

ASSESSMENT OF TRADE IN SUCCULENT *EUPHORBIA* SPP.
AND REVIEW OF THEIR LISTING IN APPENDIX II

1. This document has been prepared by Mr Grogan under contract with the CITES Secretariat.¹
2. At issue is the Plants Committee's mandate to restrict the listing of succulent *Euphorbia* spp. in Appendix II to those taxa that are actually or potentially threatened, i.e., harvested from the wild, could benefit from monitoring and restricting international trade, and meet the criteria of Resolution Conf. 9.24 (Rev. CoP14).

Background information

3. Background information most relevant to this issue can be found in the following key references and CITES documents:
 - Taylor (2001) analyzed international trade in succulent *Euphorbia* species, with emphasis on artificially propagated specimens. 328 species were identified as in international trade. The report concluded that 249 *Euphorbia* species could be de-listed from Appendix II for not meeting criteria for listing, while all *Euphorbia* taxa native to Madagascar should be retained.
 - Carter & Eggli (2003) lists 899 recognized species, sub-species, and varieties of succulent *Euphorbia*, with information on natural range and synonyms.
 - CoP14 Prop. 29, submitted by the Management Authority of Switzerland, provides background information on the issue under consideration in the present report, whether some succulent *Euphorbia* species should be excluded from Appendix II based on trade data analyses demonstrating that many species in this extremely large and amorphous taxa are not actively traded internationally. Exclusion of certain *Euphorbia* species based on three broad morphological forms (pencil-stemmed, corraliform, candelabriform) is proposed; biology, conservation status & threats, utilization & trade, and issues with lookalike species are briefly reviewed. This proposal was withdrawn after discussion at CoP14, and Decision 14.131 was adopted.
 - PC17 Doc. 8.5, prepared by the Secretariat with UNEP-WCMC, summarizes recorded net level of exports for Appendix II species during the period 2002–2006. Trade data are presented for 84 *Euphorbia* species.
 - PC17 Doc. 14, submitted by the Management Authority of Switzerland, proposes two approaches to de-listing succulent *Euphorbia* species from Appendix II: A) retain species and populations in identifiable need of trade protection, including all species from Madagascar; and B) create a list of exemptions for species in trade in large quantities which originate from artificial propagation and which are not harvested from the wild for international trade. Trade import data during 2000-2008 for 358 species, sub-species and varieties are included.
 - PC18 Doc. 16.1.2, submitted by Switzerland, reviews the issue and provides a draft Annotation for a new listing of *Euphorbia*. Two approaches are again proposed for de-listing (this time the reverse of approaches A & B in PC17 Doc. 14): A) removal of five species from Appendix II because they are heavily traded as artificially propagated specimens; and B) retention of 28 non-Malagasy species plus 55 (or all) species of *Euphorbia* from Madagascar because they meet the criteria for inclusion (Res. Conf. 9.24 (rev. CoP14)). This document also includes reports on North American and Malagasy species submitted in response to Notification No. 2008/042 requesting review of the status of listed species.
 - PC19 Doc. 14.2, prepared by the Chair of the Working Group on the Periodic Review with assistance from the Scientific Authority of Mexico, reviews work on *Euphorbia* relevant to Decision 14.131 (rev. CoP15) and further analyzes reported export/import trade data during 2000-2008, excluding species included in Review of Significant Trade (see PC19 Doc. 12.2 & PC19 Doc. 12.3.a3) and/or in list B of PC18 Doc. 16.1.2.

¹ The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.

Based on trade data, the remaining species are separated into categories including low risk from trade (191 species) and potential risk from trade (103 species), leading to the conclusion that list A (PC18 Doc. 16.1.2) of five species that could be de-listed from Appendix II is incomplete while list B of 83 species to be retained also fails to include many species potentially at risk from trade. Expansion of both lists is proposed.

Natural range, morphology & taxonomy

4. The succulent *Euphorbia* are primarily an Old World group adapted to arid environments, with centres of diversity in Madagascar, southern subtropical & temperate Africa, and eastern tropical Africa. According to Carter & Egli (2003) they occur in 75 nations, including Australia, Peru, and Jamaica as examples of their wide distribution beyond Africa.
5. Succulence is an adaptive morphological trait for within-plant water storage in response to seasonal or persistent water deficit. Leaf, stem, and root modifications may qualify a given species as 'succulent'. With ~900 recognized succulent *Euphorbia* taxa, a wide range of adaptations are represented in this large group, often with barely perceptible gradations among species, including those occupying transitional environments where succulent features become less prominent. This means that many species closely resemble others within morphological categories, as will be discussed at greater length below.
6. The genus *Euphorbia* includes many hundreds of non-succulent species that are not listed on Appendix II, making this the only plant genus 'split-listed' based on morphological and not strictly taxonomic distinctions. The fact that no strict rules exist for classifying a species as succulent (or not) leads to ambiguity about species restricted to transitional habitats where increased environmental moisture availability requires less and less plant water storage capacity against prolonged deficits. Though a recognized list of succulent *Euphorbia* apparently separates these from non-succulent species, it is inevitable to this approach that ambiguity persists among marginally succulent and non-succulent species, complicating real-world implementation of the Appendix II listing.
7. Recent phylogenetic studies have clarified taxonomic relationships among succulent genera assumed to be closely related to *Euphorbia* (see references and PC17 WG05, paragraph 7). Maintenance of the current genera *Elaeophorbia*, *Endadenium*, *Monadenium*, *Synadenium* and *Pedilanthus* would create a paraphyletic *Euphorbia*, and thus may not be tenable. Except for the *Elaeophorbia*, which are leafy trees, all of these genera contain succulent species with potential lookalike problems for the succulent *Euphorbia*, especially *Monadenium*. Any new listing proposal crafted to exclude these genera may encounter problems if their taxonomic status degrades over time.
8. New species present a second taxonomic issue for the succulent *Euphorbia*. At least 15 new species have been described in scientific journals since publication of Carter & Egli's (2003) Checklist, including: *E. ammophila* & *E. denispina* in Somalia (Carter 2004); *E. erythroculata* in Madagascar (Mangelsdorf 2005); *E. greuteri* in Yemen (Kilian et al. 2006); *E. gilbertiana* in Ethiopia (Bisseret & Specks 2006); *E. marrupana*, *E. namuliensis* & *E. stenocaulis* in Mozambique (Bruyns 2006); *E. collenetteae* in Sudan, Eritrea and Saudi Arabia (Al-Zahari & El-Karemy 2007); *E. madinahensis*, *E. saudiarabica* & *E. taifensis* in Saudi Arabia (Fayed & Al-Zahari 2007); and *E. neochamaeclada*, *E. ohiva* & *E. otjingandu* in Namibia and Angola (Bruyns 2009a,b; Swanepoel 2009a,b). Additional new species may also have been reported in the literature. Whether these proposed new species are eventually accepted or not, any change to the current CITES Appendix II listing for succulent *Euphorbia* must also account for on-going changes in taxonomy of this large group.

Conservation status

9. As of November 2011, 124 succulent *Euphorbia* on Carter & Egli's (2003) Checklist appeared on the IUCN Red List, with one species Extinct in the Wild (EW), 19 species Critically Endangered (CE), 23 species Endangered (EN), 52 species Vulnerable (VU), and 29 species listed as Near Threatened (NT) or in lower risk categories. The EW species is *E. mayuranathanii*, native to India. Ninety Red List species were from Madagascar, including 10 species listed on Appendix I. South Africa and Namibia accounted for 11 species combined, while east African nations from Tanzania to Yemen and Saudi Arabia on the Arabian Peninsula accounted for nine species on the list.

10. The IUCN Red List presents a global assessment of threatened species that is likely incomplete in coverage for the succulent *Euphorbia*, which includes a large number of species with highly localized populations threatened by habitat loss, grazing, and collection from the wild for trade or horticultural purposes. Publications in scientific and specialized journals such as *The Euphorbia Journal* (Vols. 1–10, 1983–1997) frequently describe threatened status of endemic or local populations. Annexes in Oldham (1997) list threatened status of succulent *Euphorbia* not included on the current Red List based on pre-1994 IUCN categories for the following nations: Kenya (4 species), the Canary Islands (2), southern Africa (45), Zimbabwe (15), India (2), and the West Indies (1). See also Newton & Chan (1998) for discussion of declining populations and collecting pressure on eight *Euphorbia* species in South Africa not currently on the Red List.

Trade analysis: Methods

11. The analysis provided here summarizes UNEP-WCMC trade records for succulent *Euphorbia* during the period 1990–2010. This timeframe combines time periods covered separately in previous analyses (1990s, 2000s). Further, species registering no wild-collected trade data since before 1990 are unlikely to experience collection pressure in the near future. Data for the year 2010 are incomplete but are sufficiently robust to indicate trends.
12. Because the objective is to detect trade in wild-collected specimens from the widest possible dataset, the analysis is based on total reported trade, that is, it combines reported exports and imports for a given species over time. Where trade records do not match, where X specimens are recorded exported by a given nation but no corresponding specimens are recorded imported by the destination nation, or vice versa, or where recorded export (or import) values exceed import (or export) values within records, the largest of the two values is considered to be the number of specimens in trade. As an example, consider two trade records for a given species in 1993, the first reporting 10 specimens exported from Madagascar to Germany but no quantity registered as imported, the second reporting 10 specimens imported by Germany from Madagascar but no quantity registered as exported. In the present analysis these records are combined into one record showing 10 specimens imported AND exported, with one record eliminated to avoid counting the 10 specimens twice in the global analysis.
13. 14,299 trade records were provided. A total of 529 records were eliminated because they clearly represented double-counting, that is, separate records from exporting and importing nations documenting the same transaction during the same year. This includes records for one species (*E. amygdaloides*) which were eliminated because the species does not appear on the 2003 Checklist, nor does it appear to be a succulent plant. This left a total of 13,770 trade records. Species-level trade was sub-divided by source code (A = artificially propagated, W = wild collected, I = confiscated or seized, U = unknown origin, blank = no source code provided). The reported country origin of specimens coded W, I, U and blank was compared to species' natural ranges to determine whether these specimens could possibly have been wild collected; the definition of 'range nation' was applied generously, including neighbouring range nations, in case range information was incomplete or erroneous. This means that W totals by species may or may not include W, I, U and blank specimens, depending on whether exported specimens originated from a potential range nation. This method likely overstates the prevalence of wild-collection because I, U and blank specimens are considered wild-collected if they originate from a range nation. On the other hand, unreported wild collections cannot be accounted for by this analysis. No attempt was made to account for re-exports because this trade status could not be determined with certainty for any given report.

Trade analysis: Results

14. The 899 *Euphorbia* taxa listed in the 2003 Checklist represent 706 distinct species or interspecific crosses, both naturally occurring and artificial, plus 59 sub-species, 132 varieties, one 'forma', and '*Euphorbia* hybrid'. This analysis includes an additional 12 species that i) appear in the CITES list of Appendix II species, or ii) appear in UNEP-WCMC trade data, or iii) are included on the IUCN Red List. The trade data include the category '*Euphorbia* spp.', bringing the total number of non-redundant taxa (including *Euphorbia* hybrid) considered here to 720.
15. Trade data were recorded for 544 succulent *Euphorbia* taxa during 1990-2010. Trade data for *E. frutescens*, which does not appear in the 2003 Checklist, are considered equivalent to *E. guerichiana* for which this name is probably a synonym. This means that 497 *Euphorbia* 'species' out of 720 as circumscribed above were recorded as traded internationally during this period after accounting for 9 sub-species and 37 varieties recorded in the data. These include seven of the 12 species not included in the 2003 Checklist.

16. Except for a trivial number of live specimens, *Euphorbia antisiphylitica* was traded in large quantities during this period as Candelilla wax, extract, and derivatives, with nearly 100% of traded quantities reported as originating from wild-collected specimens. Results and discussion to follow exclude these data. See PC18 Inf. 6 for a detailed report on this species.
17. Nearly 49.3 million specimens of succulent *Euphorbia* were reported traded during 1990–2010 when export and import data are combined as described above. While 81.4% of this trade was recorded 'A' for Artificially propagated, up to 99% of all trade likely originated as artificially propagated specimens as explained below.
18. Considered separately, reported exports equalled 20.9 million specimens (42.5% of the combined total), while reported imports equalled 35.1 million specimens (71.2%). This means that nearly 58% of total specimens considered to be in trade were not recorded by exporters, while 29% of total specimens in trade were not recorded by importers.
19. While international trade in succulent *Euphorbia* is a truly global enterprise, a handful of nations dominate on the exporting and importing ends, as has been reported in previous documents (see CoP14 Prop. 29, p. 5). Exports of succulent *Euphorbia* could be attributed to 87 nations during 1990-2010. Two exporting nations, the Dominican Republic and Thailand, accounted for 60.9% of combined reported export trade over this period. The top ten exporting nations accounted for 94.8% of combined reported trade, with only three range nations among them (Madagascar, Thailand and the USA; Table 1). Of these three, only Madagascar is home to significant succulent *Euphorbia* diversity. Imports of succulent *Euphorbia* could be attributed to 147 nations during this period. By far the most important importing nation was the USA, accounting for 62.5% of combined reported import trade. The top ten importing nations accounted for 91.7% of reported combined trade, with no range nations except the USA, where almost no succulent *Euphorbia* occur, in the top ten (Table 1).

TABLE 1. The top 10 exporting and importing nations of succulent *Euphorbia* during 1990-2010, with % of total. Based on combined reported trade for both exports and imports (see text explanation). Boldface type indicates range nations.

EXPORTING	% Total	IMPORTING	% Total
Dominican Republic	39.6	United States	62.5
Thailand	21.3	Netherlands	11.5
Haiti	6.8	Germany	3.5
Denmark	6.4	Canada	3.4
China	6.1	Philippines	2.9
Costa Rica	4.0	Switzerland	1.8
Canada	3.5	France	1.6
United States	3.2	Japan	1.6
Madagascar	2.3	Austria	1.5
Netherlands	1.5	Sweden	1.4

20. Annual trade data indicate that total trade quantities of succulent *Euphorbia* have been relatively constant since 1990 except during 1997–2001 when trade declined significantly (Fig. 1). *Euphorbia* spp. was the most heavily traded *Euphorbia* taxon; together with *Euphorbia* hybrid it accounted for 40.9% of combined reported trade during this period. The next three most heavily traded succulent *Euphorbia* were the three that are exempt or partially exempt from Appendix II, *E. lactea*, *E. 'Mili'*, and *E. trigona*, accounting for 46.9% of combined reported trade during this period.

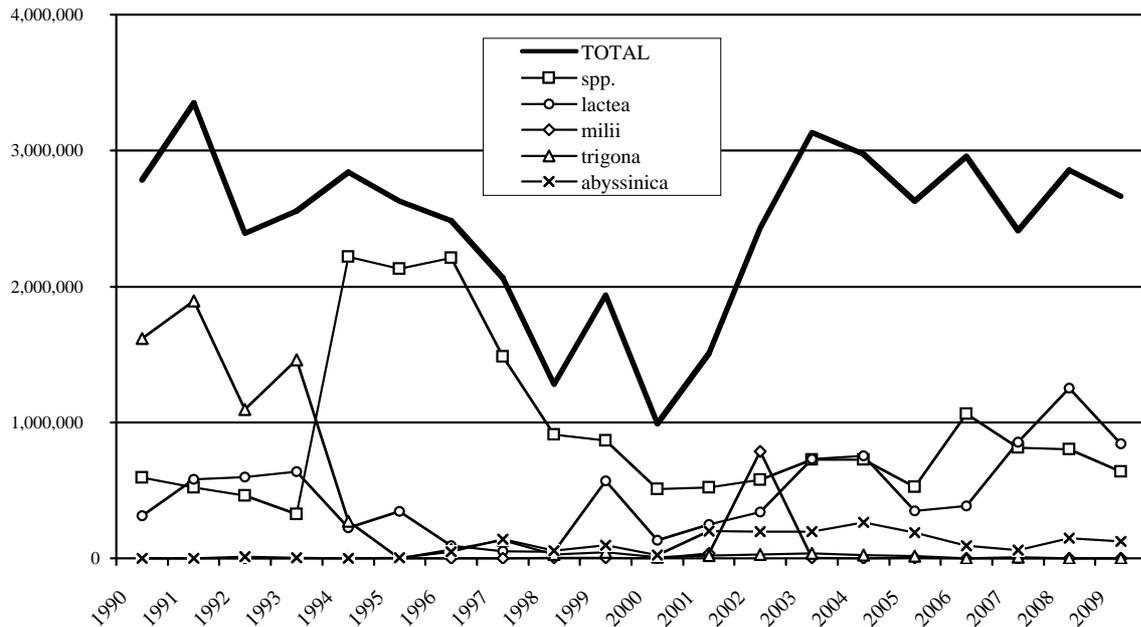


Figure 1. Annual levels of combined reported trade in specimens of succulent *Euphorbia*, 1990–2009 (darkest line = total specimens), including the five species (or ‘spp.’) with the highest level of trade during this period. Data for 2010 are omitted for being incomplete. Note that annual trade levels for *E. milii* were relatively low except during 2002.

21. The remaining 12.2% of combined reported trade during this period was accounted for by 492 species as delineated above (see paragraph 16). 70% of this remaining total was accounted for by only four species, with > 500,000 specimens in trade for each: *E. abyssinica* (see Fig. 1), *E. tirucalli*, *E. lophogona* and *E. x lomi*. Combined trade records for nearly half of the 488 remaining succulent *Euphorbia* in trade, or 223 species, totaled < 100 specimens over the past two decades.
22. Records for wild-collected (W) specimens were matched with reported exporting nations to verify whether specimens originated from range nations. The same was done for I, U and blank records to determine whether these reported specimens in trade could possibly have been wild-collected, but not reported as such. This analysis found that wild-collected specimens from 193 succulent *Euphorbia* species were (or possibly were) traded internationally during 1990-2010, including *Euphorbia* spp.. and two species not on the 2003 Checklist (see Annex 1). 16 species for which wild-collected specimens were reported were not actually wild-collected based on reported nations of origin. Eight species with no reported wild-collected specimens could have been wild-collected based on origins of specimens coded I, U and/or blank, and are included in the list of 193 species.
23. Comparing W, I, U and blank-coded records with natural ranges allowed estimation that wild-collected (or possibly wild-collected) specimens represented slightly less than 1% of total combined trade over this period. This means that nearly 99% of succulent *Euphorbia* in international trade since 1990 originated as artificially propagated plants. That is, most I, U and blank-coded specimens in the trade data actually represent artificially propagated plants.
24. The most heavily wild-collected species was *E. lophogona* in Madagascar, though > 50% of ~294,000 specimens attributed to this category were coded ‘blank’ and therefore could have been artificially propagated. Approximately 89,000 specimens or 0.5% of *Euphorbia* spp. reported in trade were or could have been wild-collected, though again, it is likely that a smaller percentage actually originated in the wild. After these two taxa, as many as 23,000 wild-collected specimens of a given species were traded (*E. millotii* from Madagascar), but most species were traded in much lower quantities. For 125 species, fewer than 100 wild-collected specimens were traded during this period. Wild-collected specimens were reported for two of the three species that are exempt or partially exempt from Appendix II, *E. lactea* and *E. milii* (and its varieties), but these represented < 0.1% of total specimens.
25. In PC19 Doc. 14.2 the Chair of the Working Group on the Periodic Review proposed that 189 species of succulent *Euphorbia* should be retained on Appendix II (86 species included in the Review of Significant Trade (PC19 Doc. 12.2) + 103 species at potential risk indicated by evidence of wild collection). This would

leave 527 species to be de-listed (191 species at low risk because only artificially propagated specimens were recorded in trade + 336 species not recorded in trade). The trade analysis reported here, covering a longer time period and applying a more rigorous standard to determine whether specimens were (or possibly were) wild-collected, indicates that these lists should be modified as follows:

- Appendix I = 10 species from Madagascar

In PC19 Doc. 14.2 seven of these were rated 'at low risk' and included in the list of species that could be de-listed, one was considered at risk from trade, and two were not included in the analysis.

- Retain on Appendix II due to potential risk posed by international trade = 199 species

This category includes: 85 species on the Review of Significant Trade (omitting one redundant variety), 87 species at potential risk due to trade in wild-collected specimens, 18 species previously classified as 'at low risk', and 17 species previously classified as 'not in trade'.

- De-list from Appendix II those at low risk, in trade but not wild-collected = 293 species

This category includes: 172 species at low risk, 104 species previously classified as 'not in trade', 16 species previously classified as 'at potential risk' due to wild-collected specimens in trade, and one species not included in the previous analysis.

- De-list from Appendix II those not in trade = 216 species

This category includes one species not included in the previous analysis. See Annex 2 for lists by category.

26. To summarize, this approach would retain 199 species on Appendix II, including 12 species not on the 2003 Checklist but which appear in the trade data or in CITES-related documentation, because they meet the criteria of Resolution Conf. 9.24 (Rev. CoP15) for inclusion (Annex 2a(B)) due to potential risk. 509 species would be de-listed for not meeting these criteria. *Euphorbia* hybrid and *Euphorbia* spp.. would be omitted from consideration.
27. If it is determined that all species from Madagascar should be retained on Appendix II regardless of trade status, then 212 species would be retained on Appendix II as above due to potential risk, 290 species would be de-listed due to low risk, and 206 species would be de-listed for lack of trade (for a total of 496 species de-listed).
28. Two species currently exempted from Appendix II when traded with certain characteristics, *E. 'Mili'* and *E. lactea*, are included on the list of species to be retained because i) wild-collected specimens are not allowed by this exemption, and ii) some degree of wild collection appears to continue for both species.

The problem of lookalike species

29. Resolution Conf. 9.24 (Rev. CoP15), Annex 2b states:

*Species may be included in Appendix II in accordance with Article II, paragraph 2 (b), if **either one** of the following criteria is met:*

A. The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2 (a), or in Appendix I, such that enforcement officers who encounter specimens of CITES-listed species, are unlikely to be able to distinguish between them

B. ...

30. The succulent *Euphorbia* pose significant lookalike problems for taxonomists and professional botanists. Identification problems undoubtedly are more extreme for customs agents responsible for identifying Appendix II species crossing international borders in trade, whether legally or in contravention of CITES.

31. In addition to analysis of trade data and conservation status, digital images of 375 succulent *Euphorbia* on the 2003 Checklist were collected in order to examine whether lookalike issues might exist between species that should be retained on Appendix II as determined in this study based on criteria stated in Resolution Conf. 9.24 (Rev. CoP15) vs. species that could be de-listed for being at low risk or not at risk from trade. Images were scanned from two sources: The *Euphorbia* Journal, Vols. 1–4 (1983–1987), and Succulents: the Illustrated Dictionary, Vols. 1 & 2, by M. Sajeve & M. Costanzo (1994 & 2000, Timber Press, Portland, OR). A small number of additional images were obtained from reliable sources on the internet.
32. These images were grouped based on gross morphological similarities as assessed by a non-specialist, that is, the only evidence for grouping species into categories was what could be observed in a given image. Most images represent a stem or stems of a given species, rarely a whole plant; this was considered appropriate insofar as specimens in trade are likely to be cuttings and/or rooted cuttings of live plants rather than whole live plants, which can be large and cumbersome to move across international borders.
33. Thirty-five morphological groups of succulent *Euphorbia* were established, each containing images of two to 57 species. This process of grouping images occurred independently of the trade analysis. Species within morphological groups were then matched to categories reported above (see paragraph 25), that is, identified as 'to be retained' in Appendix II or 'to be de-listed'.
34. Thirty out of 35 morphological groups contained both species indicated for retention in Appendix II and species indicated for de-listing. Two groups contained only species indicated for retention, while three groups contained only species indicated for de-listing. Annex 3 presents examples of lookalike species within morphological groups identified as 'to be retained' in Appendix II or 'to be de-listed'. A separate document presents images from each morphological group demonstrating lookalike problems, and lists all species in each group according to categories reported above (retain vs. de-list).
35. Included with these images are examples of lookalike issues posed by *Monadenium* and *Pedilanthus*. *Monadenium* includes several morphological types similar to succulent *Euphorbia*, especially tuberculate-stemmed and leafy-topped species.

Conclusions

36. With regards to Decision 14.131 (Rev. CoP15) directing the Plants Committee to
 - a) *analyse trade data and conservation status of succulent Euphorbia species (except those currently included in Appendix I):*
 - The trade analysis reported here combines i) time horizons of previous analyses (1990s, 2000s) and ii) reported export and import trade data into composite estimates of trade volumes for succulent *Euphorbia*. Total trade for this group has remained relatively stable over this time period. Two indeterminate taxa (*Euphorbia* spp., *Euphorbia* hybrid) plus three species exempted from Appendix II (with certain characteristics; *E. lactea*, *E. 'Mili'*, *E. trigona*) dominate international trade. The remaining 492 species recorded in trade during this period represented only ~12% of total trade. That is, most species are traded at relatively low volumes.
 - Artificially propagated specimens represent up to 99% of total recorded trade. Wild-collected specimens from 193 species were reported or inferred from the data. Excluding *Euphorbia* spp., a small number of species dominated wild collections; only 10 species accounted for 89% of all recorded or inferred wild-collected specimens. Fewer than 100 wild-collected specimens were reported in trade for 125 species.
 - The conservation status of this large group is poorly defined. Coverage by the IUCN Red List is incomplete and quite possibly seriously inadequate. Threat levels for many species, especially those with highly restricted natural ranges, are likely understated or unidentified.
37. With regards to Decision 14.131 (Rev. CoP15) directing the Plants Committee to
 - b) *prepare a revised list of succulent Euphorbia species that meet the criteria of Resolution Conf. 9.24 (Rev. CoP15) for inclusion in Appendix II:*

- The trade analysis presented here resembles the one offered by the Chair of the Working Group on the Periodic Review in PC19 Doc. 14.2 because criteria stated in Resolution Conf. 9.24 (Rev. CoP15), Annex 2a clearly state that inclusion in Appendix II is justified if “It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences”. Plausible argument can be advanced for nearly all succulent *Euphorbia* that wild collection may threaten wild populations. This analysis presumes that broadening the time horizon under consideration, and comparing exporting nations with species range nations for W, I, U and blank records, would improve and refine this approach.
 - By this criteria, 199 succulent *Euphorbia* species should be retained on Appendix II due to potential risk posed by trade in wild-collected specimens. See Annex 2 section 2 for the complete list.
38. With regards to Decision 14.131 (Rev. CoP15) directing the Plants Committee to
- c) *prepare proposals for consideration at the 16th meeting of the Conference of Parties that provide for the deletion of Euphorbia species from Appendix II that do not meet the criteria of Resolution Conf. 9.24 (Rev. CoP15), are frequently traded and can be clearly identified by non-specialists:*
- De-listing 509 species (or 496 species if all species from Madagascar are to be retained on Appendix II) should proceed if evidence for wild collection is determined to be sufficient evidence for retaining some species and de-listing others. See Annex 2 sections 3 & 4 for the complete list.

Recommendations

39. With regards to Decision 14.131 (Rev. CoP15) directing the Plants Committee to
- d) *determine the need for identification material for species retained in Appendix II:*
- Several factors make the succulent *Euphorbia* a difficult group for CITES to regulate, including: i) the intrageneric splitting is unique within CITES and poorly defined at the margins between succulent and non-succulent species; ii) even after split-listing, more than 700 *Euphorbia* are identified as succulent, making it difficult for non-specialists to differentiate among species; iii) wide geographic distribution by the group and by many species contrasts with highly restricted natural ranges of many other species, while distinguishing between these conditions is difficult due to the extreme diversity of the group.
 - Resolution Conf. 9.24 (Rev. CoP15), Annex 2b states that species may be included in Appendix II if “... specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II”. Considering the many examples of lookalike taxa provided in Annex 3 and in a separate document, and considering the bewildering diversity of the succulent *Euphorbia*, it is difficult to conceive how the lookalike provision can be ignored for 509 (or 496) species indicated for de-listing by an analysis based solely on trade data.
 - Whether a subset or all succulent *Euphorbia* as currently defined will be retained on Appendix II, identification materials for distinguishing species are necessary to facilitate the work of CITES authorities and customs officials. This species group’s overwhelming diversity could be managed by developing country-level field guides describing only species likely to be in trade within a given region.
40. Any proposed changes to the current listing must also consider new *Euphorbia* species as well as taxonomic changes that have been proposed for genera that phylogenetically belong within *Euphorbia*, including *Elaeophorbia*, *Endadenium*, *Monadenium*, *Synadenium* and *Pedilanthus*.
41. In the absence of useful identification materials, and considering Resolution Conf. 9.24 (Rev. CoP15), Annex 2b as well as the restricted range and population size of many succulent *Euphorbia* species, this independent consultant cannot recommend deletion of non-wild-collected species from Appendix II until:
- conservation status is better described and understood for the majority of succulent species; and
 - identification materials are available enabling non-experts to clearly distinguish species threatened by international trade from those that are not.

References

- Al-Zahrani DA & El-Karemy ZAR (2007) A new succulent *Euphorbia* (*Euphorbiaceae*) species from the Red Sea coast and islands. *Edinburgh Journal of Botany* 64: 131-136.
- Bisseret P & Specks E (2006) *Euphorbia gilbertiana*: a new distinctive dwarf succulent *Euphorbia* from southern Ethiopia. *Haseltonia* 12: 15-18.
- Bruyns PV (2006) Three New Species of *Euphorbia* (*Euphorbiaceae*) from South Tropical Africa. *Novon* 16: 454-457.
- Bruyns PV, Mapaya RJ & Hedderson T (2006) A new subgeneric classification for *Euphorbia* (*Euphorbiaceae*) in southern Africa based on ITS and psbA-trnH sequence data. *Taxon* 55: 397-420.
- Bruyns PV (2009) A new species of succulent *Euphorbia* from southern Angola. *Bothalia* 39: 219-221.
- Bruyns PV (2009) A new name for *Euphorbia chamaeclada* from Angola. *Bothalia* 40: 178.
- Bruyns PV, Klak C & Hanáček P (2011) Age and diversity in Old World succulent species of *Euphorbia* (*Euphorbiaceae*). *Taxon* 60: 1717-1733.
- Carter S & Egli U (2003) The CITES Checklist of Succulent *Euphorbia* Taxa (*Euphorbiaceae*), 2nd Ed. BfN/Federal Agency for Nature Conservation, Bonn–Bad Godesberg, Germany. 92 pp.
- Carter S (2004) Two new species of *Euphorbia* subsp *Euphorbia* (*Euphorbiaceae*) from east and northeast Somalia. *Nordic Journal of Botany* 23: 295-297.
- Carter-Holmes S (1997) *Euphorbiaceae*. In: Oldfield S (comp.), *Cactus and Succulent Plants – Status Survey and Conservation Action Plan*, pp. 23-26. Cactus and Succulent Specialist Group IUCN/SSC, Gland, Switzerland & Cambridge, UK.
- Fayed AA & Al-Zahrani DA (2007) Three new spiny *Euphorbia* (*Euphorbiaceae*) species from western Saudi Arabia. *Edinburgh Journal of Botany* 64: 117-129.
- Kilian N, Kürschner H & Hein P (2006) *Euphorbia greuteri* (*Euphorbiaceae*), a new single-spined succulent from the foothills of Jabal Urays, Abyan, Yemen. *Willdenowia* 36: 441-446.
- Mangelsdorf RD (2005) *Euphorbia erythroculata* Mangelsdorf, a new semisucculent *Euphorbia* species from southwestern Madagascar. *Haseltonia* 11: 3-10.
- Newton DJ & Chan J (1998) South Africa's Trade in Southern African Succulent Plants. TRAFFIC East/Southern Africa, Johannesburg, South Africa.
- Oldfield S (comp.) (1997) *Cactus and Succulent Plants – Status Survey and Conservation Action Plan*. Cactus and Succulent Specialist Group IUCN/SSC, Gland, Switzerland & Cambridge, UK.
- Steinmann VW & Porter JM (2002) Phylogenetic relationships in Euphorbieae (*Euphorbiaceae*) based on ITS and ndhF sequence data. *Annals of the Missouri Botanical Garden* 89: 453-490.
- Swanepoel HGWJ (2009a) *Euphorbia ohiva* (*Euphorbiaceae*), a new species from Namibia and Angola. *South African Journal of Botany* 75: 249-255.
- Swanepoel HGWJ (2009b) *Euphorbia otjingandu* (*Euphorbiaceae*), a new species from the Kaokoveld, Namibia. *South African Journal of Botany* 75: 497-504.
- Taylor NP (2001) Review of Trade in Artificially Propagated Plants. Royal Botanic Gardens, Kew, UK.
- UNEP World Conservation Monitoring Centre. 2011. *Checklist of CITES Species, Part 2: History of CITES Listings*. http://www.cites.org/eng/resources/pub/checklist11/History_of_CITES_listings.pdf
- Yang Y & Berry PE (2011) Phylogenetics of the Chamaesyce Clade (*Euphorbia*, *Euphorbiaceae*): Reticulate evolution and long-distance dispersal in a prominent C4 lineage. *American Journal of Botany* 98: 1486-1503.
- Zimmerman NFA, Ritz CM & Hellwig FH (2010) Further support for the phylogenetic relationships within *Euphorbia* L. (*Euphorbiaceae*) from nrITS and trnL–trnF IGS sequence data. *Plant Systematics and Evolution* 286: 39-58.

ANNEX 1

SUCCULENT *EUPHORBIA* SPECIES WITH REPORTED OR INFERRED WILD (W)-COLLECTED SPECIMENS DURING 1990-2010, INCLUDING TOTAL SPECIMENS REPORTED

BOLD names indicate species listed on Appendix I. IUCN Red List categories: CR critically endangered, EN endangered, VU vulnerable, NT near threatened, LR lower risk/near threatened, LC least concern, DD data deficient; not all Red Listed species were reported as wild collected. * indicates species not on the Carter & Egli (2003) *Checklist*.

Specimens:			
Species	W	Total	Red List
<i>E. aggregata</i>	5	3,645	
<i>E. alata</i>	5	5	
<i>E. albertensis</i>	53	177	
<i>E. albipollinifera</i>	25	571	
<i>E. alfredii</i>	501	1,139	VU
<i>E. ambovombensis</i>	8	5,173	VU
<i>E. analalavensis</i>	17	17	VU
<i>E. ankarensis</i>	1,040	2,141	EN
<i>E. annamariaeae</i>	2	4	VU
<i>E. antisiphilitica</i> live	9	22	
<i>E. antso</i>	48	56	LC
<i>E. arahaka</i>	35	35	LC
<i>E. astrophora</i>	25	149	
<i>E. atrispina</i>	3	176	
<i>E. aureoviridiflora</i>	219	1,323	VU
<i>E. бага</i>	350	350	
<i>E. banae</i>	74	74	VU
<i>E. beharensis</i>	154	574	VU
<i>E. berorohae</i>	181	187	
<i>E. biaculeata</i>	212	212	VU
<i>E. boinensis</i>	52	63	CE
<i>E. boissieri</i>	11	12	VU
<i>E. boiteaui</i>	5	9	VU
<i>E. bongolavensis</i>	623	1,760	VU
<i>E. bosseri</i>	24	244	VU
<i>E. x bothae</i>	2	1,069	
<i>E. brachiata</i>	3	3	
<i>E. braunsii</i>	18	1,274	
<i>E. bulbispina</i>	237	878	VU
<i>E. bupleurifolia</i>	13	42,682	
<i>E. burmannii</i>	3	25	
<i>E. cactus</i>	2	220	
<i>E. caerulans</i>	3	26	
<i>E. caerulescens</i>	16	642	
<i>E. canariensis</i>	14	89,171	
<i>E. candelabrum</i>	5,830	24,933	
<i>E. capmanambatoensis</i>	2,153	3,480	CE
<i>E. capsaintemariensis</i>	166	1,883	CE
<i>E. capuronii</i>	88	218	VU
<i>E. caput-aureum</i>	11	11	DE
<i>E. caput-medusae</i>	3	4,791	
<i>E. caterviflora</i>	3	3	
<i>E. CEDrorum</i>	11	18	VU
<i>E. chersina</i>	2	2	
<i>E. clava</i>	22	336	
<i>E. clavarioides</i>	11	1,255	
<i>E. colliculina</i>	62	1,251	
<i>E. CRemersii</i>	879	4,105	VU
<i>E. CRispa</i>	213	13,219	

Specimens:			
Species	W	Total	Red List
<i>E. CROizatii</i>	556	3,665	EN
<i>E. cucumerina</i>	3	3	
<i>E. curviraма</i>	3	206	
<i>E. cylindrifolia</i>	6	4,201	EN
<i>E. damarana</i>	20	60	
<i>E. decaryi</i>	14	5,151	EN
<i>E. decepta</i>	16	1,755	
<i>E. decorsei</i>	3	3	EN
<i>E. delphinensis</i>	114	302	VU
<i>E. denisiana</i>	71	71	VU
<i>E. didiereoides</i>	639	1,823	EN
<i>E. dregeana</i>	1	7	
<i>E. duranii</i>	581	596	EN
<i>E. duranii</i> var. <i>duranii</i>	2	2	
<i>E. elliotii</i>	13	16	EN
<i>E. ENterophora</i>	62	90	LC
<i>E. ephedroides</i>	2	2	
<i>E. ernestii</i>	5	164	
<i>E. esculenta</i>	3	1,224	
<i>E. famatamboay</i>	105	109	VU
<i>E. ferox</i>	4	18,829	
<i>E. fianarantsoae</i>	326	547	VU
<i>E. fiherenensis</i>	12	145	LC
<i>E. francoisii</i>	4	1,202	CE
<i>E. friedrichiae</i>	13	1,630	LC
<i>E. fusca</i>	60	2,000	
<i>E. gariépina</i>	1	171	
<i>E. gatbergensis</i>	3	19	
<i>E. genoudiana</i>	49	438	
<i>E. geroldii</i>	8,641	48,468	CE
<i>E. giessii</i>	2	2	
<i>E. globosa</i>	66	14,662	
<i>E. gorgonis</i>	141	13,961	
<i>E. gottlebei</i>	3,683	6,852	VU
<i>E. grandidens</i>	1	24,647	
<i>E. gregaria</i>	24	24	
<i>E. guerichiana</i>	1	1	
<i>E. guillauminiana</i>	2,652	3,196	EN
<i>E. guillemetii</i> *	378	725	
<i>E. gummifera</i>	6	6	
<i>E. hadramautica</i>	6	130	
<i>E. hallii</i>	3	73	
<i>E. hamata</i>	84	1,306	
<i>E. hedyotoides</i>	5,533	14,747	EN
<i>E. heptagona</i>	3	140	
<i>E. herman-schwartzii</i>	270	407	EN
<i>E. herrei</i>	1	29	
<i>E. hofstaetteri</i>	339	849	VU
<i>E. horombensis</i>	3,860	5,847	EN

Specimens:			
Species	W	Total	Red List
<i>E. horrida</i>	13	119,195	
<i>E. iharanae</i>	200	1,535	CE
<i>E. imerina</i>	3	3	EN
<i>E. inconstania</i>	2	2,061	
<i>E. indecora</i>	6	9	
<i>E. inermis</i>	3	2,432	
<i>E. intisy</i>	31	37	LC
<i>E. itremensis</i>	1,327	1,340	VU
<i>E. kamerunica</i>	2	3	
<i>E. knuthii</i>	1	546	
<i>E. kondoi</i>	1,380	1,650	CE
<i>E. labatii</i>	863	869	CE
<i>E. lactea</i>	1,500	9,614,627	
<i>E. lactiflua</i>	3	3	
<i>E. larica</i>	1	1	
<i>E. leandriana</i>	505	505	
<i>E. leucodendron</i>	161	242	
<i>E. leucodendron</i> ssp. <i>onocladata</i> 69	232		
<i>E. leuconeura</i>	233	1,508	VU
<i>E. lignosa</i>	5	158	
<i>E. lophogona</i>	263,998	779,270	VU
<i>E. loricata</i>	3	1,897	
<i>E. louwii</i>	35	374	
<i>E. mahabobokensis</i>	300	321	VU
<i>E. mahafalensis</i>	26	81	VU
<i>E. mahafalensis</i> var. <i>xanthadenia</i> 12	12		
<i>E. mainty</i>	108	108	LC
<i>E. mammillaris</i>	3	49,495	
<i>E. mangokyensis</i>	26	26	EN
<i>E. mauritanica</i>	41	275	
<i>E. melanohydrata</i>	10	953	
<i>E. meloformis</i>	233	15,046	
<i>E. micracantha</i>	1	693	
<i>E. millii</i>	7,766	5,887,342	DE
<i>E. millii</i> var. <i>brevilaniensis</i>	2,000	4,000	
<i>E. millii</i> var. <i>hislopii</i>	14	24	
<i>E. millii</i> var. <i>millii</i>	2	821,106	
<i>E. millii</i> var. <i>roseana</i>	7	152	
<i>E. millii</i> var. <i>splendens</i>	72	6,285	
<i>E. millii</i> var. <i>tanarivavae</i>	20	33	
<i>E. millii</i> var. <i>tenuispina</i>	15	762	
<i>E. millii</i> var. <i>tulearensis</i>	10	135	
<i>E. millii</i> var. <i>VUlcarii</i>	5	3,041	
<i>E. millotii</i>	23,100	41,069	CE
<i>E. monteiri</i>	5	330	
<i>E. moratii</i>	12	1,905	VU
<i>E. muirii</i>	3	129	
<i>E. multiceps</i>	85	2,036	
<i>E. multifolia</i>	136	1,253	
<i>E. neobosseri</i>	129	1,133	DE
<i>E. neohumbertii</i>	656	3,232	EN
<i>E. nesemannii</i>	3	277	
<i>E. ornithopus</i>	2	31	
<i>E. pachypodioides</i>	1,046	4,891	CE
<i>E. paulianii</i>	437	876	VU
<i>E. pedilanthoides</i>	1,279	2,029	NT
<i>E. pentagona</i>	3	8,996	
<i>E. perrieri</i>	274	1,196	VU

Specimens:			
Species	W	Total	Red List
<i>E. perrieri</i> var. <i>elongata</i>	2	498	
<i>E. pillansii</i>	2	1,007	
<i>E. plagiantha</i>	45	45	LC
<i>E. poissonii</i>	1,173	1,385	
<i>E. polycephala</i>	3	27	
<i>E. polygona</i>	1	69,032	
<i>E. primulifolia</i>	7,986	8,279	VU
<i>E. primulifolia</i> var. <i>begardii</i>	303	303	
<i>E. primulifolia</i> var. <i>primulifolia</i> 78	78		
<i>E. pseudoglobosa</i>	2	270	
<i>E. pubiglans</i>	2	416	
<i>E. pulvinata</i>	3	13,645	
<i>E. quartzitcola</i>	268	290	EN
<i>E. ramiglans</i>	1	472	
<i>E. razafindratsirae</i>	252	386	CE
<i>E. razafinjohanii</i>	9	29	DE
<i>E. resinifera</i>	4	19,164	
<i>E. rhombifolia</i>	3	4	
<i>E. robivelonae</i>	16	268	CE
<i>E. rossii</i>	775	2,164	VU
<i>E. sakarahaensis</i>	430	1,259	VU
<i>E. schimperi</i>	4	64	
<i>E. schoenlandii</i>	85	2,364	
<i>E. sekukuniensis</i>	2	911	LR
<i>E. silenifolia</i>	798	11,792	
<i>E. spinea</i>	2	232	
<i>Euphorbia</i> spp.*	89,863	18,626,532	
<i>E. squarrosa</i>	100	13,042	
<i>E. stapelioides</i>	5	11	
<i>E. stellata</i>	4,393	48,393	
<i>E. stellispina</i>	68	1,397	
<i>E. stenoclada</i>	67	784	LC
<i>E. subsalsa</i>	3	35	
<i>E. susannae</i>	253	44,172	
<i>E. susannae-mamierae</i>	1,003	1,222	
<i>E. symmetrica</i> *	3	2,793	
<i>E. tardieuana</i>	45	63	DE
<i>E. tenuispinosa</i>	18	24	
<i>E. tetragona</i>	32	2139	
<i>E. thouarsiana</i>	15	15	VU
<i>E. tirucalli</i>	113	912,380	LC
<i>E. tortirama</i>	5	2,003	
<i>E. trichadenia</i>	154	3,097	
<i>E. tridentata</i>	3	78	
<i>E. tuberculata</i>	7	91,014	
<i>E. tuberosa</i>	4	1,626	
<i>E. tuckeyana</i>	26	26	
<i>E. tulearensis</i>	21	283	CE
<i>E. unispina</i>	200	358	
<i>E. venenifica</i>	1,100	1,128	
<i>E. viguieri</i>	14,630	39,755	
<i>E. viguieri</i> var. <i>capuroniana</i>	2	237	
<i>E. viguieri</i> var. <i>tsimbazae</i>	2	2	
<i>E. waringiae</i>	4,185	17,522	VU

ANNEX 2

LISTS OF SPECIES BY CATEGORY DESCRIBED IN PARAGRAPH 25

* indicates species not on the 2003 *Checklist*.

1. 10 species on Appendix I

<i>E. ambovombensis</i>	<i>E. cylindrifolia</i>	<i>E. moratii</i>	<i>E. tulearensis</i>
<i>E. capsaintemariensis</i>	<i>E. decaryi</i>	<i>E. parvicathophora</i>	
<i>E. cremersii</i>	<i>E. francoisii</i>	<i>E. quartzitcola</i>	

2. 199 species to be retained on Appendix II due to potential risk posed by trade

<i>E. aggregata</i>	<i>E. crispa</i>	<i>E. horwoodii</i>	<i>E. plagiantha</i>
<i>E. alata</i>	<i>E. croizatii</i>	<i>E. iharanae</i>	<i>E. poissonii</i>
<i>E. albertensis</i>	<i>E. cryptocaulis</i>	<i>E. imerina</i>	<i>E. polycephala</i>
<i>E. albipollinifera</i>	<i>E. cucumerina</i>	<i>E. inconstantia</i>	<i>E. polygona</i>
<i>E. alfredii</i>	<i>E. curvirama</i>	<i>E. indecora</i>	<i>E. primulifolia</i>
<i>E. analalavensis</i>	<i>E. damarana</i>	<i>E. inermis</i>	<i>E. pseudoglobosa</i>
<i>E. ankarensis</i>	<i>E. decepta</i>	<i>E. intisy</i>	<i>E. pubiglans</i>
<i>E. ankazobensis</i>	<i>E. decorsei</i>	<i>E. itremensis</i>	<i>E. pulvinata</i>
<i>E. annamarieae</i>	<i>E. delphinensis</i>	<i>E. kamerunica</i>	<i>E. radians</i>
<i>E. antisiphilitica</i>	<i>E. denisiana</i>	<i>E. knuthii</i>	<i>E. ramiglans</i>
<i>E. antso</i>	<i>E. denisii*</i>	<i>E. kondoii</i>	<i>E. razafindratsirae</i>
<i>E. aprica*</i>	<i>E. didiereoides</i>	<i>E. labatii</i>	<i>E. razafinjohanii</i>
<i>E. arahaka</i>	<i>E. dregeana</i>	<i>E. lactea</i>	<i>E. resinifera</i>
<i>E. astrophora</i>	<i>E. duranii</i>	<i>E. lactiflua</i>	<i>E. rhombifolia</i>
<i>E. atrispina</i>	<i>E. elliotii</i>	<i>E. larica</i>	<i>E. robivelonae</i>
<i>E. aureoviridiflora</i>	<i>E. enterophora</i>	<i>E. leandriana</i>	<i>E. rossii</i>
<i>E. бага</i>	<i>E. ephedroides</i>	<i>E. leucodendron</i>	<i>E. rubella</i>
<i>E. banae</i>	<i>E. ernestii</i>	<i>E. leuconeura</i>	<i>E. sakarahensis</i>
<i>E. beharensis</i>	<i>E. esculenta</i>	<i>E. lignosa</i>	<i>E. schimperii</i>
<i>E. berorohae</i>	<i>E. famatamboay</i>	<i>E. lophogona</i>	<i>E. ophelandii</i>
<i>E. biaculeata</i>	<i>E. ferox</i>	<i>E. loricata</i>	<i>E. sekukuniensis</i>
<i>E. boinensis</i>	<i>E. fianarantsoae</i>	<i>E. louwii</i>	<i>E. silenifolia</i>
<i>E. boissieri</i>	<i>E. fiherenensis</i>	<i>E. mahabobokensis</i>	<i>E. spinea</i>
<i>E. boiteaui</i>	<i>E. friedrichiae</i>	<i>E. mahafalensis</i>	<i>E. squarrosa</i>
<i>E. bongolavensis</i>	<i>E. fusca</i>	<i>E. mainty</i>	<i>E. stapelioides</i>
<i>E. bosseri</i>	<i>E. gariepina</i>	<i>E. mammillaris</i>	<i>E. stellata</i>
<i>E. x bothae</i>	<i>E. gatbergensis</i>	<i>E. mangokyensis</i>	<i>E. stellispina</i>
<i>E. brachiata</i>	<i>E. genoudiana</i>	<i>E. mauritanica</i>	<i>E. stenoclada</i>
<i>E. braunsii</i>	<i>E. geroldii</i>	<i>E. melanohydrata</i>	<i>E. subpeltatophylla*</i>
<i>E. bulbispina</i>	<i>E. giessii</i>	<i>E. meloformis</i>	<i>E. subsalsa</i>
<i>E. bupleurifolia</i>	<i>E. globosa</i>	<i>E. micracantha</i>	<i>E. susannae</i>
<i>E. burmannii</i>	<i>E. gorgonis</i>	<i>E. millii</i>	<i>E. suzannae-marnieriae</i>
<i>E. cactus</i>	<i>E. gottlebei</i>	<i>E. millotii</i>	<i>E. symmetrica*</i>
<i>E. caerulans</i>	<i>E. grandidens</i>	<i>E. monteiri</i>	<i>E. tardieuana</i>
<i>E. caerulescens</i>	<i>E. gregaria</i>	<i>E. muirii</i>	<i>E. tenuispinosa</i>
<i>E. canariensis</i>	<i>E. guerichiana</i>	<i>E. multiceps</i>	<i>E. tetragona</i>
<i>E. candelabrum</i>	<i>E. guillauminiana</i>	<i>E. multiflora*</i>	<i>E. thouarsiana</i>
<i>E. capmanambatoensis</i>	<i>E. guillemetii*</i>	<i>E. multifolia</i>	<i>E. tirucalli</i>
<i>E. capuronii</i>	<i>E. gummifera</i>	<i>E. neobosseri</i>	<i>E. tortirama</i>
<i>E. caput-aureum</i>	<i>E. gymnocalycioides</i>	<i>E. neohumbertii</i>	<i>E. trichadenia</i>
<i>E. caput-medusae</i>	<i>E. hadramautica</i>	<i>E. nesemannii</i>	<i>E. tridentata</i>
<i>E. caterviflora</i>	<i>E. hallii</i>	<i>E. ornithopus</i>	<i>E. tuberculata</i>
<i>E. cedrorum</i>	<i>E. hamata</i>	<i>E. pachypodioides</i>	<i>E. tuberosa</i>
<i>E. charleswilsoniana</i>	<i>E. hedyotoides</i>	<i>E. pauliana*</i>	<i>E. tuckeyana</i>
<i>E. chersina</i>	<i>E. heptagona</i>	<i>E. paulianii</i>	<i>E. turbiniformis</i>
<i>E. clava</i>	<i>E. herman-schwartzii</i>	<i>E. pedilanthoides</i>	<i>E. unispina</i>
<i>E. clavarioides</i>	<i>E. herrei</i>	<i>E. pentagona</i>	<i>E. venenifera</i>
<i>E. colliculina</i>	<i>E. hofstaetteri</i>	<i>E. perrieri</i>	<i>E. viguieri</i>
<i>E. columnaris</i>	<i>E. horombensis</i>	<i>E. pillansii</i>	<i>E. waringiae</i>
<i>E. crassipes</i>	<i>E. horrida</i>	<i>E. piscidermis</i>	

3. 293 species to be de-listed from Appendix II due to low risk, in trade but not wild-collected

<i>E. abdelkuri</i>	<i>E. davyi</i>	<i>E. imitata</i>	<i>E. phosphorea</i>
<i>E. abyssinica</i>	<i>E. dawei</i>	<i>E. immersa</i>	<i>E. planiceps</i>
<i>E. actinoclada</i>	<i>E. debilispinga</i>	<i>E. inaequispinga</i>	<i>E. platycephala</i>
<i>E. adjurana</i>	<i>E. decidua</i>	<i>E. inarticulata</i>	<i>E. platyclada</i>
<i>E. aeruginosa</i>	<i>E. deightonii</i>	<i>E. ingens</i>	<i>E. plumerioides</i>
<i>E. xambohipotsiensis</i>	<i>E. dekindtii</i>	<i>E. ingenticapsa</i>	<i>E. polyacantha</i>
<i>E. ambroseae</i>	<i>E. desmondii</i>	<i>E. inornata</i>	<i>E. ponderosa</i>
<i>E. ammak</i>	<i>E. dichroa</i>	<i>E. isacantha</i>	<i>E. proballyana</i>
<i>E. angularis</i>	<i>E. dilobadena*</i>	<i>E. jansenvillensis</i>	<i>E. pseudoburuana</i>
<i>E. angustiflora</i>	<i>E. dissitispina</i>	<i>E. jubata</i>	<i>E. pseudocactus</i>
<i>E. anoplia</i>	<i>E. dumeticola</i>	<i>E. juglans</i>	<i>E. pseudoduseimata</i>
<i>E. antiquorum</i>	<i>E. duseimata</i>	<i>E. juttae</i>	<i>E. pseudotuberosa</i>
<i>E. aphylla</i>	<i>E. echinus</i>	<i>E. kalisana</i>	<i>E. pteroclada</i>
<i>E. arbuscula</i>	<i>E. ecklonii</i>	<i>E. keithii</i>	<i>E. pteroneura</i>
<i>E. arceuthobioides</i>	<i>E. eilensis</i>	<i>E. knobelii</i>	<i>E. pugniformis</i>
<i>E. arida</i>	<i>E. elegantissima</i>	<i>E. laikipiensis</i>	<i>E. qarad</i>
<i>E. aspericaulis</i>	<i>E. ellenbeckii</i>	<i>E. lamarckii</i>	<i>E. quadrangularis</i>
<i>E. asthenacantha</i>	<i>E. enopla</i>	<i>E. lambii</i>	<i>E. quadrialata</i>
<i>E. atroflora</i>	<i>E. enormis</i>	<i>E. lavrani</i>	<i>E. quadrilatera</i>
<i>E. atropurpurea</i>	<i>E. epiphylloides</i>	<i>E. ledienii</i>	<i>E. quadrispinga</i>
<i>E. atrox</i>	<i>E. erlangeri</i>	<i>E. lividiflora</i>	<i>E. regis-jubae</i>
<i>E. avasmontana</i>	<i>E. erythroculata*</i>	<i>E. x lomi</i>	<i>E. restricta</i>
<i>E. baioensis</i>	<i>E. espinosa</i>	<i>E. longispina</i>	<i>E. richardsiae</i>
<i>E. ballyana</i>	<i>E. eustacei</i>	<i>E. longituberculosa</i>	<i>E. rivae</i>
<i>E. ballyi</i>	<i>E. evansii</i>	<i>E. lupulina</i>	<i>E. robecchii</i>
<i>E. balsamifera</i>	<i>E. excelsa</i>	<i>E. lydenburgensis</i>	<i>E. royleana</i>
<i>E. barbicollis</i>	<i>E. eyassiana</i>	<i>E. magnicapsula</i>	<i>E. rubrispingosa</i>
<i>E. barnardii</i>	<i>E. fanshawei</i>	<i>E. makallensis</i>	<i>E. rudis</i>
<i>E. barnhartii</i>	<i>E. fascicaulis</i>	<i>E. maleolens</i>	<i>E. samburuensis</i>
<i>E. bayeri</i>	<i>E. fasciculata</i>	<i>E. malevola</i>	<i>E. santapau</i>
<i>E. baylissii</i>	<i>E. filiflora</i>	<i>E. marsabitensis</i>	<i>E. sapinii</i>
<i>E. bergeri</i>	<i>E. fimbriata</i>	<i>E. matabelensis</i>	<i>E. saxorum</i>
<i>E. bergii</i>	<i>E. fissispina</i>	<i>E. mayuranathanii</i>	<i>E. schinzii</i>
<i>E. boranensis</i>	<i>E. flanaganii</i>	<i>E. memoralis</i>	<i>E. schizacantha</i>
<i>E. bougheyi</i>	<i>E. fluminis</i>	<i>E. meridionalis</i>	<i>E. scitula</i>
<i>E. bourgaeana</i>	<i>E. fortissima</i>	<i>E. migiurtinorum</i>	<i>E. sebsebei</i>
<i>E. brachyphylla</i>	<i>E. fortuita</i>	<i>E. misera</i>	<i>E. septentrionalis</i>
<i>E. brakdamensis</i>	<i>E. fractiflexa</i>	<i>E. mitriformis</i>	<i>E. sepulta</i>
<i>E. breviarticulata</i>	<i>E. franckiana</i>	<i>E. mlanjeana</i>	<i>E. setispina</i>
<i>E. brevirama</i>	<i>E. franksiae</i>	<i>E. monacantha</i>	<i>E. similiramea</i>
<i>E. brevitorta</i>	<i>E. fruticosa</i>	<i>E. monadenioides</i>	<i>E. sipolisii</i>
<i>E. brunellii</i>	<i>E. furcata</i>	<i>E. mosaica</i>	<i>E. speciosa</i>
<i>E. bubalina</i>	<i>E. fusiformis</i>	<i>E. multiclava</i>	<i>E. spicata</i>
<i>E. burgeri</i>	<i>E. galgalana</i>	<i>E. namibensis</i>	<i>E. spiralis</i>
<i>E. buruana</i>	<i>E. gemmea</i>	<i>E. namuskluftensis</i>	<i>E. stapfii</i>
<i>E. bwambensis</i>	<i>E. gentiles</i>	<i>E. neriifolia</i>	<i>E. stolonifera</i>
<i>E. cannellii</i>	<i>E. gillettii</i>	<i>E. nigripina</i>	<i>E. strangulata</i>
<i>E. carteriana</i>	<i>E. globulicaulis</i>	<i>E. nivulia</i>	<i>E. submamillar</i>
<i>E. cassythoides</i>	<i>E. glochidiata</i>	<i>E. nubica</i>	<i>E. subscandens</i>
<i>E. cereiformis</i>	<i>E. gossypina</i>	<i>E. nubigena</i>	<i>E. sudanica</i>
<i>E. clandestina</i>	<i>E. gracilicaulis</i>	<i>E. nyassae</i>	<i>E. superans</i>
<i>E. classenii</i>	<i>E. graciliramea</i>	<i>E. obesa</i>	<i>E. taboraensis</i>
<i>E. clavigera</i>	<i>E. grandialata</i>	<i>E. odontophora</i>	<i>E. taruensis</i>
<i>E. clivicola</i>	<i>E. grandicornis</i>	<i>E. officinarum</i>	<i>E. teixeirae</i>
<i>E. colubrina</i>	<i>E. granitica</i>	<i>E. oligoclada</i>	<i>E. teke</i>
<i>E. complexa</i>	<i>E. greenwayi</i>	<i>E. opuntioides</i>	<i>E. tescorum</i>
<i>E. confinalis</i>	<i>E. griseola</i>	<i>E. oxystegia</i>	<i>E. tetracanthoides</i>
<i>E. confluens</i>	<i>E. groenewaldii</i>	<i>E. pachyclada</i>	<i>E. torta</i>
<i>E. consobrina</i>	<i>E. gueinzii</i>	<i>E. parciramulosa</i>	<i>E. tortilis</i>
<i>E. cooperi</i>	<i>E. halipedicola</i>	<i>E. pedemontana</i>	<i>E. triaculeata</i>
<i>E. cryptospinosa</i>	<i>E. handiensis</i>	<i>E. pentops</i>	<i>E. triangularis</i>
<i>E. cumulata</i>	<i>E. heterochroma</i>	<i>E. perangusta</i>	<i>E. trigona</i>
<i>E. cuneata</i>	<i>E. heterospina</i>	<i>E. persistens*</i>	<i>E. tuberculatoides</i>
<i>E. cuprispina</i>	<i>E. holmesiae</i>	<i>E. persistentifolia</i>	<i>E. tubiglans</i>
<i>E. cussonioides</i>	<i>E. hopetownensis</i>	<i>E. petraea</i>	<i>E. uhligiana</i>
<i>E. cylindrica</i>	<i>E. hottentota</i>	<i>E. petricola</i>	<i>E. umbonata</i>
<i>E. dasyacantha</i>	<i>Euphorbia hybrid*</i>	<i>E. phillipsiae</i>	<i>E. umfoloziensis</i>
<i>E. dauana</i>	<i>E. hypogaea</i>	<i>E. phillipsioides</i>	<i>E. undulatifolia</i>

<i>E. vajravelui</i>	<i>E. virosa</i>	<i>E. weberbaueri</i>	<i>E. xylacantha</i>
<i>E. valida*</i>	<i>E. vittata</i>	<i>E. whellanii</i>	<i>E. xylophyloides*</i>
<i>E. vallis</i>	<i>E. volkmaniae</i>	<i>E. wildii</i>	<i>E. zoutpansbergensis</i>
<i>E. vandermerewi</i>	<i>E. vulcanorum</i>	<i>E. williamsonii</i>	
<i>E. venenata</i>	<i>E. wakefieldii</i>	<i>E. woodii</i>	
<i>E. viduiflora</i>	<i>E. waterbergensis</i>	<i>E. xanti</i>	

4. 216 species to be de-listed from Appendix II because not in trade

<i>E. acervata</i>	<i>E. cuneneana</i>	<i>E. leistneri</i>	<i>E. punicea</i>
<i>E. aculeata</i>	<i>E. curocana</i>	<i>E. lemaireana</i>	<i>E. quadrata</i>
<i>E. adenochila</i>	<i>E. dalettiensis</i>	<i>E. lenewontii</i>	<i>E. quaitensis</i>
<i>E. aequoris</i>	<i>E. darbandensis</i>	<i>E. leonensis</i>	<i>E. quinquecostata</i>
<i>E. allicornis</i>	<i>E. decliviticola</i>	<i>E. leontopoda</i>	<i>E. ramulosa</i>
<i>E. amarifontana</i>	<i>E. dedzana</i>	<i>E. letestui</i>	<i>E. reclinata</i>
<i>E. ambarivaotensis</i>	<i>E. demissa</i>	<i>E. limpopoana</i>	<i>E. rectirama</i>
<i>E. amicum</i>	<i>E. dendroides</i>	<i>E. longifolia</i>	<i>E. reptans</i>
<i>E. ampliphylla</i>	<i>E. x dentonii</i>	<i>E. luapulana</i>	<i>E. restituta</i>
<i>E. analavelonensis</i>	<i>E. despoliata</i>	<i>E. lukoseana</i>	<i>E. retrospina</i>
<i>E. x andrefandrovana</i>	<i>E. dhofarensis</i>	<i>E. lumbricalis</i>	<i>E. rhabdodes</i>
<i>E. angrae</i>	<i>E. discrepans</i>	<i>E. macella</i>	<i>E. rowlandii</i>
<i>E. apparicana</i>	<i>E. dispersa</i>	<i>E. mangelsdorffii</i>	<i>E. rubrimarginata</i>
<i>E. applanata</i>	<i>E. distinctissima</i>	<i>E. margaretae</i>	<i>E. rubriseminalis</i>
<i>E. atoto</i>	<i>E. x doinetiana</i>	<i>E. maritae</i>	<i>E. rudolfii</i>
<i>E. atrocarnesina</i>	<i>E. dolichoceras</i>	<i>E. marlothiana</i>	<i>E. rugosiflora</i>
<i>E. attastoma</i>	<i>E. eduardoi</i>	<i>E. martinae</i>	<i>E. sarcodes</i>
<i>E. awashensis</i>	<i>E. eranthes</i>	<i>E. masirahensis</i>	<i>E. sarcothemmoides</i>
<i>E. baleensis</i>	<i>E. erigavensis</i>	<i>E. mcvaughii</i>	<i>E. scarlatina</i>
<i>E. baliola</i>	<i>E. estevesii</i>	<i>E. meeneae</i>	<i>E. schmitzii</i>
<i>E. baradii</i>	<i>E. etuberculosa</i>	<i>E. mira</i>	<i>E. scyphadena</i>
<i>E. bariensis</i>	<i>E. exilis</i>	<i>E. x mitsimbinensis</i>	<i>E. seibanica</i>
<i>E. beillei</i>	<i>E. exilispinga</i>	<i>E. mixta</i>	<i>E. semperflorens</i>
<i>E. bemarahaensis</i>	<i>E. faucicola</i>	<i>E. multifida</i>	<i>E. serendipita</i>
<i>E. berotica</i>	<i>E. fleckii</i>	<i>E. munditii</i>	<i>E. seretii</i>
<i>E. berthelotii</i>	<i>E. forolensis</i>	<i>E. muricata</i>	<i>E. sessiliflora</i>
<i>E. biharamulensis</i>	<i>E. gamkensis</i>	<i>E. mwinilungensis</i>	<i>E. x soanieranensis</i>
<i>E. bitataensis</i>	<i>E. geldorensis</i>	<i>E. myrioclada</i>	<i>E. songweanae</i>
<i>E. bolusii</i>	<i>E. glandularis</i>	<i>E. x navae</i>	<i>E. spartaria</i>
<i>E. bottae</i>	<i>E. goetzei</i>	<i>E. negromontana</i>	<i>E. specksii</i>
<i>E. brassii</i>	<i>E. gradyi</i>	<i>E. nigrispinoides</i>	<i>E. strigosa</i>
<i>E. bravoana</i>	<i>E. guiengola</i>	<i>E. norfolkiana</i>	<i>E. stygiana</i>
<i>E. brevis</i>	<i>E. gumaroi</i>	<i>E. nyikae</i>	<i>E. suffulta</i>
<i>E. broussonetii</i>	<i>E. gymnoclada</i>	<i>E. omariana</i>	<i>E. sumati</i>
<i>E. bruynsii</i>	<i>E. heterodoxa</i>	<i>E. orbiculifolia</i>	<i>E. suppressa</i>
<i>E. bussei</i>	<i>E. hintonii</i>	<i>E. otjipembana</i>	<i>E. susan-holmesiae</i>
<i>E. caducifolia</i>	<i>E. holochlorina</i>	<i>E. pachysantha</i>	<i>E. tanaensis</i>
<i>E. calamiformis</i>	<i>E. hubertii</i>	<i>E. paganorum</i>	<i>E. tenax</i>
<i>E. californica</i>	<i>E. imparispina</i>	<i>E. panchganiensis</i>	<i>E. tetracantha</i>
<i>E. caloderma</i>	<i>E. inculta</i>	<i>E. papilionum</i>	<i>E. thinophila</i>
<i>E. cameronii</i>	<i>E. indurescens</i>	<i>E. parviceps</i>	<i>E. tholicola</i>
<i>E. carunculifera</i>	<i>E. x ingezalahiana</i>	<i>E. patentispina</i>	<i>E. tortistyla</i>
<i>E. castillonii</i>	<i>E. inundaticola</i>	<i>E. pedroi</i>	<i>E. transvaalensis</i>
<i>E. cataractarum</i>	<i>E. invaginata</i>	<i>E. perarmata</i>	<i>E. tsimbazazae</i>
<i>E. cattimandoo</i>	<i>E. johannis</i>	<i>E. perpera</i>	<i>E. tugelensis</i>
<i>E. celata</i>	<i>E. x jubaephylla</i>	<i>E. perplexa</i>	<i>E. turkanensis</i>
<i>E. cibdela</i>	<i>E. kamponii</i>	<i>E. pervittata</i>	<i>E. unicornis</i>
<i>E. comosa</i>	<i>E. kanalensis</i>	<i>E. x petterssonii</i>	<i>E. uzmuk</i>
<i>E. congestiflora</i>	<i>E. kaokoensis</i>	<i>E. piscatorial</i>	<i>E. vaalputsiana</i>
<i>E. conspicua</i>	<i>E. karroensis</i>	<i>E. platyrrhiza</i>	<i>E. venterii</i>
<i>E. contorta</i>	<i>E. kerrii</i>	<i>E. plenispina</i>	<i>E. verruculosa</i>
<i>E. copiapina</i>	<i>E. khandallensis</i>	<i>E. porphyrantha</i>	<i>E. versicolores</i>
<i>E. corniculata</i>	<i>E. lacei</i>	<i>E. prona</i>	<i>E. wilmaniae</i>
<i>E. corymbosa</i>	<i>E. lateriflora</i>	<i>E. psammophila</i>	<i>E. x zanaharensis</i>

5. Additional species from Madagascar to be retained if all Malagasy species will be retained

E. brachyphylla
E. platyclada
E. alcicornis

E. ambarivaotensis
E. analavelonensis
E. bemarahaensis

E. castillonii
E. kamponii
E. x lomi

E. mangelsdorffii
E. martinae
E. pachysantha
E. retrospina

ANNEX 3

EXAMPLES OF LOOKALIKE ISSUES ASSOCIATED WITH RETAINING SOME SUCCULENT *EUPHORBIA* SPECIES ON APPENDIX II WHILE DE-LISTING OTHERS

Scanned digital images of 375 succulent *Euphorbia* were grouped based on gross morphological similarities as assessed by a non-specialist, that is, the only evidence for grouping species into categories was what could be observed in a given image. Most images represent a stem or stems of a given species, rarely a whole plant. No claims are made based on these groupings as to actual morphological or taxonomic relationships among species.

Thirty-five morphological groups of succulent *Euphorbia* were established. Species within morphological groups were then identified as 'to be retained' in Appendix II or 'to be de-listed' according to the current analysis (see paragraph 25). Examples below present paired species from morphological groups, purposefully selected to demonstrate lookalike problems. Lookalike issues with a closely related genus, *Monadenium*, are also shown. More examples can be seen in a companion document to this report.

Slides indicate morphological group ('tuberculate-branching') and scientific name with species indicated for retention ('Retain') shown left side vs. species indicated for deletion ('De-list') shown right side.

tuberculate – branching



Retain
E. fusca



De-list
E. maleolens

tuberculate – medusae type from stem



Retain
E. crassipes

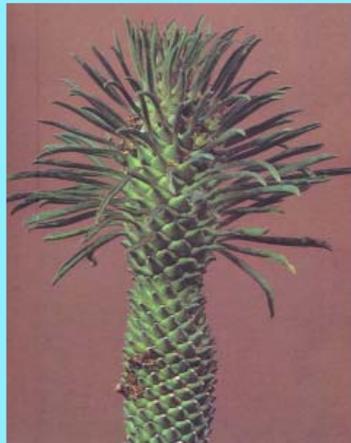


De-list
E. fortuita

tuberculate – leafy



Retain
E. monteroi



De-list
E. clandestina

***ferox* type**



Retain
E. inconstantia



De-list
E. submammilaris

leafy - no spines



Retain
E. bongolavaensis



De-list
E. bravoana

pencil (thin)-stemmed – spiny



Retain
E. horwoodii



De-list
E. serendipita

pencil (thin)-stemmed – no spines



Retain
E. burmannii



De-list
E. aphylla

angular branching – segmented



Retain
E. cactus



De-list
E. grandicornis

angular branching – 4 sides – heavy spines



Retain
E. cactus



De-list
E. strangulata



***Monadenium
lugardae***



***Euphorbia
tugelensis***



***Monadenium
schubei***



***Euphorbia
hypogaea***