

## PERSPECTIVE ARTICLE

# Consensus classifications are crucial for conservation: How CITES utilizes checklists

Ronell R. Klopper<sup>1,2</sup> 

1 National Herbarium, Foundational Biodiversity Sciences Division, South African National Biodiversity Institute, Private Bag X101, Pretoria 0001, South Africa

2 H.G.W.J. Schweickerdt Herbarium, Department of Plant & Soil Sciences, University of Pretoria, Pretoria 0001, South Africa

Address for correspondence: Ronell R. Klopper, [r.klopper@sanbi.org.za](mailto:r.klopper@sanbi.org.za)

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**Abstract** The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an end-user of the consensus classifications and checklists produced by global initiatives such as the World Flora Online (WFO). This paper provides a brief background on CITES and the impact of classification and nomenclature changes on the CITES processes and enforcement of CITES regulations, with a focus on plants. The importance of global consensus classifications for CITES-listed plants is highlighted and the ways in which CITES utilizes checklists are illustrated. The WFO and especially the Taxonomic Expert Networks can, and already do, make huge contributions towards the production of checklists for CITES.

**Keywords** checklist; CITES; conservation; impact; taxonomy

## INTRODUCTION

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) aims to ensure that international trade in wild animals and plants does not threaten their survival (<https://cites.org/>). To manage and regulate trade in endangered species, these taxa are listed in one of three CITES Appendices (CITES, 2024). Trade in listed taxa (either whole organisms – living or dead, parts of these organisms, or products derived from them) are subject to permits or certificates of origin, as well as legal acquisition findings and non-detrimental findings, and may be subject to quotas, with the restrictions and provisions being most strict for Appendix I-listed taxa.

To be listed on one of the CITES Appendices a taxon must meet certain biological and trade criteria as set out in CITES Resolution Conf. 9.24 on *Criteria for amendment of Appendices I and II* (<https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-09-24-R17.pdf>), and Resolution Conf. 9.25 on *Implementation of the Convention for species in Appendix III* (<https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-09-25-R18.pdf>). Species that are threatened with extinction can be listed in Appendix I. International trade in these species is prohibited, but can be allowed in exceptional cases (e.g., for scientific research) and then only under very strict regulations (see Article VII of the Convention: “Exemptions and other special provisions relating to trade”; <https://cites.org/eng/disc/text.php>)

(see also Article II of the Convention: “Fundamental principles”; and Article III of the Convention: “Regulation of trade in specimens of species included in Appendix I”; <https://cites.org/eng/disc/text.php>). Just more than 1100 taxa are listed in Appendix I, which is around 3% of all listed taxa (numbers as of 23 February 2023; <https://cites.org/eng/disc/species.php>). Species that are not yet threatened with extinction, but that may well become extinct if trade is not controlled, are candidates for listing in Appendix II. Look-alike species are species where traded material look very similar to those of species that meet the criteria for Appendix II-listing. These look-alike species are also included in Appendix II and trade in them restricted to ensure that trade in the target species can be effectively controlled by preventing material being traded under the name of a look-alike species (see Article II of the Convention: “Fundamental principles”; and Article IV of the Convention: “Regulation of trade in specimens of species included in Appendix II”; <https://cites.org/eng/disc/text.php>). The vast majority of CITES-listed taxa are included in Appendix II (just under 39,500 or 96% of listed taxa; <https://cites.org/eng/disc/species.php>). Species can only be added or removed from Appendix I or II after a formal proposal to do so was accepted at a meeting of the CITES Conference of the Parties (CoP). Species are added to Appendix III upon request of a Party that already controls trade in this species within its jurisdiction, but where the Party requires the cooperation of other Parties to the Convention to control international trade to prevent illegal or unsustainable exploitation

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(see Article II of the Convention: “Fundamental principles”; and Article V of the Convention: “Regulation of trade in specimens of species included in Appendix III”; <https://cites.org/eng/disc/text.php>). Only about 1% (just over 500 taxa) of CITES-listed taxa are included in Appendix III (<https://cites.org/eng/disc/species.php>).

Taxa can be listed in the CITES Appendices at various levels (see the “Interpretation” section of the Appendices for more details; <https://cites.org/eng/app/appendices.php>). Some taxa are individually listed at species or infraspecific level, while only certain geographically separate populations are listed for other taxa (e.g., the population of a taxon in a single or a few countries, but not the populations in other countries). However, many groups of species are included in the Appendices via higher-taxon listings, often because of the look-alike species criteria mentioned above. In such cases an entire genus or family will be listed (or in the case of animals, up to the level of order), for instance the entry for “*Rhodiola* spp.” (Crassulaceae) in Appendix II includes all species in the genus *Rhodiola* L. Some higher-taxon listings will have a split-listing, i.e., there will be species from the genus or family listed in more than one Appendix, for instance the entry for “Cycadaceae spp.” in Appendix II will include all cycads in this family, except for *Cycas beddomei* Dyer, which is individually listed in Appendix I. A higher-taxon listing may also be accompanied by an exemption statement or note that excludes certain taxa or populations from the listing, e.g., the entry for “*Diospyros* spp.” (Ebenaceae) in Appendix II only covers populations of this genus in Madagascar, therefore populations of *Diospyros* L. in other countries are not subject to CITES regulations.

A CITES listing always covers the entire organism (living or dead). However, for some taxa specific populations, artificially propagated specimens, or certain parts or derivatives may be exempted from CITES regulations. These are indicated in the Appendices by either footnotes or # annotations next to the taxon name (<https://cites.org/eng/app/appendices.php>). An illustrated manual of plant # annotations in the CITES Appendices are available to guide how these annotations should be interpreted (Schippmann, 2020).

As classifications change, families or genera can be divided into smaller, narrowly defined taxonomic units (split) or combined into larger, more broadly circumscribed taxon units (merged/synonymised). These changes in classification have dire implications for all CITES management and scientific authorities and law enforcement officials who need to implement CITES regulations, since it directly impacts on the names used on documents for traded plants and animals, which in turn could lead to erroneous inclusion or exclusion of the species in regulations and control of traded material. The situation is further complicated when different resources provide different classifications for the same group of organisms. To alleviate this potential problem, CITES designates, what they call, standard nomenclature references to use for most of the listed taxa, especially those with higher-taxon listings, i.e., those listed at genus, family, or even higher level. The purpose of a CITES standard nomenclature reference is

to clearly indicate which species are included in a higher-taxon listing. Such standard nomenclature references are adopted at meetings of the CITES CoP, which occur roughly every three years.

CITES standard nomenclature references contain, at a minimum, lists of names that are currently accepted in the relevant listed higher taxon and their synonyms. Each higher-taxon listing (i.e., genus or family) will normally have a single standard nomenclature reference for all the included species. However, a supplement to this reference is sometimes required where several new species were recently described and where updating the entire reference is not possible or will be too time-consuming. Sometimes not all the taxa contained in the standard nomenclature reference will necessarily be CITES-listed species, especially in cases where certain species or populations are exempt from CITES regulations. These standard nomenclature references form the basis for updates to the taxonomic backbone of the CITES Checklist of Species and the Species+ databases, which are regularly consulted by those who need to regulate international plant and animal trade.

The main aim of this paper is to provide a brief background on CITES and to illustrate the importance of global consensus classifications for implementation of the Convention and the regulation of trade in endangered species, with a particular focus on plants. A further aim is to illustrate the contribution that World Flora Online (WFO) Taxonomic Expert Networks (TENs) and others can make towards supporting plant conservation by assisting CITES through the checklists that they create and maintain for the taxonomic groups they research. It also highlights possible improvements that can be made in the way that checklists and related information is structured to further facilitate CITES implementation.

## ■ CITES-RELATED DATABASES

Two important resources for the dissemination of information on CITES-listed species are the CITES Checklist of Species and the Species+ databases. These are the two official resources for CITES stakeholders implementing the Convention and are maintained by the United Nations Environment Programme-World Conservation Monitoring Centre (UNEP-WCMC) and the CITES Secretariat. These databases contain information on the taxonomy and nomenclature of CITES-listed species (alphabetical lists of species and their synonyms, common names, and trade names), their distribution, and level of protection (i.e., in which CITES Appendix the species is listed, etc.), as well as other documentation related to the listing of species in the CITES Appendices and trade in these species. It is important to note that these databases do not report on trade information as that is disseminated via the CITES Trade Database (<https://trade.cites.org/>). Species lists and other information or documents can be downloaded from both databases.

The scientific names (accepted names and synonyms), common names, and distribution information in the CITES Checklist of Species and the Species+ databases come directly

from the CITES standard nomenclature reference for the taxon or the original listing proposal, if no standard reference has been designated. Where no common names or distribution information are included in the standard nomenclature reference or listing proposal, these are sourced by UNEP-WCMC for inclusion in the databases. The nomenclature and taxonomy of these databases are updated following each CITES CoP meeting based on newly listed species or newly adopted standard nomenclature references. Between CoP meetings, synonyms not yet in the databases are added when these appear in trade records, are found during species assessments (e.g., through the Review of Significant Trade process), or upon request from experts or CITES Authorities (for more information on how the taxonomic backbone of these databases are maintained and updated, see Section 3 of CITES PC24 Inf. 15; <https://cites.org/sites/default/files/eng/com/PC/24/Inf/E-PC24-Inf-15.pdf>).

These two databases are linked and based on the same taxonomic backbone, and there should be no discrepancies between them, but each offers a unique view of the source data.

**CITES Checklist of Species.** — The CITES Checklist of Species (<https://checklist.cites.org/>) is the official list of CITES-listed species and allows the exploration of information on these species and their degree of protection. Basic information provided includes: the scientific name and associated synonyms; common names and trade names in English, French, and Spanish (where available)—although for some species common names in other languages are also provided; the CITES Appendix in which the taxon is currently listed; and country-level distribution—because CITES regulations are implemented at country level (Fig. 1A–D). The CITES Checklist of Species also provides information on the historical Appendix listings of the species, including exemptions, annotations, and the level of listing, as well as links to identification materials (Fig. 1E–G).

**Species+.** — Species+ (<https://speciesplus.net/>) is designed to assist Parties with implementing species-focussed multilateral environmental agreements, like CITES and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). It provides a centralised portal for accessing key information on species of global concern and contains information on all species that are listed in the Appendices of CITES and CMS, as well as other CMS Family listings and species included in the Annexes to the European Union (EU) Wildlife Trade Regulations.

Species+ offers users the option to select which multilateral agreement information is needed for: either CITES or CMS (Fig. 2A). Available data for a species is organised on different tabs that each provide a specific type of information. In the CITES view: the “Legal” tab contains the CITES Appendix number in which the species is listed, the date of listing (and the history of listings when clicking on the “show history” button), and information on current and historical quotas and suspensions, as well as EU Annexes and EU decisions relating to the species; the “Names” tab contains the synonyms

and common names of the listed species (Fig. 2B), as well as nomenclature notes, where applicable, explaining changes in taxonomy and alerting users to the existence of homonyms, etc. (Fig. 3); the “Distribution” tab contains geographic distribution at the country and territory or province level (where available) (Fig. 2C); the “References” tab contains literature citations for the CITES standard nomenclature references, where applicable, or other scientific literature references that relate to the species name or the distribution (Fig. 2D); the “Documents” tab contains links to proposals to the CITES CoP to amend the Appendices, Animals and Plants Committee documents relating to the CITES Review of Significant Trade Process, Non-detriment Findings, identification materials, the Agenda and Summary of Conclusions of meetings of the EU CITES Scientific Review Group, and any other relevant documents.

## ■ CITES STANDARD NOMENCLATURE REFERENCES

Standard nomenclature references, as designated by CITES, are used to update the taxonomic backbone of the databases that underlie the Species+ and the CITES Checklist of Species websites. These online resources are crucial tools used by enforcement agencies around the world. It is therefore important that the standard references providing the nomenclature information for these databases are correct and as up to date as possible, in order for the backbone of these resources to remain current.

Standard nomenclature references for CITES should not be confused with the protologue citations that taxonomists are familiar with. A CITES standard nomenclature reference provides a list of the accepted species (and their synonyms) included in a higher taxon that is listed in one or more of the CITES Appendices. These references can take the form of published revisions or other taxonomic works (e.g., De Carvalho & al., 2020), customised checklist publications produced specifically for this purpose (e.g., Cowell & al., 2022), or time-stamped extracts from online data sources (e.g., POWO, 2023). The minimum information that a CITES standard nomenclature reference contains is accepted names and full synonymy of the listed species, preferably country-level distribution, and maybe an indication of the relevant Appendix of the listing. The latter is normally only present in the customised CITES checklists.

All CITES standard nomenclature references must be ratified by a meeting of the CITES CoP, which takes place roughly every three years. CITES standard nomenclature references are listed in the Annex to CITES Resolution Conf. 12.11 on *Standard nomenclature* ([https://cites.org/sites/default/files/documents/E-Res-12-11-R19\\_1.pdf](https://cites.org/sites/default/files/documents/E-Res-12-11-R19_1.pdf)) and this list is revised following every CoP to incorporate the decisions taken at that meeting. Through their Nomenclature Specialist, the CITES Plants Committee regularly reviews the validity of the standard nomenclature references for plants included in the Annex to Resolution Conf. 12.11 on *Standard*

*nomenclature* and proposes updates to existing references, consideration of additional references, or the production of new references as appropriate (the same is done by the CITES Animals Committee and their Nomenclature Specialist for the standard nomenclature references for animals).

It is crucial that all proposed nomenclatural and taxonomic amendments and additions should not change the original intent of the listing in the CITES Appendices and should follow the provisions of CITES Resolution Conf. 12.11 on *Standard nomenclature* ([\[documents/E-Res-12-11-R19\\\_1.pdf\]\(https://cites.org/sites/default/files/documents/E-Res-12-11-R19\_1.pdf\)\), Resolution Conf. 9.24 on \*Criteria for amendment of Appendices I and II\* \(<https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-09-24-R17.pdf>\), and Resolution Conf. 9.25 on \*Implementation of the Convention for species in Appendix III\* \(<https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-09-25-R18.pdf>\). If taxonomic and classification changes do alter the scope of the listing \(i.e., the non-listed genus \*Chortolirion\* A.Berger that is now included in the listed genus \*Aloe\* L.\), a proposal to amend the](https://cites.org/sites/default/files/</a></p>
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**CITES Checklist of CITES Species** About Terms of Use Species+ / CITES Checklist API

English Español Français

Aloe ferox **SEARCH** **APPXS.** **ALL LOCATIONS**

**A** *Aloe ferox* Mill.  
*(Aloe supralaevis* Haw, *Aloe pseudoferox* Salm-Dyck, *Aloe candelabrum* A.Berger, *Aloe perfoliata* Thunb., *Aloe muricata* Haw., *Pachidendron supralaeve* (Haw.) Haw., *Pachidendron pseudoferox* (Salm-Dyck) Haw., *Aloe galpinii* Baker, *Pachidendron ferox* (Mill) Haw, *Aloe horrida* Haw., *Aloe subferox* Spreng, *Aloe socotorina* Masson)  
 Liliaceae

**B** EN - Aloe, Cape Aloe, Lucid Aloe  
 ES - Aloe  
 FR - Aloè du Cap

**C** II

**D** Lesotho, South Africa

**E** CITES history

I  
 II  
 III

1975 1980 1985 1990 1995 2000 2005 2010 2015 2020

**F**

CITES Appendix II 13/09/07  
 GENUS listing Aloe spp.  
 Included in Appendix II, except for the species included in Appendix I. Also excludes *Aloe vera*, also referenced as *Aloe barbadensis*, which is not included in the Appendices.  
 #1  
 All parts and derivatives, except:  
 a) seeds, spores and pollen (including pollinia);  
 b) seedling or tissue cultures obtained in vitro, in solid or liquid media, transported in sterile containers;  
 c) cut flowers of artificially propagated plants; and  
 d) fruits and parts and derivatives thereof of artificially propagated plants of the genus *Vanilla*

**G** CITES Identification Manual entries

Download all ID Manual entries for *Aloe ferox*

Other identification materials

SANBI IDentifyIt Select language

Succulent Plants - A guide to CITES-listed species Select language

**Fig. 1.** Information disseminated on the CITES Checklist of Species website (<https://checklist.cites.org>) includes: **A**, The scientific name and associated synonyms; **B**, Common names; **C**, The CITES Appendix in which the taxon is currently listed; **D**, Country-level distribution; **E**, History of the CITES listing; **F**, Exemptions, annotations, and the level of listing; **G**, Links to identification materials.

Appendices need to be submitted and accepted by a CoP meeting before the new standard nomenclature reference can be accepted. Alternatively, the non-listed species should be explicitly excluded from the genus listing in the Appendices. This does complicate matters from a taxonomic point of view,

and highlights the importance of end-user consultation to understand how changes made in taxonomy and the classification of plants (and animals) impact end-users, and why these changes are not always easily implemented by conventions such as CITES.

**Species+** About | Related Resources | Terms of use **DOWNLOAD SPECIES LISTS**

Search for Species | Search for CITES Documents

**A** CITES CMS Aloe ferox SEARCH LOCATIONS

**Aloe ferox**  
Mill.  
▸ Liliales ▸ Liliaceae ▸ Aloe

**B** LEGAL NAMES DISTRIBUTION REFERENCES DOCUMENTS

COMMON NAMES

LANGUAGE	NAME
English	Lucid Aloe, Aloe, Cape Aloe
French	Aloè du Cape
Spanish	Aloe

SHOW MORE LANGUAGES

SYNONYMS

Aloe candelabrum A.Berger	Aloe socotorina Masson
Aloe galpinii Haw.	Aloe subferox Spreng.
Aloe horrida Haw.	Aloe supralaevis Haw.
Aloe muricata Haw.	Pachidendron ferox (Mill.) Haw.
Aloe perfoliata Thunb.	Pachidendron pseudoferox (Salm-Dyck) Haw.
Aloe pseudoferox Salm-Dyck	Pachidendron supraleavis (Haw.) Haw.

**C** LEGAL NAMES DISTRIBUTION REFERENCES DOCUMENTS

COUNTRIES AND TERRITORIES

Lesotho	South Africa
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**D** LEGAL NAMES DISTRIBUTION REFERENCES DOCUMENTS

CITES STANDARD REFERENCE

Newton, L.E. and Rowley, G.D. 2001. CITES Aloe and Pachypodium checklist. Egli, U. (Ed.). Städtische Sukkulenten-Sammlung, The Royal Botanic Gardens, Kew, Zurich, Switzerland; and its update: Lüthy, J.M. 2007. An update and supplement to the CITES Aloe and Pachypodium checklist. Bern, Switzerland.

Klopper, R.R. 2021. Supplement of aloe spp. names and synonyms. Compiled by Dr. Ronell R Klopper, with input from the PC25 Nomenclature Working Group, 10 June 2021. PC25 Com. 5, Annex. Accessible at: <https://cites.org/sites/default/files/eng/com/pc/25/com/E-PC25-Com-005.pdf>

**Fig. 2.** Information from CITES standard nomenclature references disseminated on the Species+ website (<https://speciesplus.net/species>). **A**, One can choose to see information for CITES or CMS; **B**, The “Names” tab contains the synonyms and common names of the listed species; **C**, The “Distribution” tab contains geographic distribution of the listed species at country level; **D**, The “References” tab contains literature citations for the CITES standard nomenclature references, where applicable.

## ■ HOW CAN WFO ASSIST CITES?

The WFO Plant List (<https://wfoplantlist.org/plant-list/>; for more information on the WFO and the WFO Plant List, see Borsch & al., 2020) can play an important role as a consensus classification source, which is curated by a global specialist-based community of experts, to be used for future CITES standard nomenclature references. Time-stamped extracts for use by CITES (extracts made from online resources and dated to ensure a stable reference, see for example POWO, 2023) have so far only been made from Plants of the World Online (POWO; <https://powo.science.kew.org>) and World Checklist of Vascular Plants (WCVP, now disseminated as part of POWO). The WFO Plant List is equally well-

placed to provide such extracts for CITES, and might be the preferred source of names, especially for groups curated by a Taxonomic Expert Network (TEN) (Borsch & al., 2020). However, some important functionality to enable such extracts is currently still under development within the WFO framework.

Furthermore, the WFO TENs are ideally placed to produce customised CITES checklist publications. Custom checklists, to be used as standard nomenclature references, are commissioned by the CITES Secretariat for CITES-listed families or genera where there is either no standard nomenclature reference, or where the current reference is regarded as outdated. Taxon experts or institutions holding expertise on the specific plant group are approached and contracted to

A <i>Dalbergia ferruginea</i>				
Roxb.				
▸ Fabales ▸ Leguminosae ▸ Dalbergia				
LEGAL	NAMES	DISTRIBUTION	REFERENCES	DOCUMENTS
SYNONYMS				
	Amerimnon ferrugineum (Roxb.) Kuntze		Dalbergia luzonensis Vogel	
	Dalbergia elliptica Spanoghe		Dalbergia luzoniensis Vogel	
	Dalbergia ferruginea var. daronensis Elmer		Dalbergia rivularis Merr. & L.M.Perry	
NOMENCLATURE NOTE				
<i>Dalbergia ferruginea</i> was split from <i>Dalbergia stipulacea</i> in 2023, following taxonomic changes adopted at CoP19.				
B <i>Aloe purpurea</i>				
Lam.				
▸ Liliales ▸ Liliaceae ▸ Aloe				
LEGAL	NAMES	DISTRIBUTION	REFERENCES	DOCUMENTS
SYNONYMS				
	Aloe marginalis DC.		Lomatophyllum borbonicum Willd.	
	Aloe marginata (Aiton) Willd.		Lomatophyllum marginatum Hoffmanns	
	Aloe rufocincta Haw.		Lomatophyllum purpureum (Lam.) T. Durand & Schinz	
	Dracaena dentata Pers.		Lomatophyllum rufocinctum (Haw) Salm-Dyck ex Roem. & Schult	
	Dracaena marginata Aiton		Phylloma aloiflorum Ker Gawl.	
	Lomatophyllum aloiflorum (Ker Gawl.) G.Nicholson		Phylloma rufocinctum (Haw) Sweet	
NOMENCLATURE NOTE				
Note that the trade name <i>Dracaena marginata</i> (Dragon tree) refers to <i>Dracaena marginata</i> Lam. which is a synonym of the non-CITES listed <i>Dracaena reflexa</i> var. <i>angustifolia</i> Baker. <i>Dracaena marginata</i> Aiton is a synonym of <i>Aloe purpurea</i> L. which is listed in the CITES Appendices. Please see this identification guidance to help distinguish the two.				

**Fig. 3.** The “Names” tab on Species+ showing nomenclature notes for two species. **A**, A note explaining a taxonomic change where *Dalbergia ferruginea*, previously treated as a synonym of *Dalbergia stipulacea*, is now regarded as a separate species; **B**, A note providing additional information to assist users in distinguishing between the two homonyms of the name *Aloe purpurea*, where one name refers to a CITES-listed species, and the other to a commonly traded, non-listed plant.

produce such checklists following a list of criteria approved by the CITES Plants Committee.

Three of the four CITES Checklists currently under development for plants are being produced by WFO TENS. The TEN for the family Asphodelaceae subfam. Alooideae is producing an updated CITES Checklist for the aloes (covering the genera *Aloe* L., *Aloestrela* Molteno & Gideon F.Sm., *Aloiampelos* Klopper & Gideon F.Sm., *Aloidendron* (A. Berger) Klopper & Gideon F.Sm., *Aristaloe* Boatwr. & J.C. Manning, *Gonialoe* (Baker) Boatwr. & J.C. Manning, and *Kumara* Medik.), under the auspices of the South African National Biodiversity Institute. An updated CITES Checklist for the large tree-species of *Diospyros* from Madagascar is being produced under the auspices of the Missouri Botanical Garden. This checklist for commercially exploited Malagasy ebonies is produced by members of the Ebenaceae TEN, which was established shortly after this checklist was commissioned by CITES. The Conifer TEN, under the auspices of the Royal Botanic Garden Edinburgh, is producing a CITES Checklist for the yews in the genus *Taxus* L. The checklists for the aloes and Malagasy *Diospyros*, together with the updated CITES Checklist for *Pachypodium* Lindl. (developed by the Royal Botanic Gardens, Kew), will be proposed for adoption at the 20th meeting of the CITES Conference of the Parties to be held in Samarkand, Uzbekistan during November–December 2025.

During the joint sessions of the 27th meeting of the CITES Plants Committee and the 33rd meeting of the CITES Animals Committee in Geneva, Switzerland in July 2024, a list of plant and animal taxa requiring new or updated standard nomenclature references was approved (see CITES PC & AC, 2024). Depending on future recommendations of the Plants Committee, these checklists for plants will either take the form of customised CITES Checklists or of time-stamped extracts from an online resource, such as from the WFO Plant List. WFO TENS should ideally become involved in the proposed future development of standard nomenclature references for these plant taxa. For several of the CITES priority plant taxa, a WFO TEN does exist or is being developed, but for others there is currently none (see Table 1). The need for updated nomenclature references and the absence of a TEN for that group could indicate a lack of capacity, which would need to be addressed through other avenues. On the other hand, if the CITES standard nomenclature reference is outdated due to recent taxonomic changes, then capacity is not the main concern. In such cases, researchers working on these groups should be encouraged to engage with WFO and form TENS to update the taxonomic backbone of the WFO Plant List to ensure an up to date resource is available to be used by end-users, such as CITES. Engagement by the WFO with the botanical community on the benefits of TENS at the International Botanical Congress (IBC) in Madrid, Spain in July 2024, has illustrated how successful such outreach initiatives can be. Following the IBC there was an increase in proposals for the establishment of TENS being submitted to the WFO.

## ■ HOW CAN TENS BENEFIT?

Taxonomists are under increasing pressure to motivate the importance of their work. They need to be able to show that their work is relevant and that it has a positive impact on society, e.g., on conservation, sustaining livelihoods, etc. (Taxonomy Decadal Plant Working Group, 2018; Löbl & al., 2023). When CITES designates an extract from the WFO Plant List to use as a standard nomenclature reference, this will raise the profile of the TEN involved in developing the taxonomic backbone for that taxon. What better way to show the global significance and impact of the taxonomic

**Table 1.** Genera identified by the CITES Plants Committee as priority groups for creating or updating standard nomenclature references, with an indication of whether there is currently a WFO TEN covering each group.

Family	Genus	WFO TEN
Amaryllidaceae	<i>Galanthus</i>	Pending
	<i>Sternbergia</i>	Pending
Apocynaceae	<i>Hoodia</i>	Apocynaceae TEN
Asparagaceae	<i>Beaucarnea</i>	None
Bignoniaceae	<i>Handroanthus</i>	Pending
	<i>Roseodendron</i>	Pending
	<i>Tabebuia</i>	Pending
Crassulaceae	<i>Rhodiola</i>	None
Cyatheaceae	<i>Cyathea</i>	Pteridophyte TEN
Dicksoniaceae	<i>Dicksonia</i>	Pteridophyte TEN
Didiereaceae	<i>Alluaudia</i>	Caryophyllales TEN
	<i>Alluaudiopsis</i>	Caryophyllales TEN
	<i>Decarya</i>	Caryophyllales TEN
	<i>Didierea</i>	Caryophyllales TEN
Euphorbiaceae	Succulent <i>Euphorbia</i>	Pending
Fabaceae	<i>Afzelia</i>	Fabaceae TEN
Meliaceae	<i>Cedrela</i>	Meliaceae TEN
Nepenthaceae	<i>Nepenthes</i>	Caryophyllales TEN
Portulacaceae	<i>Anacampseros</i>	Caryophyllales TEN
	<i>Avonia</i>	Caryophyllales TEN
Primulaceae	<i>Cyclamen</i>	None
Sarraceniaceae	<i>Sarracenia</i>	None
Stangeriaceae	<i>Bowenia</i>	Cycad TEN
	<i>Stangeria</i>	Cycad TEN
Thymelaeaceae	<i>Aquilaria</i>	None
	<i>Gyrinops</i>	None
	<i>Gonystylus</i>	None
Zamiaceae	All genera	Cycad TEN
Zygophyllaceae	<i>Guaiaicum</i>	None

work one does, than to be able to say that a multilateral environmental agreement, such as CITES, base their nomenclature on the taxonomic backbone that one curates. This would be even more evident when a TEN is commissioned to develop a customised CITES Checklist for the respective group.

## ■ CONCLUSION

Global consensus classifications are crucial for the implementation of multilateral environmental agreements, such as CITES. Amongst others, CITES Scientific Authorities and customs officials rely heavily on checklists to implement CITES trade regulations and ensure that permits and other legislation correctly reflect the names of plants in international trade, whether live horticultural specimens, herbarium or tissue samples, lumber, or cosmetic and pharmaceutical products containing plant parts. Checklists based on global consensus classifications have the advantage of being less subject to change (i.e., they are more stable) than those based on regional or local opinions, and are thus more suited for law enforcement. The WFO and especially the TENs are well-placed to provide a global consensus classification and to produce standard nomenclature references for CITES-listed plants. The WFO will also be able to provide time-stamped extracts, once the required customisable functionality to produce such extracts, with minimum editing after extraction, via the WFO Plant List web interface or Rhakhis database (Hyam & al., 2022), is in place.

Law enforcement and the implementation of CITES regulations, quotas, etc. happens at the country level. For this reason it would be crucial to provide distribution information at ISO country level, and not only for the “botanical country units” of the World Geographical Scheme for Recording Plant Distributions (<https://www.tdwg.org/standards/wgsrpd/>), as is often the case in many online resources and some publications. In addition to country-level information, distribution data at the level of province or smaller botanical units, e.g., for large countries such as Brazil, or in biogeographical terms (hotspots, floristics regions, etc.) can better delimit the distribution of taxa with restricted ranges for conservation purposes. However, for implementation of CITES trade regulations the distribution information is required at country level.

CITES recognises and appreciates the work done by initiatives such as WFO towards producing global consensus classifications. The Plants and Animals Committees encourage their Nomenclature Specialists to stay up to date with progress towards the development of global checklists (see Decision 19.274 of the “Development of standardised global checklists of species”, <https://cites.org/eng/dec/index.php/44426>). Furthermore, at their 27th meeting, the CITES Plants Committee provided a mandate to the specialist on botanical nomenclature to liaise with global plant databases, such as WFO, regarding the format of distribution data provided by

these resources [see Recommendation a) in <https://cites.org/sites/default/files/documents/E-PC27-Com-04.pdf>].

There is much support and gratitude within the CITES Secretariat, and among members of the CITES Plants Committee and Parties to the Convention for the work done by the WFO and its contributors toward producing a global consensus classification for the world’s plants. The WFO should build on this, continue to engage their end-users, and promote and improve their valuable resources and the work done by the WFO TENs, towards the conservation of the world’s plants.

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