locations and a very small area. The area of occupancy (AOO) and the extent of occurrence (EOO) are estimated to be less than 10 km<sup>2</sup> and 100 km<sup>2</sup> respectively. A city is being built in the national park, which is a potential threat to this species. It is listed as Critically Endangered due to its small population size.

Assessors: Rivers, M.C. &amp; Orel, G.

***Camellia stuartiana*** Sealy

VU B1ab(iii)

China

This species is listed as Vulnerable B1ab(iii) as it has an extent of occurrence of 13,685 km<sup>2</sup> and it is likely to be present in under 10 locations. This species is likely to be threatened by deforestation throughout the Yunnan region which is thought to be causing a decline in both the area and quality of habitat.

***Camellia szechuanensis*** C.W.Chi

EN B1ab(iii)

China

*Camellia szechuanensis* is assessed as Endangered B1ab(iii). It has an estimated extent of occurrence (EOO) of 2,771 km<sup>2</sup> and it occurs in fewer than five locations. High rates of deforestation in Sichuan due to urbanisation, development for tourism and agriculture are decreasing the area and quality of habitat for this species.

***Camellia szemaoensis*** Hung T.Chang

VU B1ab(iii,v)

China

*Camellia szemaoensis* has an extent of occurrence (EOO) of 10,918 km<sup>2</sup>. Experts believe that the species has declined (GTSG, 2012), although the scale and the time frame of this decline are not fully understood. High rates of deforestation in the whole of the Yunnan region are likely to be causing a continuing decline in area and quality of habitat for this species, and in the number of mature individuals. There are fewer than 10 locations. *Camellia szemaoensis* is listed as Vulnerable B1ab(iii,v).

***Camellia tenii*** Sealy

EN B1ab(iii)

China

*Camellia tenii* has been assessed as Endangered B1ab(iii). The estimated extent of occurrence is 4,146 km<sup>2</sup> and it is thought to occur in fewer than five locations. This species is threatened by deforestation occurring throughout the Yunnan region causing a continuing decline in the area and quality of habitat. Experts believe that there has been a 50% decline in the area and quality of habitat in the last three generations; however the reasons for this decline and the exact time frame are unknown. Therefore, this information cannot be used to suspect a population reduction for Criterion A.

***Camellia thailandica*** Hung T.Chang &

S.X.Ren

EN B1ab(iii)

Thailand

*Camellia thailandica* is only known from a single collection from Khao Yai National Park in Thailand. No further collections have been made and no further data could be found. The extent of occurrence for Khao Yai National Park is 2,400 km<sup>2</sup> and the quality and extent of the habitat is challenged from illegal logging and encroachment from locals (agriculture and settlements). No information is available on the population size or trends. The species is listed here as Endangered.

***Camellia tonkinensis*** (Pit.) Cohen-

Stuart

EN B1ab(iii)

Viet Nam

*Camellia tonkinensis* was recently rediscovered in Viet Nam after 100 years in the Hoa Binh Province, Viet Nam and a specimen has been identified from Ninh Binh Province, Viet Nam (Dongwei Zhao pers. comm.). It is uncertain if it still exists in its original locality. The extent of occurrence for all three collections (considered locations) is 2,033 km<sup>2</sup> and there is a continuing decline in the habitat extent and quality. The species is therefore listed as Endangered B1ab(iii) and urgent conservation actions, in terms of *ex situ* collections and establishing effective *in situ* conservation measures, are needed to ensure the survival of the species.

***Camellia transarisanensis*** (Hayata)

Cohen-Stuart

VU D1

China

*Camellia transarisanensis* is endemic to Taiwan. It occurs in fewer than five locations and total number of mature individuals is fewer than 1,000. This species has been severely influenced by logging in the past. Although the logging has ceased, the remaining population is small and not regenerating well. This species is assessed as Vulnerable.

Assessors: Rivers, M.C. &amp; Su, M.

***Camellia trichoclada*** (Rehder)

S.S.Chien  
VU B2ab(iii)  
China

*Camellia trichoclada* is a species confined to Taiwan, Zhejiang Province and Fujian Province. The extent of occurrence (EOO) is 57,000 km<sup>2</sup> but the area of occupancy may be below 2,000 km<sup>2</sup>, as the species have been described as confined to known collection sites (Wei *et al.*, 2011). The number of locations is 10 or fewer based on the continued threat of habitat conversion. The species therefore qualifies for Vulnerable B2ab(iii), however further research is needed into a more exact measure of area of occupancy. The species is therefore listed here as Vulnerable.

***Camellia xanthochroma*** K.M.Feng & L.S.Xie

EN A2c; B1ab(iii)  
China

*Camellia xanthochroma* is a species known only from southern Hainan, China. It has an extent of occurrence (EOO) of c. 2,000 km<sup>2</sup> and is known from under five localities. The forest habitat has been declining due to agricultural expansion (both large and small scale) for rubber, oil palm and coffee over the last 60 years. The forest decline in the region where *Camellia xanthochroma* grows is estimated as up to 80% over three generations. Based on this there is a suspected past population decline of 50-80% over three generations. The remaining forest patches are all small, with most of them measuring less than 0.1 km<sup>2</sup>. The threats are likely to continue and any reforestation attempts to date have been made using exotic species. The species is listed as Endangered A2c; B1ab(iii).



*Polyspora ceylanica* (Anuradha Gunathilake)

**\**Gordonia penangensis*** Ridley

VU B1ab(iii)  
Malaysia and Singapore

This species is a small tree found in Peninsula Malaysia and Singapore. It is here assessed as Vulnerable as the species has a restricted extent of occurrence, occurs in five locations and is threatened by destruction of its low land habitat. It is not reported in an *ex situ* collection.

**\**Gordonia singaporeana*** Wall. ex Ridley

VU A4c  
Malaysia and Singapore

This large tree species is native to Peninsular Malaysia and Singapore. The extent of occurrence is 89,707 km<sup>2</sup>. It is suspected that the population of this species will have declined by at least 30% over a 300 year moving window due to a decline in quality of the species area of occupancy. The species is threatened by habitat decline as a consequence of the development of oil palm plantations and urban expansion. The species is globally assessed as Vulnerable.

***Polyspora ceylanica*** (Wight) Orel,

Peter G.Wilson, Curry & Luu  
CR C1  
Sri Lanka

This species is a small tree endemic to Sri Lanka. It is here assessed as Critically Endangered as there are few remaining individuals and a decline of over 25% is likely in a single generation. This species requires habitat protection in order to persist and should be brought into *ex situ* collections.

Assessors: Gunathilake, L.A.A.H. & Beech, E.

*\*needs a new genus (probably Polyspora), however, this combination has not currently been made*

***Polyspora dassanayakei*** (Wadhwa & Weeras.) Orel, Peter G. Wilson, Curry & Luu

CR D

Sri Lanka

This species is a small tree endemic to Sri Lanka. It is here assessed as Critically Endangered as there are thought to be fewer than 50 individuals remaining. The species is threatened by deforestation and urbanisation as well as extraction for firewood. Action is needed to ensure this species is protected in both *ex situ* collections and *in situ* in a protected area. Assessors: Gunathilake, L.A.A.H. & Beech, E.



*Polyspora dassanayakei* (Anuradha Gunathilake)

***Polyspora elliptica*** (Gardner) Orel, Peter G. Wilson, Curry & Luu

CR C1

Sri Lanka

This species is a large tree endemic to Sri Lanka. It is here assessed as Critically Endangered as the population is likely to be under 250 individuals and it is thought there will be a decline of over 25% in a generation. The habitat of this species should be protected in order to prevent the extinction of this species and it should be brought into an *ex situ* collection as a priority.

Assessors: Gunathilake, L.A.A.H. & Beech, E.



*Polyspora elliptica* (Anuradha Gunathilake)

***Polyspora gardneri*** Orel, Peter G. Wilson, Curry & Luu

CR B1ab(iii,v); C1

Sri Lanka

This species is a small tree endemic to Sri Lanka. It is here assessed as Critically Endangered as it occurs in a single location and has a restricted extent of occurrence. The species is threatened by the expansion of urban areas as well as tourism, which is causing a decline in the habitat quality and area. There are thought to be fewer than 100 individuals and it is thought there will be a decline of over 25% in a single generation. There is currently no *ex situ* collection of this species.

Assessors: Gunathilake, L.A.A.H. & Beech, E.

***Polyspora gioii*** Luu, Tich & H. Tran

CR B1ab(iii); D

Viet Nam

*Polyspora gioii* is a small tree endemic to a single location in the Hòn Bà Nature Reserve, in southern Viet Nam. Its population consist of fewer than 50 mature individuals. It also has a restricted range, with an extent of occurrence of less than 100 km<sup>2</sup>. The population has suffered losses due to the construction of a road from the foothills to the top of the Hon Ba Mountain. The decline in area, extent and quality of habitat is likely to continue as there is no vehicle access to the site. Therefore the species is listed as Critically Endangered.

***Polyspora huongiana*** Orel, Curry & Luu

VU B2ab(iii)

Viet Nam

This species is a tree found only in Viet Nam. This species is here assessed as Vulnerable as it has an extent of occurrence of less than 1,300 km<sup>2</sup>, it is known from very few locations and despite being contained within the National Park is threatened by logging and development. There is no known *ex situ* collections of these species.

***Polyspora scortechinii*** (King) Orel,  
Peter G. Wilson, Curry & Luu  
CR B2ab(iii)  
Malaysia

This species is a small tree found in primary hillside forest. It is here assessed as Critically Endangered as it is found only in one locality, with a very small area of occupancy (4 km<sup>2</sup>). The species is threatened by land use changes in the form of deforestation. The species is not found in *ex situ* collection.

Assessors: Chua, L.S.L. & Barstow, M.

***Pyrenaria buisanensis*** (Sasaki)  
C.F.Hsieh, Sheng Z. Yang & M.H. Su  
CR D  
China

*Pyrenaria buisanensis* is endemic to southwestern Taiwan. It is only known from 20 mature individuals, and the population has been put at risk from habitat loss from large scale logging. The geographical range of this species is also very small. The species is listed here as Critically Endangered due to its restricted population size.

***Pyrenaria cherrapunjeana*** Mir  
CR D  
India

*Pyrenaria cherrapunjeana* is a small tree species. It is endemic to the Khasi hills in Meghalaya, India. No more than eight mature individuals of the species have been observed so far and the species has a restricted geographic range with area of occupancy below 10 km<sup>2</sup> and extent of occurrence anticipated to be below 100 km<sup>2</sup>. This however will require a full population survey before it is confirmed. The species is threatened by anthropogenic conversion of the species' native habitat to urban and agricultural areas so the species now persists within a fragmented forest and in a habitat subject to rapid decline. There is also timber felling and collections of non-timber products within the area which further threaten the species. *Pyrenaria cherrapunjeana* is globally assessed as Critically Endangered. Immediate habitat protection is essential for this species survival.

Assessors: Mir, A.H. & Upadhyaya, K.

***Pyrenaria kwangsiensis*** Hung T.  
Chang  
VU D1  
China

*Pyrenaria kwangsiensis* is a Chinese endemic tree, found only in the province of Guangxi. There is a lack of information on the species habitat and ecology however it is estimated that the overall population size of the species is below 1000 mature individuals. Therefore the species is here assessed as Vulnerable.

***Pyrenaria maculatoclada*** (Y.K. Li) S.X.  
Yang  
VU D1  
China

*Pyrenaria maculatoclada* is a small tree endemic to China. The population size is estimated to be below 500 individuals. The species is assessed as Vulnerable but it is still recommended that further information is gathered on the species habitat and ecology.

***Pyrenaria menglaensis*** G.D. Tao  
CR B1ab(iii)  
China

*Pyrenaria menglaensis* is a Chinese endemic tree, where it is found only in the state of Yunnan. This species occurs in a single location and is found in an area of around 100 km<sup>2</sup>. The species is threatened by deforestation in Yunnan, decreasing the quality and extent of the species' habitat. It is currently not found in *ex situ* collections. The species is assessed as Critically Endangered.  
Assessors: Barstow, M. & Yang, S.

***Pyrenaria oblongicarpa*** Hung T.  
Chang  
VU D1  
China

*Pyrenaria oblongicarpa* is a small tree species endemic to Yunnan, China. The population of this species is estimated to be made up of fewer than 500 individuals. The population is also currently in decline due agricultural expansion within the region. The species is assessed as Vulnerable. It is recommended information on ecology, population and threats is gathered.

Assessors: Barstow, M. & Yang, S.

## THEACEAE SPECIES EVALUATED AS NEAR THREATENED

*Camellia costata* S.Y.Hu & S.Ye Liang  
ex Hung T.Chang  
China

*Camellia hengchunensis* Chang  
China

*Camellia indochinensis* Merr.  
China and Viet Nam

*Camellia kwangsiensis* H.T.Chang  
China

*Camellia longissima* Hung T.Chang &  
S.Y.Liang  
China

*Camellia melliana* Hand.-Mazz.  
China

*Camellia parvimuricata* Hung T.Chang  
China

*Camellia pilosperma* S.Yun Liang  
China

*Camellia subintegra* P.C.Huang  
China

*Camellia tuberculata* S.S.Chien  
China

*Polyspora bidoupensis* (Gagnep.) Orel,  
Peter G.Wilson, Curry & Luu  
Viet Nam

*Polyspora hainanensis* (Hung T. Chang)  
C.X.Ye ex B.M. Barthol. & T.L.Ming  
China

*Polyspora taipingensis* (Burkill) Orel,  
Peter G.Wilson, Curry & Luu  
Malaysia

*Polyspora tiantangensis* (L.L. Deng &  
G.S. Fan) S.X.Yang  
China

*Pyrenaria pingpienensis* (Hung T.  
Chang) S.X.Yang & T.L.Ming  
China



Tea fields and deforestation, Kenya (Barney Wilczak)

## THEACEAE SPECIES EVALUATED AS DATA DEFICIENT

*Camellia assimiloides* Sealy  
China

*Camellia calcicola* T.L.Ming  
China

*Camellia cherryana* Orel  
China

*Camellia connata* (Craib) Craib  
Thailand

*Camellia cylindracea* T.L.Ming  
Viet Nam

*Camellia dormoyana* (Pierre ex  
Laness.) Sealy  
Cambodia (?), Lao People's Democratic  
Republic (?) and Viet Nam

*Camellia drupifera* Lour.  
China and Viet Nam

*Camellia glabricostata* T.L.Ming  
China and Viet Nam

*Camellia grandibracteata* Hung  
T.Chang & F.L.Yu  
China

*Camellia grijsii* Hance  
China



*Camellia grijsii* (Arboretum Wespelaar)

*Camellia hongiaoensis* Orel & Curry  
Viet Nam

*Camellia krempfii* (Gagnep.) Sealy  
Viet Nam

*Camellia laotica* (Gagnep.) T.L.Ming  
Lao People's Democratic Republic

*Camellia leptophylla* S.Yun Liang ex  
H.T.Chang  
China

*Camellia longicalyx* Hung T.Chang  
China

*Camellia maoniushanensis* J.L.Liu &  
Q.Luo  
China

*Camellia megasepala* Hung T.Chang &  
Trin Ninh  
Viet Nam

*Camellia mollis* Hung T.Chang &  
S.X.Ren  
Philippines

*Camellia montana* (Blanco) Hung  
T.Chang & S.X.Ren  
Philippines

*Camellia murauchii* Ninh & N.Hakoda  
Viet Nam

*Camellia nematodea* (Gagnep.) Sealy  
Viet Nam

*Camellia nervosa* (Gagnep.) Hung  
T.Chang  
Lao People's Democratic Republic and  
Viet Nam

*Camellia philippinensis* Hung T.Chang  
& S.X.Ren  
Philippines

*Camellia pleurocarpa* (Gagnep.) Sealy  
Thailand (?) and Viet Nam

*Camellia reticulata* Lindley  
China

*Camellia sealyana* T.L.Ming  
Lao People's Democratic Republic

*Camellia siangensis* T.K.Paul &  
M.P.Nayar  
India

*Camellia sinensis* (L.) Kuntze  
China (?), India (?), Lao People's  
Democratic Republic (?), Myanmar (?),  
Thailand (?) and Viet Nam (?)

*Camellia uraku* Kitam.  
Japan

*Camellia vidalii* J.C.Rosmann  
Viet Nam

*Camellia villicarpa* S.S.Chien  
China

*Camellia viridicalyx* Hung T.Chang &  
S.Y.Liang  
China

*Dankia langbianensis* Gagnep.  
Viet Nam

\**Gordonia ovalis* (Korth.) Walp.  
Indonesia

*Polyspora ampla* Orel, Curry & Luu  
Viet Nam

*Polyspora balansae* (Pit.) Hu  
Viet Nam



*Polyspora dalgleishiana* (RBGE)

***Polyspora concentricatrix***

(Burkill) Orel, Peter G. Wilson, Curry & Luu  
Malaysia

***Polyspora dalglieshiana***

(Craib) Orel, Peter G. Wilson, Curry & Luu  
Lao People's Democratic Republic and  
Thailand

***Polyspora dipterosperma***

(Kurz) Orel, Peter G. Wilson, Curry & Luu  
India and Bhutan

***Polyspora gigantiflora***

(Gagnep.) Orel, Peter G. Wilson, Curry & Luu  
Lao People's Democratic Republic and  
Viet Nam

***Polyspora grandiflora***

(Merr.) Orel, Peter G. Wilson, Curry & Luu  
Malaysia

***Polyspora hirtella***

(Ridl.) Orel, Peter G. Wilson, Curry & Luu  
Malaysia

***Polyspora integerrima***

(Miq.) Orel, Peter G. Wilson, Curry & Luu  
Indonesia

***Polyspora intricata***

(Gagnep.) Orel, Peter G. Wilson, Curry & Luu  
Viet Nam

***Polyspora lanceifolia***

(Burkill) Orel, Peter G. Wilson, Curry & Luu  
Malaysia

***Polyspora marginata***

(Korth.) Orel, Peter G. Wilson, Curry & Luu  
Indonesia

***Polyspora nivea***

Orel, Curry & Luu  
Viet Nam

***Polyspora oblongifolia***

(Miq.) Orel, Peter G. Wilson, Curry & Luu  
Indonesia

***Polyspora polisana***

(Burkill) Orel, Peter G. Wilson, Curry & Luu  
Philippines

***Polyspora sarawakensis***

(H.Keng) Orel, Peter G. Wilson, Curry & Luu  
Malaysia

***Polyspora vulcanica***

(Korth.) Orel, Peter G. Wilson, Curry & Luu  
Indonesia

***Pyrenaria barringtoniifolia***

Seem.  
India

***Pyrenaria johorensis***

H.Keng  
Malaysia

***Pyrenaria jonquieriana***

Pierre ex Laness.  
China, Lao People's Democratic  
Republic and Viet Nam

***Pyrenaria khasiana***

R.N. Paul  
China

***Pyrenaria laotica***

Gagnep.  
Lao People's Democratic Republic

***Pyrenaria microphylla***

Pit.  
Lao People's Democratic Republic

***Pyrenaria mindanaensis***

Merr.  
Philippines

***Pyrenaria pahangensis***

H. Keng  
Malaysia

***Pyrenaria poilaneana***

Gagnep.  
Viet Nam

***Pyrenaria viridifolia***

Symington ex H.Keng  
Malaysia

***Pyrenaria wrayi***

King  
Malaysia

***Pyrenaria wuiana***

(Hung T.Chang) S.X. Yang  
China

***Stewartia calcicola***

T.L.Ming & J.Li  
China and Viet Nam (?)

***Stewartia crassifolia***

(S.Z. Yan) J.Li & T.L.Ming  
China

***Stewartia densivillosa***

(Hu ex Hung T. Chang & C.X. Ye) J.Li & T.L.Ming  
China

***Stewartia laotica***

(Gagnep.) J.Li & T.L.Ming  
China, Lao People's Democratic  
Republic and Viet Nam

***Stewartia medogensis***

J. Li & T.L. Ming  
China

***Stewartia micrantha***

(Chun) Sealy  
China

***Stewartia obovata***

(Chun & Hung T. Chang) J.Li & T.L.Ming  
China

***Stewartia rostrata***

Spongberg  
China

***Stewartia sichuanensis***

(S.Z. Yan) J.Li & T.L.Ming  
China

***Stewartia sinii***

(C.Y.Wu) Sealy  
China

***Stewartia tonkinensis***

(Merr.) C.Y.Wu  
Viet Nam

## THEACEAE SPECIES EVALUATED AS LEAST CONCERN

*Camellia anlungensis* Hung T.Chang  
China

*Camellia brevistyla* (Hayata)  
Cohen-Stuart  
China

*Camellia caudata* Wall.  
Bangladesh, Bhutan, China, India,  
Myanmar, Nepal and Viet Nam

*Camellia chekiangoleosa* Hu  
China

*Camellia confusa* (Craib) Cohen-Stuart  
China, India, Lao People's Democratic  
Republic, Myanmar, Thailand and  
Viet Nam

*Camellia cordifolia* (F.P.Metcalf) Nakai  
China

*Camellia costei* H.Lév.  
China

*Camellia crassicolumna* Hung T.Chang  
China

*Camellia curryana* Orel & Luu  
Viet Nam

*Camellia cuspidata* (Kochs) H.J. Veitch  
China

*Camellia edithae* Hance  
China

*Camellia euryoides* Lindl.  
China

*Camellia fluviatilis* Hand.-Mazz.  
China, India and Myanmar

*Camellia forrestii* (Diels) Cohen-Stuart  
China and Viet Nam

*Camellia fraterna* Hance  
China

*Camellia furfuracea* (Merr.)  
Cohen-Stuart  
China, Lao People's Democratic  
Republic and Viet Nam

*Camellia gymnogyna* H.T.Chang  
China

*Camellia japonica* L.  
China, Japan and South Korea

*Camellia kissii* Wall.  
Bhutan, Cambodia, China, India, Lao  
People's Democratic Republic,  
Myanmar, Nepal, Thailand and Viet Nam

*Camellia lanceolata* (Blume) Seem.  
Indonesia and Philippines

*Camellia lawii* Sealy  
China

*Camellia lutchuensis* T.Itô  
China and Japan

*Camellia mairei* (H.Lév.) Melch.  
China

*Camellia oleifera* Abel  
China, Lao People's Democratic  
Republic, Myanmar and Viet Nam

*Camellia pachyandra* Hu  
China

*Camellia pitardii* Cohen-Stuart  
China

*Camellia polyodonta* F.C.How ex Hu  
China

*Camellia rhytidocarpa* Hung T.Chang  
& S.Y.Liang  
China

*Camellia rosthorniana* Hand.-Mazz.  
China

*Camellia salicifolia* Champ. ex Benth.  
China

*Camellia saluenensis* Stapf ex Bean  
China

*Camellia sasanqua* Thunb.  
Japan

*Camellia semiserrata* C.W.Chi  
China

*Camellia synaptica* Sealy  
China

*Camellia tachangensis* F.S.Zhang  
China

*Camellia taliensis* (W.W.Sm.) Melch.  
China, Myanmar and Thailand

*Camellia tsaii* Hu  
China, Myanmar and Viet Nam

*Camellia tsingpienensis* Hu  
China and Viet Nam

*Camellia wardii* Kobuski  
Bhutan (?), China and Myanmar

*Camellia yunnanensis* (Pit. ex Diels)  
Cohen-Stuart  
China

*Gordonia brenesii* (Standl.) Q.Jiménez  
Costa Rica, El Salvador, Guatemala,  
Honduras, Mexico, Nicaragua and  
Panama

*Gordonia lasianthus* (L.) J.Ellis  
United States

\**Gordonia obtusa* Wall. ex Wight  
India



**Laplacea fruticosa** (Schrad.) Kobuski  
Bolivia, Brazil, Colombia, Costa Rica,  
French Guiana, Guyana, Honduras,  
Nicaragua, Panama, Peru, Suriname  
and Venezuela

**Laplacea haematoxylon** G.Don  
Cuba, Dominican Republic, Haiti,  
Jamaica and Puerto Rico

**Polyspora amboinensis** (Miq.) Orel,  
Peter G.Wilson, Curry & Luu  
Indonesia and Papua New Guinea

**Polyspora axillaris** (Roxb. ex Ker  
Gawl.) Sweet  
China and Viet Nam

**Polyspora borneensis** (H.Keng) Orel,  
Peter G.Wilson, Curry & Luu  
Brunei Darussalam, Indonesia and  
Malaysia

**Polyspora chrysandra** (Cowan) Hu ex  
B.M. Barthol. & T.L.Ming  
China and Myanmar

**Polyspora excelsa** (Blume) Orel, Peter  
G.Wilson, Curry & Luu  
Indonesia

**Polyspora havilandii** (Burkill) Orel,  
Peter G.Wilson, Curry & Luu  
Indonesia and Malaysia

**Polyspora imbricata** (King) Orel, Peter  
G.Wilson, Curry & Luu  
Indonesia and Malaysia

**Polyspora longicarpa** (Hung T. Chang)  
C.X.Ye ex B.M. Barthol. & T.L.Ming  
China, Myanmar, Thailand and Viet Nam

**Polyspora luzonica** (S.Vidal) Orel, Peter  
G.Wilson, Curry & Luu  
Papua New Guinea (?) and Philippines

**Polyspora maingayi** (Dyer) Orel, Peter  
G.Wilson, Curry & Luu  
Malaysia

**Polyspora multinervis** (King) Orel,  
Peter G.Wilson, Curry & Luu  
Malaysia and Singapore

**Polyspora papuana** (Kobuski) Orel,  
Peter G.Wilson, Curry & Luu  
Indonesia and Papua New Guinea

**Polyspora speciosa** (Kochs) B.M.  
Barthol. & T.L.Ming  
China and Viet Nam

**Pyrenaria acuminata** Planch. ex  
Choisy  
Indonesia, Malaysia and Singapore

**Pyrenaria diospyricarpa** Kurz  
China, India, Lao People's Democratic  
Republic, Myanmar, Thailand and  
Viet Nam

**Pyrenaria hirta** (Hand.-Mazz.) H. Keng  
China and Viet Nam

**Pyrenaria microcarpa** (Dunn) H. Keng  
China, Japan and Viet Nam

**Pyrenaria serrata** Blume  
Brunei Darussalam, Indonesia and  
Malaysia

**Pyrenaria sophiae** (Hu) S.X.Yang &  
T.L.Ming  
China

**Pyrenaria spectabilis** (Champ. ex  
Benth.) C.Y.Wu & S.X.Yang  
China and Viet Nam

**Pyrenaria tawauensis** H.Keng  
Indonesia and Malaysia

**Pyrenaria villosula** Miq.  
Indonesia and Malaysia

**Schima wallichii** (DC.) Korth.  
Bhutan, China, India, Indonesia, Lao  
People's Democratic Republic,  
Myanmar, Nepal, Papua New Guinea,  
Philippines, Thailand and Viet Nam

**Stewartia cordifolia** (H.L. Li) J.Li &  
T.L.Ming  
China

**Stewartia malacodendron** L.  
United states

**Stewartia monadelphpha** Siebold & Zucc.  
Japan

**Stewartia ovata** (Cav.) Weath.  
United States

**Stewartia pseudocamellia** Maxim.  
Japan, Democratic People's Republic of  
Korea and Republic of Korea



*Stewartia pseudocamellia* (Arboretum Wespelaar)

**Stewartia pteropetiolata** W.C. Cheng  
China

**Stewartia rubiginosa** Hung T. Chang  
China

**Stewartia serrata** Maxim.  
Japan

**Stewartia sinensis** Rehder &  
E.H. Wilson  
China

**Stewartia villosa** Merr.  
China

## APPENDIX 1

Full list of evaluated Theaceae species and the number of *ex situ* collections

Taxon Names	Authors	Red List Category	Red List Criteria	Ex situ Collections	Taxon Names	Authors	Red List Category	Red List Criteria	Ex situ Collections
<i>Apterosperma oblata</i>	Hung T.Chang	CR	B2ab(i,ii,iii,iv,v)	0	<i>Camellia flavida</i>	Hung T.Chang	VU	B1ab(i,iii)	6
<i>Camellia amplexicaulis</i>	(Pit.) Cohen-Stuart	EW		14	<i>Camellia fleuryi</i>	(A.Chev.) Sealy	EN	B1ab(iii)	0
<i>Camellia amplexifolia</i>	Merr. & Chun	EN	A2c; B1ab(i,iii)	1	<i>Camellia fluviatilis</i>	Hand.-Mazz.	LC		14
<i>Camellia anlungensis</i>	Hung T.Chang	LC		4	<i>Camellia formosensis</i>	(Masam. & Suzuki) M.H.Su, C.F.Hsieh & C.H.Tsou	VU	B1ab(iii,v)	1
<i>Camellia assimilooides</i>	Sealy	DD		0	<i>Camellia forrestii</i>	(Diels) Cohen-Stuart	LC		19
<i>Camellia aurea</i>	Hung T.Chang	VU	B1ab(i,ii,iii)	2	<i>Camellia fraterna</i>	Hance	LC		30
<i>Camellia azalea</i>	C.F.Weii	CR	B1ab(i,ii,iii,v)+2ab(i,ii,iii,v)	15	<i>Camellia furturacea</i>	(Merr.) Cohen-Stuart	LC		8
<i>Camellia brevistyla</i>	(Hayata) Cohen-Stuart	LC		38	<i>Camellia gaudichaudii</i>	(Gagnep.) Sealy	VU	B2ab(iii)	3
<i>Camellia bugiamapensis</i>	Orel, Curry, Luu & Q.D.Nguyen	CR	D	0	<i>Camellia gilbertii</i>	(A. Chev.) Sealy	VU	B1ab(iii)	0
<i>Camellia calcicola</i>	T.L.Ming	DD		0	<i>Camellia glabricostata</i>	T.L.Ming	DD		0
<i>Camellia candida</i>	Hung T.Chang	EN	A2c	0	<i>Camellia gracilipes</i>	Merr. ex Sealy	VU	B1ab(iii)	0
<i>Camellia capitata</i>	Orel, Curry & Luu	CR	D	0	<i>Camellia grandibracteata</i>	Hung T.Chang & F.L.Yu	DD		0
<i>Camellia cattienensis</i>	Orel	VU	D2	0	<i>Camellia granthamiana</i>	Sealy	VU	C2a(i)	21
<i>Camellia caudata</i>	Wall.	LC		21	<i>Camellia grijsii</i>	Hance	DD		47
<i>Camellia chekiangoleosa</i>	Hu	LC		34	<i>Camellia gymnogyne</i>	Hung T.Chang	LC		0
<i>Camellia cherryana</i>	Orel	DD		0	<i>Camellia hekouensis</i>	C.J.Wang & G.S.Fan	CR	B1ab(iii)	1
<i>Camellia chrysanthoides</i>	Hung T.Chang	EN	B1ab(iii); D	7	<i>Camellia hengchunensis</i>	Chang	NT		2
<i>Camellia confusa</i>	(Craib) Cohen-Stuart	LC		4	<i>Camellia hongiaensis</i>	Orel & Curry	DD		0
<i>Camellia connata</i>	(Craib) Craib	DD		0	<i>Camellia hongkongensis</i>	Seem.	EN	B1ab(iii)	12
<i>Camellia corallina</i>	(Gagnep.) Sealy	EN	B1ab(iii)	0	<i>Camellia huana</i>	T.L.Ming & W.J.Zhang	EN	D	3
<i>Camellia cordifolia</i>	(F.P.Metcalf) Nakai	LC		13	<i>Camellia ilicifolia</i>	Y.K.Li	CR	B1ab(iii,v)	4
<i>Camellia costata</i>	S.Y.Hu & S.Ye Liang ex Hung T.Chang	NT		2	<i>Camellia impressinervis</i>	Hung T.Chang & S.Y.Liang	CR	B1ab(iii,v); C2a(i); D	14
<i>Camellia costei</i>	H.Lév.	LC		7	<i>Camellia indochinensis</i>	Merr.	NT		14
<i>Camellia crapnelliana</i>	Tutcher	VU	A2c	40	<i>Camellia inusitata</i>	Orel, Curry & Luu	CR	B1ab(iii,v)+2ab(iii,v); C2a(ii)	0
<i>Camellia crassicolumna</i>	Hung T.Chang	LC		3	<i>Camellia japonica</i>	L.	LC		161
<i>Camellia crassiphylla</i>	Ninh & N.Hakoda	CR	B1ab(i,ii)+2ab(i,ii); D	0	<i>Camellia kissii</i>	Wall.	LC		17
<i>Camellia cucphuongensis</i>	Ninh & Rosmann	CR	D	1	<i>Camellia krempfii</i>	(Gagnep.) Sealy	DD		0
<i>Camellia cupiformis</i>	T.L.Ming	CR	B1ab(i,iii)	0	<i>Camellia kwangsiensis</i>	Hung T.Chang	NT	B1ab(iii)	1
<i>Camellia curryana</i>	Orel & Luu	LC		0	<i>Camellia lanceolata</i>	(Blume) Seem.	LC		2
<i>Camellia cuspidata</i>	(Kochs) H.J. Veitch	LC		45	<i>Camellia laotica</i>	(Gagnep.) T.L.Ming	DD		0
<i>Camellia cylindracea</i>	T.L.Ming	DD		0	<i>Camellia lawii</i>	Sealy	LC		0
<i>Camellia dalatensis</i>	V.D.Luong, Ninh & Hakoda	CR	B1ab(iii)	0	<i>Camellia leptophylla</i>	S.Yun Liang ex Hung T.Chang	DD		1
<i>Camellia dilinensis</i>	Ninh & V.D.Luong	EN	B2ab(iii,v)	0	<i>Camellia ligustrina</i>	Orel, Curry & Luu	EN	B1ab(iii)	0
<i>Camellia dongnaiensis</i>	Orel	CR	B1ab(i,ii,iii)+2ab(i,ii,iii)	0	<i>Camellia longicalyx</i>	Hung T.Chang	DD		0
<i>Camellia dormoyana</i>	(Pierre ex Laness.) Sealy	DD		0	<i>Camellia longii</i>	Orel & Luu	EN	B1ab(iii)+2ab(iii)	0
<i>Camellia drupifera</i>	Lour.	DD		15	<i>Camellia longipedicellata</i>	(Hu) Hung T.Chang & D.Fang	EN	B1ab(iii)	3
<i>Camellia duyana</i>	Orel, Curry & Luu	CR	D	0	<i>Camellia longissima</i>	Hung T.Chang & S.Y.Liang	NT		1
<i>Camellia edithae</i>	Hance	LC		13	<i>Camellia longzhouensis</i>	J.Y.Luo	EN	B1ab(iii)	1
<i>Camellia elongata</i>	(Rehder & E.H.Wilson) Rehder	EN	B1ab(iii)	4	<i>Camellia lutchuensis</i>	T.Itô	LC		40
<i>Camellia euphlebia</i>	Merr. ex Sealy	EN	B1ab(i,ii,iii,iv)	17	<i>Camellia luteocerata</i>	Orel	VU	D1	0
<i>Camellia euryoides</i>	Lindl.	LC		20	<i>Camellia luteoflora</i>	Y.K.Li ex Hung T.Chang & F.A.Zeng	CR	B1ab(iii)+2ab(iii)	1
<i>Camellia fangchengensis</i>	S.Ye Liang & Y.C. Zhong	CR	B1ab(iii)	1	<i>Camellia maiana</i>	Orel	CR	B1ab(i,ii,iii)+2ab(i,ii,iii); D	0
<i>Camellia fascicularis</i>	Hung T.Chang	CR	A2c	2	<i>Camellia mairei</i>	(H.Lév.) Melch.	LC		7
<i>Camellia flava</i>	(Pit.) Sealy	CR	C2a(i)	5	<i>Camellia maoniushanensis</i>	J.L.Liu & Q.Luo	DD		0

Taxon Names	Authors	Red List Category	Red List Criteria	Ex situ Collections
<i>Camellia megasepala</i>	Hung T.Chang & Trin Ninh	DD		0
<i>Camellia melliana</i>	Hand.-Mazz.	NT		3
<i>Camellia micrantha</i>	S.Yun Liang & Y.C.Zhong	EN	B1ab(v)	4
<i>Camellia mileensis</i>	T.L.Ming	VU	D2	0
<i>Camellia mollis</i>	Hung T.Chang & S.X.Ren	DD		0
<i>Camellia montana</i>	(Blanco) Hung T.Chang & S.X.Ren	DD		0
<i>Camellia murauchii</i>	Ninh & N.Hakoda	DD		0
<i>Camellia nematodea</i>	(Gagnep.) Sealy	DD		0
<i>Camellia nervosa</i>	(Gagnep.) Hung T.Chang	DD		1
<i>Camellia nitidissima</i>	C.W.Chi	EN	B1ab(iii,v); C2a(i)	35
<i>Camellia oconoriana</i>	Orel, Curry & Luu	CR	D	0
<i>Camellia oleifera</i>	Abel	LC		66
<i>Camellia pachyandra</i>	Hu	LC		0
<i>Camellia parviflora</i>	Merr. & Chun ex Sealy	EN	B1ab(i,iii)	0
<i>Camellia parvimiricata</i>	Hung T.Chang	NT		7
<i>Camellia paucipunctata</i>	(Merr. & Chun) Chun	EN	A2c; B1ab(ii,iii)	0
<i>Camellia petelotii</i>	(Merr.) Sealy	EN	B1ab(ii,v)+2ab(ii,v)	4
<i>Camellia philippinensis</i>	Hung T.Chang & S.X.Ren	DD		0
<i>Camellia pilosperma</i>	S.Yun Liang	NT		1
<i>Camellia pingguensis</i>	D.Fang	EN	B1ab(iii)	12
<i>Camellia piquetiana</i>	(Pierre ex Lanessan.) Sealy	CR	D	1
<i>Camellia pitardii</i>	Cohen-Stuart	LC		29
<i>Camellia pleurocarpa</i>	(Gagnep.) Sealy	DD		0
<i>Camellia polyodonta</i>	F.C.How ex Hu	LC		16
<i>Camellia ptilophylla</i>	Hung T.Chang	VU	B1ab(iii,v)	2
<i>Camellia pubicosta</i>	Merr.	EN	B1ab(iii)	0
<i>Camellia pubifurcata</i>	Y.C.Zhong	EN	B1ab(iii)	1
<i>Camellia pubipetala</i>	Y.Wan & S.Z.Huang	EN	B1ab(iii)	8
<i>Camellia punctata</i>	(Kochs) Cohen-Stuart	VU	B1ab(iii)	0
<i>Camellia pyxidacea</i>	Z.R.Xu, F.P.Chen & C.Y.Deng	EN	B1ab(iii)	6
<i>Camellia renschanxiangiae</i>	C.X.Ye & X.Q.Zheng	VU	D2	1
<i>Camellia reticulata</i>	Lindley	DD		55
<i>Camellia rhytidocarpa</i>	Hung T.Chang & S.Y.Liang	LC		5
<i>Camellia rosmannii</i>	Ninh	CR	B1ab(iii,v)	2
<i>Camellia rosthorniana</i>	Hand.-Mazz.	LC		6
<i>Camellia rubriflora</i>	Ninh & N.Hakoda	CR	D	0
<i>Camellia salicifolia</i>	Champ. ex Benth.	LC		15
<i>Camellia saluenensis</i>	Stapf ex Bean	LC		25
<i>Camellia sasanqua</i>	Thunb.	LC		88
<i>Camellia sealyana</i>	T.L.Ming	DD		0
<i>Camellia semiserrata</i>	C.W.Chi	LC		14
<i>Camellia siangensis</i>	T.K.Paul & M.P.Nayar	DD		0
<i>Camellia sinensis</i>	(L.) Kuntze	DD		158
<i>Camellia stuartiana</i>	Sealy	VU	B1ab(iii)	0
<i>Camellia subintegra</i>	P.C.Huang	NT		3
<i>Camellia synaptica</i>	Sealy	LC		17
<i>Camellia szechuanensis</i>	C.W.Chi	EN	B1ab(iii)	1
<i>Camellia szemaensis</i>	Hung T.Chang	VU	B1ab(iii,v)	1
<i>Camellia tachangensis</i>	F.S.Zhang	LC		2
<i>Camellia taliensis</i>	(W.W.Sm.) Melch.	LC		20
<i>Camellia tenii</i>	Sealy	EN	B1ab(iii)	2

Taxon Names	Authors	Red List Category	Red List Criteria	Ex situ Collections
<i>Camellia thailandica</i>	Hung T.Chang & S.X.Ren	EN	B1ab(iii)	0
<i>Camellia tonkinensis</i>	(Pit.) Cohen-Stuart	EN	B1ab(iii)	0
<i>Camellia transsianensis</i>	(Hayata) Cohen-Stuart	VU	D1	20
<i>Camellia trichoclada</i>	(Rehder) S.S.Chien	VU	B2ab(iii)	7
<i>Camellia tsaii</i>	Hu	LC		27
<i>Camellia tsingpiensis</i>	Hu	LC		2
<i>Camellia tuberculata</i>	S.S.Chien	NT		2
<i>Camellia uraku</i>	Kitam.	DD		3
<i>Camellia vidalii</i>	J.C.Rosmann	DD		0
<i>Camellia villicarpa</i>	S.S.Chien	DD		0
<i>Camellia viridicalyx</i>	Hung T.Chang & S.Y.Liang	DD		1
<i>Camellia wardii</i>	Kobuski	LC		0
<i>Camellia xanthochroma</i>	K.M.Feng & L.S.Xie	EN	A2c; B1ab(iii)	0
<i>Camellia yunnanensis</i>	(Pit. ex Diels) Cohen-Stuart	LC		20
<i>Dankia langbianensis</i>	Gagnep.	DD		0
<i>Franklinia alatamaha</i>	Marshall	EW		99
<i>Gordonia brenesii</i>	(Standl.) Q.Jiménez	LC		0
<i>Gordonia lasianthus</i>	(L.) J.Ellis	LC		26
<i>Gordonia obtusa*</i>	Wall. ex Wight	LC		0
<i>Gordonia ovalis*</i>	(Korth.) Walp.	DD		0
<i>Gordonia penangensis*</i>	Ridley	VU	B1ab(iii)	0
<i>Gordonia singaporeana*</i>	Wall. ex Ridley	VU	A4c	1
<i>Laplacea fruticosa</i>	(Schrad.) Kobuski	LC		0
<i>Laplacea haematoxylon</i>	G.Don	LC		0
<i>Polyspora amboinensis</i>	(Miq.) Orel, Peter G.Wilson, Curry & Luu	LC		1
<i>Polyspora ampla</i>	Orel, Curry & Luu	DD		0
<i>Polyspora axillaris</i>	(Roxb. ex Ker Gawl.) Sweet	LC		11
<i>Polyspora balansae</i>	(Pit.) Hu	DD		0
<i>Polyspora bidoupensis</i>	(Gagnep.) Orel, Peter G.Wilson, Curry & Luu	NT	B1ab(iii)	0
<i>Polyspora borneensis</i>	(H.Keng) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora ceylanica</i>	(Wight) Orel, Peter G.Wilson, Curry & Luu	CR	C1	0
<i>Polyspora chrysandra</i>	(Cowan) Hu ex B.M. Barthol. & T.L. Ming	LC		10
<i>Polyspora concentricatrix</i>	(Burkill) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora dalglieshiana</i>	(Craib) Orel, Peter G.Wilson, Curry & Luu	DD		2
<i>Polyspora dassanayakei</i>	(Wadhwa & Weeras.) Orel, Peter G.Wilson, Curry & Luu	CR	D	0
<i>Polyspora dipterosperma</i>	(Kurz) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora elliptica</i>	(Gardner) Orel, Peter G.Wilson, Curry & Luu	CR	C1	0
<i>Polyspora excelsa</i>	(Blume) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora gardneri</i>	Orel, Peter G.Wilson, Curry & Luu	CR	B1ab(iii,v); C1	0

Taxon Names	Authors	Red List Category	Red List Criteria	Ex situ Collections
<i>Polyspora gigantiflora</i>	(Gagnep.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora gioii</i>	Luu, Tich & H.Tran	CR	B1ab(iii); D	0
<i>Polyspora grandiflora</i>	(Merr.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora hainanensis</i>	(Hung T.Chang) C.X. Ye ex B.M. Barthol. & T.L. Ming	NT		5
<i>Polyspora havilandii</i>	(Burkill) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora hirtella</i>	(Ridl.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora huongiana</i>	Orel, Curry & Luu	VU	B2ab(iii)	0
<i>Polyspora imbricata</i>	(King) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora integerrima</i>	(Miq.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora intricata</i>	(Gagnep.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora lanceifolia</i>	(Burkill) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora longicarpa</i>	(Hung T. Chang) C.X. Ye ex B.M. Barthol. & T.L. Ming	LC		12
<i>Polyspora luzonica</i>	(S.Vidal) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora maingayi</i>	(Dyer) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora marginata</i>	(Korth.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora multinervis</i>	(King) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora nivea</i>	Orel, Curry & Luu	DD		0
<i>Polyspora oblongifolia</i>	(Miq.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora papuana</i>	(Kobuski) Orel, Peter G.Wilson, Curry & Luu	LC		0
<i>Polyspora polisanana</i>	(Burkill) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora sarawakensis</i>	(H.Keng) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Polyspora scortechinii</i>	(King) Orel, Peter G.Wilson, Curry & Luu	CR	B2ab(iii)	0
<i>Polyspora speciosa</i>	(Kochs) B.M. Barthol. & T.L. Ming	LC		10
<i>Polyspora taipingensis</i>	(Burkill) Orel, Peter G.Wilson, Curry & Luu	NT	B1ab(iii)	0
<i>Polyspora tiantangensis</i>	(L.L. Deng & G.S. Fan) S.X. Yang	NT	B1ab(iii)	0
<i>Polyspora vulcanica</i>	(Korth.) Orel, Peter G.Wilson, Curry & Luu	DD		0
<i>Pyrenaria acuminata</i>	Planch. ex Choisy	LC		1
<i>Pyrenaria barringtoniifolia</i>	Seem.	DD		0
<i>Pyrenaria buisanensis</i>	(Sasaki) C.F.Hsieh, Sheng Z. Yang & M.H.Su	CR	D	1

Taxon Names	Authors	Red List Category	Red List Criteria	Ex situ Collections
<i>Pyrenaria cherrapunjeana</i>	Mir	CR	D	0
<i>Pyrenaria diospyricarpa</i>	Kurz	LC		3
<i>Pyrenaria hirta</i>	(Hand.-Mazz.) H. Keng	LC		5
<i>Pyrenaria johorensis</i>	H.Keng	DD		0
<i>Pyrenaria jonquieriana</i>	Pierre ex Laness.	DD		0
<i>Pyrenaria khasiana</i>	R.N. Paul	DD		0
<i>Pyrenaria kwangsiensis</i>	Hung T.Chang	VU	D1	0
<i>Pyrenaria laotica</i>	Gagnep.	DD		0
<i>Pyrenaria maculatoclada</i>	(Y.K. Li) S.X. Yang	VU	D1	0
<i>Pyrenaria menglaensis</i>	G.D. Tao	CR	B1ab(iii)	1
<i>Pyrenaria microcarpa</i>	(Dunn) H. Keng	LC		8
<i>Pyrenaria microphylla</i>	Pit.	DD		0
<i>Pyrenaria mindanaensis</i>	Merr.	DD		0
<i>Pyrenaria oblongicarpa</i>	Hung T.Chang	VU	D1	1
<i>Pyrenaria pahangensis</i>	H. Keng	DD		0
<i>Pyrenaria pingpienensis</i>	(Hung T.Chang) S.X. Yang & T.L. Ming	NT	D1	1
<i>Pyrenaria poilaneana</i>	Gagnep.	DD		0
<i>Pyrenaria serrata</i>	Blume	LC		1
<i>Pyrenaria sophiae</i>	(Hu) S.X. Yang & T.L. Ming	LC		0
<i>Pyrenaria spectabilis</i>	(Champ. ex Benth.) C.Y. Wu & S.X. Yang	LC		14
<i>Pyrenaria tawauensis</i>	H.Keng	LC		0
<i>Pyrenaria villosula</i>	Miq.	LC		0
<i>Pyrenaria viridifolia</i>	Symington ex H.Keng	DD		0
<i>Pyrenaria wrayi</i>	King	DD		0
<i>Pyrenaria wuiana</i>	(Hung T.Chang) S.X. Yang	DD		0
<i>Schima wallichii</i>	(DC.) Korth.	LC		27
<i>Stewartia calcicola</i>	T.L. Ming & J. Li	DD		1
<i>Stewartia cordifolia</i>	(H.L. Li) J. Li & T.L. Ming	LC		0
<i>Stewartia crassifolia</i>	(S.Z. Yan) J. Li & T.L. Ming	DD		1
<i>Stewartia densivillosa</i>	(Hu ex Hung T. Chang & C.X. Ye) J. Li & T.L. Ming	DD		0
<i>Stewartia laotica</i>	(Gagnep.) J. Li & T.L. Ming	DD		0
<i>Stewartia malacodendron</i>	L.	LC		44
<i>Stewartia medogensis</i>	J. Li & T.L. Ming	DD		0
<i>Stewartia micrantha</i>	(Chun) Sealy	DD		0
<i>Stewartia monadelpha</i>	Siebold & Zucc.	LC		75
<i>Stewartia obovata</i>	(Chun & Hung T.Chang) J. Li & T.L. Ming	DD		0
<i>Stewartia ovata</i>	(Cav.) Weath.	LC		33
<i>Stewartia pseudocamellia</i>	Maxim.	LC		170
<i>Stewartia pteropetiolata</i>	W.C. Cheng	LC		20
<i>Stewartia rostrata</i>	Spongberg	DD		54
<i>Stewartia rubiginosa</i>	Hung T.Chang	LC		1
<i>Stewartia serrata</i>	Maxim.	LC		51
<i>Stewartia sichuanensis</i>	(S.Z. Yan) J. Li & T.L. Ming	DD		0
<i>Stewartia sinensis</i>	Rehder & E.H. Wilson	LC		80
<i>Stewartia sinii</i>	(Y.C. Wu) Sealy	DD		0
<i>Stewartia tonkinensis</i>	(Merr.) C.Y. Wu	DD		0
<i>Stewartia villosa</i>	Merr.	LC		1

## APPENDIX 2

### Participating institutions

Amani Botanical Garden; Annapolis Royal Historic Gardens; Antony; Arboretum at Kutztown University; Arboretum at the University of California, Santa Cruz; Arboretum Freiburg-Günterstal; Arboretum Groenendaal - Flemish Forest Department - Houtvesterij Groenendaal; Arboretum Mustila; Arboretum National des Barres (et Fruticetum Vilmorinianum); Arboretum of Jiangxi Institute of Forestry Science; Arboretum of The Barnes Foundation; Arboretum of Wuhan University; Arboretum Waasland; Arboretum Wespelaar; Arnold Arboretum of Harvard University, The; Aswan Botanic Garden; Atlanta Botanical Garden; Auckland Botanic Gardens; Baker Arboretum; Bangladesh Agricultural University Botanic Garden; Bartlett Tree Research Laboratories Arboretum; Batumi Botanical Garden; Bayard Cutting Arboretum; Bedgebury National Pinetum & Forest; Beijing Medicinal Garden; Belmonte Arboretum; Bendigo Botanic Gardens, White Hills; Benmore Botanic Garden; Berkshire Botanical Garden; Birmingham Botanical Gardens and Glasshouses; Bishop Museum - Checklist of Cultivated Plants of Hawai'i; Blue Mountains Botanic Garden, Mount Tomah; Bogor Botanic Gardens (Centre for Plant Conservation); Bokrijk Arboretum; Boone County Arboretum; Botanic Garden Meise; Botanic Garden of Rostock University; Botanic Garden of Smith College, The; Botanic Garden, Delft University of Technology; Botanic Gardens of South Australia; Botanical Garden - Institute of the Volga State Technological University; Botanical Garden of Moscow Palace of Pioneers; Botanical Garden of Tartu University; Botanical Garden of Vilnius University; Botanical Garden University of Duesseldorf; Botanical Garden, Natural History Museum of Denmark; Botanical Garden-Institute, Ufa Research Center; Botanische Gärten der Universität Bonn; Botanischer Garten der Carl von Ossietzky-Universität Oldenburg; Botanischer Garten der Friedrich-Schiller-Universität; Botanischer Garten der J.W. Goethe-Universität; Botanischer Garten der Johannes Gutenberg-Universität Mainz; Botanischer Garten der Justus-Liebig Universität Giessen; Botanischer Garten der Ruhr-Universität Bochum; Botanischer Garten der Technischen Universität Darmstadt; Botanischer Garten der Technischen Universität Dresden; Botanischer Garten der Universität des Saarlandes; Botanischer Garten der Universität Freiburg; Botanischer Garten der Universität Kiel; Botanischer Garten der Universität Osnabrück; Botanischer Garten der Universität Ulm; Brisbane Botanic Gardens; Brookgreen Gardens; Brooklyn Botanic Garden; Brookside Gardens; Buckland Abbey; C. M. Goethe Arboretum; Cambridge University Botanic Garden; Cape Fear Botanical Garden; Catalogue of Medicinal Plants of Ukrainian Botanic Gardens and Parks; Cecilia Koo Botanic Conservation Center; Centro di Ateneo Orto Botanico dell'Università degli Studi di Padova; Chanticleer Foundation; Charles R. Keith Arboretum, The; Chelsea Physic Garden; Chicago Botanic Garden; Chongqing Nanshan Botanic Garden; Cleveland Botanical Garden; Coastal Maine Botanical Gardens; Columbus Botanical Garden; Connecticut College Arboretum; Conservatoire Botanique National du Brest; Conservatoire Botanique Pierre Fabre; Conservatoire et Jardin botaniques de la Ville de Genève; Conservatoire et Jardins Botaniques de Nancy; Cornell Botanic

Gardens; Cotehele; Crosby Arboretum, The; Dashushan Botanical Garden; Dawes Arboretum, The; Dendrological garden of the Silva Tarouca Research Institute for Landscape and Ornamental Gardening; Denver Botanic Gardens; Devonian Botanic Garden; Dixon Gallery and Gardens, The; Donald E. Davis Arboretum; Dow Gardens; Dr. Sun Yat-Sen Classical Chinese Garden; Duke Farms; Dyffryn Gardens; Eden Project, The; EEB Plant Growth Facilities; Elisabeth C. Miller Botanical Garden; Espace Pierres Folles; Fellows Riverside Gardens; Fernwood Botanical Garden and Nature Preserve; Foellinger-Freimann Botanical Conservatory; Forstbotanischer Garten der Technischen Universität Dresden; Forstbotanischer Garten und Arboretum; Fort Worth Botanic Garden; Frederik Meijer Gardens & Sculpture Park; Frelinghuysen Arboretum; Gainesway Farm; Gannan Arboretum of Jiangxi; Garvan Woodland Gardens; Ghent University Botanic Garden; Glasgow Botanic Gardens; Glendurgan Garden; Gore Public Gardens; Grapevine Botanical Gardens at Heritage Park; Green Bay Botanical Garden; Green Spring Gardens; Greenway; Greenwood Gardens; Grugapark und Botanischer Garten der Stadt Essen; Guangxi Botanical Garden of Medicinal Plants; Guangxi Institute of Botany; Guilin Botanical Garden; Guizhou Botanical Garden; Hangzhou Botanic Garden; Hangzhou Botanical Garden; Helsinki University Botanic Garden; Henry Schmieder Arboretum; Hershey Gardens; Hidden Lake Gardens; High Beeches Gardens Conservation Trust; Holden Arboretum, The; Honolulu Botanical Gardens System; Hortus Botanicus Amsterdam; Hoyt Arboretum; Hunan Forest Botanical Garden; Hunan Nanyue Arboretum; Huntsville Botanical Garden; Incheon Arboretum; Jade Garden Natural Arboretum; Jangheung Natural Arboretum; Jardí Botànic de la Universitat de València; Jardí Botanic de Soller; Jardim Botânico da Madeira; Jardim Botânico da Universidade de Coimbra; Jardim Botânico da Universidade de Lisboa; Jardim Botânico da Universidade de Trás-os-Montes e Alto Douro; Jardim Botânico da Universidade do Porto; Jardim Botânico Tropical; Jardín Botánico Atlántico de Gijón; Jardín Botánico Carlos Thays; Jardin Botanique de la Facultad de Estudios Superiores; Jardín Botánico Francisco Javier Clavijero; Jardin Botanique Las Orquideas; Jardín Botánico Lucien Hauman; Jardin Botanique Camifolia; Jardin Botanique de Kisantu; Jardin Botanique de la Ville de Caen; Jardin Botanique de la Ville de Lyon; Jardin Botanique de l'Université de Strasbourg; Jardin Botanique de Marnay sur Seine; Jardin botanique de Paris; Jardin Botanique et Arboretum Henri Gaussen; Jardin Botanique Exotique Val Rahmeh; Jardin Botanique Yves Rocher; Jardin des Plantes; Jardin des Plantes de Paris et Arboretum de Chevreloup; Jardins des Plantes de l'Université; Jawaharlal Nehru Tropical Botanic Garden and Research Institute; JC Raulston Arboretum; Jeju Botanical Garden, Yeomiji; Jerusalem Botanical Gardens; Kadoorie Farm and Botanic Garden; Kalmthout Arboretum; Kee-chung-san Botanic Garden; Keum Kang Arboretum; Killerton; Kings Park and Botanic Garden; Knightshayes; Korea Botanic Garden; Kunming Botanical Garden; Kurpark Bad Bellingen; KwaZulu-Natal National Botanical Garden; Landis Arboretum; Lanhydrock; Lauritzen Gardens; Les Jardins Suspendus; Leuven Botanic Garden; Lewis Ginter Botanical Garden; Limbe Botanic

Garden; Lincoln Park Conservatory; Ljubljana University Botanic Garden; Logan Botanic Garden; Longwood Gardens; Los Angeles County Arboretum and Botanic Garden; Lushan Botanical Garden; Mackay Regional Botanic Gardens; Main Botanical Garden, Russian Academy of Sciences; Marie Selby Botanical Gardens; Maymont Foundation; Meadowlark Botanical Gardens; Memorial University Botanical Garden; Memphis Botanic Garden; Mendocino Coast Botanical Gardens; Millennium Seed Bank; Milner Gardens and Woodland; Mobile Botanical Garden; Mobile Botanical Gardens; Montreal Botanical Garden / Jardin botanique de Montréal; Moore Farms Botanical Garden; Morris Arboretum, The; Morton Arboretum, The; Moscow State University Botanical Garden; Mount Auburn Cemetery; Mount Usher Gardens; Mountain Top Arboretum; Multiplant International Medicinal Conservation; Multiplant International Medicinal Conservation-Seed Bank; Museo Orto Botanico di Roma; Nanjing Botanical Garden Mem. Sun Yat-sen; Nanjing Botanical Garden Memorial Sun Yat-Sen; Naples Botanical Garden; National Arboretum Canberra; National Botanic Garden of Latvia; National Botanic Gardens, Glasnevin; National Kandawgyi Botanical Gardens (Maymyo Botanical Garden); National Plant Germplasm System - USDA-ARS-NGRL; National Rhododendron Garden; Neuer Botanischer Garten der Universität Göttingen; New England Wild Flower Society - Garden in the Woods; Niagara Parks Botanical Gardens and School of Horticulture, The; Noosa Botanic Gardens; Norfolk Botanical Garden; North Carolina Arboretum, The; Novosibirsk Dendropark; Nymans; Oak Park Conservatory; Oekologisch-Botanischer Garten Universitaet Bayreuth; Orto Botanico Carmela Cortini - Università di Camerino; Orto Botanico dell'Università degli studi di Siena; Orto Botanico di Bergamo Lorenzo Rota; Oxford University Botanic Garden; Paignton Zoo Environmental Park; Palmengarten der Stadt Frankfurt am Main; Parco Botanico del Cantone Ticino.; Parque Botânico da Tapada da Ajuda; Pine Lodge Pinetum; Polly Hill Arboretum, The; Pukeiti Garden; Pukekura Park; Purdue Arboretum, The; Pyunggang Botanical Garden; Qingdao Botanical Garden (Shangdong); Quarryhill Botanical Garden; Queens Botanical Garden; Real Jardín Botánico Juan Carlos I; Real Jardín Botánico, CSIC; Red Butte Garden and Arboretum; Research Institute of Subtropical Forestry (Zhejiang); Rimba Ilmu Botanic Garden; Rio Grande Botanic Garden; Rogów Arboretum of Warsaw University of Life Sciences; Rowallane Garden; Royal Botanic Garden Edinburgh; Royal Botanic Gardens Kew (Wakehurst); Royal Botanic Gardens Sydney; Royal Botanic Gardens, Kew; Royal Botanic Gardens, Victoria - Melbourne Gardens; Royal Botanical Gardens, Ontario; Royal Burgers' Zoo; Royal Horticultural Society's Garden, Harlow Carr; Royal Horticultural Society's Garden, Hyde Hall; Royal Horticultural Society's Garden, Rosemoor; Royal Horticultural Society's Garden, Wisley; Royal Roads University Botanical Gardens; Royal Tasmanian Botanical Gardens; Royal Veterinary and Agricultural University Arboretum; Sakhalin Botanical Garden; Saltram; San Diego Botanic Garden; San Diego Zoo Botanical Gardens; San Francisco Botanical Garden; Sanghyo Botanical Garden; Sarah P. Duke Gardens; School Botanic Garden 'Ostrog'; Scott

Arboretum of Swarthmore College, The; Seeds of Success (SOS); Shanghai Botanical Garden; Shanghai Chenshan Botanical Garden; Sheffield Botanical Gardens; Shenzhen Fairy Lake Botanical Garden; Shing Mun Arboretum (Hong Kong); Shing Mun Arboretum, AFCD; Singapore Botanic Gardens; Sister Mary Grace Burns Arboretum; Smith-Gilbert Gardens; Smithsonian National Zoological Park; South China Botanical Garden, CAS; Spring Grove Cemetery and Arboretum; St. Andrews Botanic Garden; St. Kilda Botanic Garden; State Arboretum of Virginia (Orland E. White Arboretum); State Botanical Garden of Georgia, The; Stellenbosch University Botanical Garden; Stichting Botanische Tuin Kerkrade; Swansea Botanical Complex; Taltree Arboretum & Gardens; Tasmanian Arboretum Inc; Tatton Garden Society/Quinta Arboretum; The Aritaki Arboretum; The Cairns Botanic Gardens; The Linnaean Gardens of Uppsala (Uppsala University); The Mercerr Society - Mercer Botanic Gardens; The Sir Harold Hillier Gardens; The Tree Register of the British Isles; Timaru Botanic Garden; Toledo Botanical Garden; Toronto Botanical Garden; Trees Atlanta; Tregothnan Estate; Treliwick Garden; Trinity College Botanic Garden; Trompenburg Gardens & Arboretum; Tyler Arboretum; United States National Arboretum; University of British Columbia Botanical Garden; University of California Botanical Garden at Berkeley; University of Delaware Botanic Gardens; University of Dundee Botanic Garden; University of Idaho Arboretum & Botanical Garden; University of Oslo Botanical Garden; University of Washington Botanic Gardens; Utrecht University Botanic Gardens; Vanderbilt University Arboretum; VanDusen Botanical Garden; W. J. Beal Botanical Garden; Wentworth Castle Gardens; Westonbirt, The National Arboretum; Willowood Arboretum; Wuhan Botanic Garden; Wuhan Botanical Garden; Xiamen Botanical Garden; Xi'an BG; Xiashi Arboretum; Xishuangbanna Tropical Botanical Garden, CAS; Yew Dell Botanical Gardens;



*Schima wallichii* (Arboretum Wespelaar)

## APPENDIX 3

### IUCN Red List Categories and Criteria

#### EXTINCT (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time-frame appropriate to the taxon's life cycle and life form.

#### EXTINCT IN THE WILD (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time-frame appropriate to the taxon's life cycle and life form.

#### CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

#### ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

#### VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

#### NEAR THREATENED (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

#### LEAST CONCERN (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

#### DATA DEFICIENT (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

#### NOT EVALUATED (NE)

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

### THE CRITERIA FOR CRITICALLY ENDANGERED, ENDANGERED AND VULNERABLE

#### CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

- A. Reduction in population size based on any of the following:
  1. An observed, estimated, inferred or suspected population size reduction of  $\geq 90\%$  over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
    - (a) direct observation
    - (b) an index of abundance appropriate to the taxon
    - (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
    - (d) actual or potential levels of exploitation
    - (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
  2. An observed, estimated, inferred or suspected population size reduction of  $\geq 80\%$  over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may

not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of  $\geq 80\%$ , projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
4. An observed, estimated, inferred, projected or suspected population size reduction of  $\geq 80\%$  over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 100 km<sup>2</sup>, and estimates indicating at least two of a-c:
  - a. Severely fragmented or known to exist at only a single location.
  - b. Continuing decline, observed, inferred or projected, in any of the following:
    - (i) extent of occurrence
    - (ii) area of occupancy
    - (iii) area, extent and/or quality of habitat
    - (iv) number of locations or subpopulations
    - (v) number of mature individuals.
  - c. Extreme fluctuations in any of the following:
    - (i) extent of occurrence
    - (ii) area of occupancy
    - (iii) number of locations or subpopulations
    - (iv) number of mature individuals.
2. Area of occupancy estimated to be less than 10 km<sup>2</sup>, and estimates indicating at least two of a-c:
  - a. Severely fragmented or known to exist at only a single location.
  - b. Continuing decline, observed, inferred or projected, in any of the following:
    - (i) extent of occurrence
    - (ii) area of occupancy
    - (iii) area, extent and/or quality of habitat
    - (iv) number of locations or subpopulations
    - (v) number of mature individuals.

- c. Extreme fluctuations in any of the following:
  - (i) extent of occurrence
  - (ii) area of occupancy
  - (iii) number of locations or subpopulations
  - (iv) number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
  - (a) Population structure in the form of one of the following:
    - (i) no subpopulation estimated to contain more than 50 mature individuals, OR
    - (ii) at least 90% of mature individuals in one subpopulation.
  - (b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

#### **ENDANGERED (EN)**

A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild:

- A. Reduction in population size based on any of the following:
  1. An observed, estimated, inferred or suspected population size reduction of  $\geq 70\%$  over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
    - (a) direct observation
    - (b) an index of abundance appropriate to the taxon
    - (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
    - (d) actual or potential levels of exploitation
    - (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.



2. An observed, estimated, inferred or suspected population size reduction of  $\geq 50\%$  over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
    - (ii) area of occupancy
    - (iii) area, extent and/or quality of habitat
    - (iv) number of locations or subpopulations
    - (v) number of mature individuals.
  3. A population size reduction of  $\geq 50\%$ , projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
    - (i) extent of occurrence
    - (ii) area of occupancy
    - (iii) number of locations or subpopulations
    - (iv) number of mature individuals.
  4. An observed, estimated, inferred, projected or suspected population size reduction of  $\geq 50\%$  over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
- B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:
1. Extent of occurrence estimated to be less than 5000 km<sup>2</sup>, and estimates indicating at least two of a-c:
    - a. Severely fragmented or known to exist at no more than five locations.
    - b. Continuing decline, observed, inferred or projected, in any of the following:
      - (i) extent of occurrence
      - (ii) area of occupancy
      - (iii) area, extent and/or quality of habitat
      - (iv) number of locations or subpopulations
      - (v) number of mature individuals.
    - c. Extreme fluctuations in any of the following:
      - (i) extent of occurrence
      - (ii) area of occupancy
      - (iii) number of locations or subpopulations
      - (iv) number of mature individuals.
  2. Area of occupancy estimated to be less than 500 km<sup>2</sup>, and estimates indicating at least two of a-c:
    - a. Severely fragmented or known to exist at no more than five locations.
    - b. Continuing decline, observed, inferred or projected, in any of the following:
      - (i) extent of occurrence
      - (ii) area of occupancy
      - (iii) number of locations or subpopulations
      - (iv) number of mature individuals.
- C. Population size estimated to number fewer than 2500 mature individuals and either:
1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR
  2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
    - (a) Population structure in the form of one of the following:
      - (i) no subpopulation estimated to contain more than 250 mature individuals, OR
      - (ii) at least 95% of mature individuals in one subpopulation.
    - (b) Extreme fluctuations in number of mature individuals.
- D. Population size estimated to number fewer than 250 mature individuals.
- E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).
- VULNERABLE (VU)**
- A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:
- A. Reduction in population size based on any of the following:
1. An observed, estimated, inferred or suspected population size reduction of  $\geq 50\%$  over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
    - (a) direct observation
    - (b) an index of abundance appropriate to the taxon
    - (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

- (d) actual or potential levels of exploitation
  - (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
2. An observed, estimated, inferred or suspected population size reduction of  $\geq 30\%$  over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
  3. A population size reduction of  $\geq 30\%$ , projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
  4. An observed, estimated, inferred, projected or suspected population size reduction of  $\geq 30\%$  over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
- B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:
1. Extent of occurrence estimated to be less than 20,000 km<sup>2</sup>, and estimates indicating at least two of a-c:
    - a. Severely fragmented or known to exist at no more than 10 locations.
    - b. Continuing decline, observed, inferred or projected, in any of the following:
      - (i) extent of occurrence
      - (ii) area of occupancy
      - (iii) area, extent and/or quality of habitat
      - (iv) number of locations or subpopulations
      - (v) number of mature individuals.
    - c. Extreme fluctuations in any of the following:
      - (i) extent of occurrence
      - (ii) area of occupancy
      - (iii) number of locations or subpopulations
      - (iv) number of mature individuals.
  2. Area of occupancy estimated to be less than 2000 km<sup>2</sup>, and estimates indicating at least two of a-c:
    - a. Severely fragmented or known to exist at no more than 10 locations.
- b. Continuing decline, observed, inferred or projected, in any of the following:
  - (i) extent of occurrence
  - (ii) area of occupancy
  - (iii) area, extent and/or quality of habitat
  - (iv) number of locations or subpopulations
  - (v) number of mature individuals.
- c. Extreme fluctuations in any of the following:
  - (i) extent of occurrence
  - (ii) area of occupancy
  - (iii) number of locations or subpopulations
  - (iv) number of mature individuals.
- C. Population size estimated to number fewer than 10,000 mature individuals and either:
1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future) OR
  2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):
    - (a) Population structure in the form of one of the following:
      - (i) no subpopulation estimated to contain more than 1000 mature individuals, OR
      - (ii) all mature individuals are in one subpopulation.
    - (b) Extreme fluctuations in number of mature individuals.
- D. Population very small or restricted in the form of either of the following:
1. Population size estimated to number fewer than 1000 mature individuals.
  2. Population with a very restricted area of occupancy (typically less than 20 km<sup>2</sup>) or number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.
- E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

Source: IUCN (2001)



# The Red List of Theaceae

For further information please contact:

**BGCI**

Descanso House  
199 Kew Road, Richmond  
Surrey, TW9 3BW  
United Kingdom  
Tel: +44 (0)20 8332 5953  
Fax: +44 (0)20 8332 5956  
E-mail: [info@bgci.org](mailto:info@bgci.org)  
Web: [www.bgci.org](http://www.bgci.org)

**Fauna & Flora International**

The David Attenborough Building,  
Pembroke Street, Cambridge,  
CB2 3QZ United Kingdom  
Tel: + 44 (0) 1223 571000  
Fax: + 44 (0) 1223 461481  
E-mail: [info@fauna-flora.org](mailto:info@fauna-flora.org)  
Web: [www.fauna-flora.org](http://www.fauna-flora.org)

[www.globaltrees.org](http://www.globaltrees.org)