TRADE REVIEW

SOUTH AFRICA'S TRADE IN SOUTHERN AFRICAN SUCCULENT PLANTS

David J. Newton

and

Justine Chan

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by David J. Newton and Justine Chan

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1. ACKNOWLEDGEMENTS

The succulent plant trade study has been in the making since the inception of the TRAFFIC programme in South Africa. The scale of the project was not foreseen at the outset, however, it soon became clear that assessing over 5,000 taxa of succulent plants was not to be a simple task. Compounding this situation was the lack of quantitative trade statistics and some complicated taxonomic inconsistencies. In helping us to deal with these problems some key people have been extremely helpful, patient and generous with their time. Professor Paul Fatti, Head, Department Statistics and Actuarial Science, Witwatersrand University, played a crucial role in helping to develop the statistical procedures employed during this study. Craig Hilton-Taylor, National Botanical Institute, has spent many hours advising us on the latest taxonomic changes amongst succulent plants and reviewing the document during several phases of development. The authors are particularly grateful to Akiko Ishihara of TRAFFIC Japan who spent many hours translating Japanese Plant Journals into English and entering the data onto a computer database. This dedication has provided vital information to this project. Special thanks are also due to Ashish Bodasing, Programme Officer, for the development and updating of the several computer databases used during this study. We would also like to thank the documents reviewers. They are Nina Marshall – Senior Programme Officer with TRAFFIC East/Southern Africa, Teresa Mulliken – Programme Officer for TRAFFIC International, Sara Oldfield – IUCN, Dr Marizio Sajeva, Dipartimento Di Scienze Botaniche, University of Palermo, Italy, and Professor Tim Dunne, Head – Department of Maths and Statistics, University of Cape Town. We would also like to thank the CITES Secretariat and all members of the CITES Plants Committee who have supported various aspects of this research. Finally we want to thank the TRAFFIC Network for all their contributions to our research.

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2. INTRODUCTION

Ornamental plants are an important commodity in international trade; in 1985 total world imports of cut flowers, cut foliage and plants already amounted to US$2,488 million (Oldfield, 1992). Yet the same report concluded that plant genetic resources used for ornamental purposes was a lesser priority nationally and internationally, when compared to animals, food, fruit and forage crops. Despite the common usage of sophisticated propagation techniques, significant numbers of plants continue to be removed from the wild for horticultural use. It is also fairly easy for traders to declare wild-collected plants as artificially propagated to avoid CITES controls. This study aims to investigate this issue focusing on the trade in southern African succulent plant taxa in South Africa.

The southern African sub-continent hosts the richest and most diverse succulent flora in the world (Van Jaarsveld, 1987; Smith, *et al.*, 1993). The consumer demand for these diverse flora is well known. Amongst the vast diversity of succulent plants, people of different cultures and nationalities have found uses for many. Within the horticultural industry the wide variety of shapes, colours and sizes has led to demand from collectors and gardeners alike. These same plants, in poorer rural communities, may be used as traditional medicines. The pharmaceutical industry in turn may depend on rural communities to provide them with clues about medicinal uses so that they know where to start looking for unique therapeutic compounds. Without these valuable properties some species may never have been placed under pressure. However, today it is their value that may prevent them, and their associated ecosystems, from being threatened with extinction.

The trade in artificially propagated and wild-collected South African succulent plants involves large volumes of many species. South Africa has a thriving internal trade in succulent plants, based largely on artificially propagated plants produced by the country's well-established nursery community. Limited imports into South Africa are mainly for the horticultural and pot plant trade. Exports form the bulk of the succulent plant trade. Interest in collection, propagation and sale of succulent plants appears to have accelerated during the 1940's and 1950's. Many of the collectors active during this time were amateurs who allegedly accounted for most of the wild plants collected and exported during this time. These people would often sponsor their trips in South Africa from the proceeds of plants collected during their field research. This practice was apparently widespread and accepted. At the same time, just one or two large commercial nurseries accounted for most artificial propagation in the country. Concerns about the effects of wild collecting were minimal during the 1940's, 1950's and 1960's. However, the 1970's saw an awakening when the destruction of *Lithops pseudotruncatella* subsp. *voulkii* and *Lithops julii* subsp. *fulleri* var. *rouxii* populations by commercial collectors became known. These actions, together with the illegal activities of other collectors, allegedly contributed to individuals becoming known as exporters of illegal wild-collected succulents. Today there is still concern that some plants exported as "artificially propagated" are in fact wild-collected. This, if true, threatens wild plant populations and undermines the legitimate trade of some South African based nursery owners. Reports indicate that collectors continue to remove substantial portions of wild populations and sell them overseas. The populations of specific succulent plant species traded on traditional medicine markets are subject to additional pressure.

The postal system, used by traders to transport wild-collected plants, bypasses nature conservation regulations. Without any means in place to measure the volume of the postal plant trade, it is difficult to assess the severity of the problem. Nature conservation authorities, stung by accusations of poor historical management have responded by clamping down on all forms of plant trade (including seed collection). This has not had the desired effect because of inadequate law enforcement capabilities. Because legislation in South Africa is not uniform, it is also possible to bypass many regulations through 'province hopping'. Former 'Homeland' regulations have caused additional confusion.

The main destinations for South Africa's succulent plant exports are Europe, the United States and several far Eastern countries. In Europe, studies have demonstrated that an active trade in South African succulent plants exists (Jenkins, 1993). European, Asian and American plant catalogues and journals displaying advertisements for southern African succulent plant species offer further proof. European plant imports are divisible into three categories, namely, the general or 'supermarket' trade, the prestige 'specimen' trade for the non-specialist trade, and the specialist collector trade. In particular, demand has been concentrated on wild-collected caudiciform genera such as *Adenium, Brachystelma, Cyphostemma, Dioscorea, Euphorbia, Fockea, Pachypodium, Raphionacme* and *Sarcostemma.*

The TRAFFIC Network, IUCN and WWF have conducted several studies of the role that European markets play in the succulent plant industry (Oldfield, 1985; Oldfield, 1985; Jenkins and Oldfield, 1992; Jenkins, 1993). The aim of this report is to fill the gap in knowledge about the market situation in South Africa. The project emphasises both CITES listed and non-CITES listed species using predictive techniques developed through this research. The approach attempts to eliminate the 'fire-fighting' approach normally adopted when a species only gains extra protection once it is already under trade pressure. Due to a limited budget this project has not benefited from a comprehensive market survey within South Africa or abroad. To mitigate this deficiency TRAFFIC surveyed experts from the scientific, hobbyist and nursery industry to assess the validity of the priority list.

To provide the study with a focus the primarily western-based horticultural trade has been studied. A separate TRAFFIC report in preparation examines medicinal uses of succulents. Factors such as habitat destruction by agriculture fall beyond the scope of this project. In achieving the aim of this research the following six objectives were set:

- To determine the species and trade volumes of southern African succulent plants being exported from South Africa.
- To document the species being sold in national and international markets;
- To identify species potentially threatened by trade.
- To identify species of conservation concern requiring further in-depth research;
- To assess the effectiveness of relevant plant legislation in controlling the succulent plant trade in southern Africa.
- To make recommendations aimed at improving trade controls and the conservation of southern African succulent plants.

3. METHODOLOGY

Activities designed to achieve the objectives outlined in the introduction follow below.

3.1. Selection of Succulent Plant Taxa

In selecting the southern African succulent plant taxa to be examined, three qualifying criteria were set:

- Taxa had to fit the following definition of a succulent plant, namely, 'A succulent is a plant which stores water in the stem, leaves, roots or rhizomes giving them a fleshy appearance, enabling them to survive long, hot, rainless periods' (Smith *et al.* 1993).
- Taxa were chosen from the following plant families:

Aizoaceae (Mesembryanthemaceae)	Aloaceae
Apocynaceae	Asclepiadaceae
Asphodelaceae	Brassicaceae
Chenopodiaceae	Compositae (Asteraceae)
Crassulaceae	Dioscoreaceae
Dracaenaceae	Euphorbiaceae
Geraniaceae	Goodeniaceae
Hyacinthaceae	Lamiaceae
Liliaceae	Passifloraceae
Pedaliaceae	Piperaceae
Portulacaceae	Rubiaceae
Sterculiaceae	Vitaceae
Zygophyllaceae	

- Taxa had to be endemic to southern Africa, defined to include South Africa, Lesotho, Swaziland, Namibia, Botswana, Zimbabwe and Mozambique.

The nomenclature of Arnold and De Wet (1993) was followed except for the genera *Conophytum* (Hammer, 1993), *Lithops* (Cole, 1988), *Gasteria* (Van Jaarsveld, 1994) and *Haworthia* (Bayer, 1982; Scott, 1985) where other authoritative monographs were available. The validity of species not contained in Arnold and De Wet (1993) or the monographs were assessed with the assistance of the Conservation Biology Research Unit, National Botanical Institute (Hilton-Taylor, *in litt.*, 1994).

3.2. Literature review

The literature review was undertaken to:

- gather information on the history of the trade and to identify reasons for the demand in succulent plants.
- identify trade studies previously conducted on succulent plants in order to obtain relevant trade data and prevent duplication of research efforts.
- gather information on the priority species identified in this study (see section 4.2.5) regarding their biology, ecology, conservation status, ethnobotany and propagation. This information would identify characteristics of species making them vulnerable to trade.

3.3. Export Permit Data and CITES Annual Reports

3.3.1 Collection and Analysis of Exemption Certificates, CITES and non-CITES permit data

Data from CITES and non-CITES export permits, for the period 1981 to March 1995, issued by Cape Nature Conservation (CNC), Natal Parks Board (NPB), Directorate of Nature and Environmental Conservation – Orange Free State (OFS) and the Chief Directorate of Nature and Environmental Conservation – Transvaal (TNC), were captured on a database. CNC Exemption Certificate data were also included in this database. Exemption Certificates granted to nursery owners for the export of CITES species, *in place* of CITES permits, expedited permitting procedures for nursery owners. *Aloe ferox* data, excluded from this analysis, is available in a detailed trade report by Newton and Vaughan (1996).

Analysis of CITES, non-CITES and Exemption Certificate data involved four main activities, namely:

- Determination of major importing countries, description of imports and the quantity of succulent plants reportedly received by each.
- Determination of annual export quantities from South Africa.
- Determination of species traded for one year or more from 1981 to 1995.
- Determination of number of Red Data Book (RDB) species exported.

3.3.2. Analysis of South Africa's CITES Annual Reports

The World Conservation Monitoring Centre (WCMC) provided comparative tabulations for the period 1991 to 1995. These were compared with South Africa's CITES Annual reports for 1991, 1993 and 1994. The aim was to assess the accuracy of Annual Reports and to identify trade discrepancies between importing countries and South Africa (see Section 4.1.2 and 4.1.3).

3.4. Collection and Analysis of Succulent Plant Nursery Catalogue Data

The TRAFFIC Network and the German CITES Scientific Authority assisted TRAFFIC East/Southern Africa: South Africa (TESA – ZA) in obtaining 171 succulent plant nursery catalogues (1990-1994)(see Section 4.2). The majority of catalogues (158) dated from 1993 and 1994. The research yielded publications from Czechoslovakia (CS), France (FR), Germany (DE), Ireland (IE), Japan (JP), Netherlands (NL), South Africa (ZA), Switzerland (CH), United Kingdom (GB) and United States of America (US).

Data entered into the Succulent Plant Database (SPD) from catalogues included:

- Species names and synonyms.
- Plant collection locality.
- Plant form (plant, seedling or seed).
- Quantity of plant available.
- Unit volume (whole plant, seed packet, seed capsule).
- Pot diameter (in centimetre's).
- Collector's number.
- Plant source.
- Plant price, and
- Specific plant characteristics making them attractive to potential buyers.

Hilton-Taylor (1996a; 1996b) provided the RDB status of species identified in catalogues. TRAFFIC Japan provided data from Japanese plant catalogues. Classification of species as artificially propagated (AP) or wild-collected (WC) were based on information given in catalogues. Plants of unstated origins

were marked as 'unknown' (UNK). The conversion of catalogue prices into South African Rands proceeded using the annual average exchange rate for each country (Rasodi, *in litt.*, 1995; Vogel, *in litt.*, 1995). Species names from catalogues have, in most cases, been corrected to reflect recent taxonomic changes. Most taxonomic errors have occured with the genera Haworthia and Conophytum.

Some preliminary analyses provided valuable insights into the data. Analysis-of-variance (using Microsoft Excel version 4) tested the relationship between price and source of 16,861 catalogue records (7,318 AP; 9,197 UNK and 346 WC). Although this test detected significant evidence of higher prices (F-test = 5%) between WC and AP plants, and between WC and UNK plant sources, the low number of reported WC data points casts doubt on the reliability of this result. Consequently, no further use was made of this data and exploration of other analytical tools was conducted.

Further analysis proceeded in collaboration with the Department of Statistics and Actuarial Science, University of the Witwatersrand. Analysis-of-variance comparing price versus country of sale data revealed a significant difference in prices between countries (F-test = 5%). Thus, it became apparent that inter-country price differences could not be ignored. On this basis data were subdivided into country files and countries named according to International Standards Organisation (ISO) codes. For each country, prices for the years 1990 to 1993 were converted to 1994 prices to offset the bias introduced by inflation. The conversion of prices was done using the consumer price indices of individual countries (Morudu, *in litt.*, 1995). Unless otherwise stated, all prices from this point on can be converted to US Dollars using the exchange rate of one United States Dollar to 3.55 South African Rand.

To refine the selection of species potentially threatened by trade, further selection of the SPD data became necessary. The main analysis only incorporated data for plants offered for sale as whole plants (SUP), cuttings (CUT) and seedlings (SL). Therefore taxa advertised for sale as seed were excluded under the assumption that seed availability indicated a lower likelihood of trade threat to species.

Finally, after all data modifications and exclusions, descriptive statistics and price dynamic histograms representing price versus frequency of offer-for-sale in each country were compiled (see Section 4.2.1 and 4.2.2).

3.5. Determination of potentially threatened species from catalogue data

To identify species potentially threatened by trade, it was first necessary to determine whether there was an association between high price and the distribution of RDB species listed in catalogues. The following procedures were followed:

- Nine categories of price data derived from histograms were compiled. All species included in the upper 5, 10, 15, 20, 25, 30, 40, 50 and 100 percent of price data were selected. This set of categories encompassed every price from a narrow range of high prices to a broader range of high to lower prices.
- The unique number of RDB species classified as Extinct (Ex), Endangered (E), Vulnerable (V), Vulnerable/Endangered (V/E), Rare (R), Rare/Vulnerable (R/V) in each category was determined.
- A species list was produced by selecting the highest price categories collectively containing 50% or more of all RDB species advertised for sale in each country.

This method highlighted the weak positive association between high price and RDB species demonstrating that catalogues tend to record higher prices for RDB species than non-RDB species. A conclusion derived from this association is that the high prices asked for RDB species extends to non-

RDB, but threatened, species included in the same higher price categories. Hence, all of the species in this selected upper 50% price category are regarded as candidates for a potentially threatened species list and ultimately the priority species list (see section 4.2.5).

3.5.1. Summarising association between high prices and RDB species

To measure the above association, TRAFFIC utilised the Gini index (Dollar and Jensen, 1971), to measure the distribution inequality of RDB species within the total price and species database. In this study RDB species are compared with the more numerous non-RDB species, as the cumulative relative frequencies or proportions move through categories of increasing price (see Section 4.2.3). The price categories chosen were:

R0.00	to	R9.99
R10.00	to	R19.99
R20.00	to	R29.99
R30.00	to	R39.99
R40.00	to	R49.99
R50.00	to	R59.99
R60.00	to	R700.99

The value of the Gini index ranges from 0 to 1 where:

- Zero (0) indicates that RDB species in the population are distributed evenly in the price categories.
- One (1) indicates that distribution of the RDB species is skewed totally to the highest price category.

Values between zero and one suggest some degree of upward price shift of RDB species relative to other non-RDB species.

The Gini index was calculated only for countries such as DE, GB, JP, NL, US and ZA having sufficient price data for analysis. The equation for the Gini index is:

$$G = 1 - 2 \quad (\sum P*CumY) + \sum(Y*P)$$

Sigma ($\sum$)	=	sum over the entire range of ranked categories
P	=	proportion of all traded non-RDB species in price category.
Y	=	proportion of all traded RDB species in a price category.
CumY	=	cumulative proportion of all traded RDB species at a specific price category.
CumP	=	cumulative proportion of all traded non-RDB species at a specific price category.
*	=	multiplication.
Sigma P	=	Sigma Y = 1

CumP on the x-axis was plotted against CumY (y-axis) to obtain the Lorenz curve. The area between the Lorenz curve and the Line of Equality is a visual representation of the inequality present for RDB species.

3.6. Identification of potentially threatened species

The potentially threatened species list resulted from the combination of two lists. Extraction for the first used the following criterion:

- Taxa occurred in any price category species list which contained 50% or more of total RDB species recorded in trade for each country; and
- Taxa were traded in volumes of 100 units or greater per annum from South Africa (for the period 1981 to March 1995) according to CITES and non-CITES permit information.

The second list used the following criterion:

- Taxa occurred in any price category species list which contained 50% or more of total RDB species recorded in trade for each country; and
- Taxa were not recorded as exports by South Africa.

The two lists were then combined into one, resulting in a unique list of potentially threatened species (see Section 4.2.4). The RDB status (Hilton-Taylor, 1996a; 1996b) of the species provided confirmation of a potentially threatened species or priority species and was not used as a primary selection criterion at any stage.

3.7. Consultation with experts in developing the final priority species list

A questionnaire was distributed to experts to collect additional information on the potentially threatened species list and to develop a final priority species list. Experts were chosen based on their knowledge of succulent plant species and/or involvement in the propagation and sale of plants. Experts were requested to:

- Identify those species on the list threatened by trade.
- Identify additional species threatened by trade.
- Identify biological characteristics of the species (for example, life span and reproductive rate) which make it vulnerable to trade.
- Identify species threatened by non-trade factors and to specify such threats to the species.

Taxa were placed on the priority species list:

- If 50% or more of responding experts regarded a taxon as threatened by trade; and, the taxon had one or more of the following characteristics: slow growth, difficult propagation, limited distribution, small populations, low levels of seed production, were sought after or were over- or illegally collected.
- If one or more experts identified additional trade threatened species not listed in the questionnaire.

Taxa were excluded from the priority species list:

- If experts were uncertain or had no comment to make about the taxon, i.e. were allocated a question mark by the experts.
- If one or more experts regarded species as not threatened by trade.

The consultation process resulted in a final priority list of species threatened by trade. This list was then analysed in depth to determine its accuracy (see Section 4.2.5).

3.8. Review of national plant trade legislation

Examination of South African national and provincial laws allowed assessment of their effectiveness in controlling the trade in succulent plants (see Section 4.3).

3.9. Assessment of the undocumented trade in southern African succulent plants

The extent of undocumented trade from South Africa (see Section 4.4) was determined by:

- Comparing a list of taxa derived from export documents with those advertised in catalogues to determine species exported onto the international market without meeting permit requirements as laid out in Table 7. The list excluded taxa available as seed.
- Comparing export documents with CITES Annual Reports for 1991, 1993 and 1994 to document potentially illegal trade not reported by South Africa. Due to time constraints the Annual Report for 1992 was not analysed.
- Gathering information on illegal trade by consultation with law enforcement agencies and other experts.

4. RESULTS AND DISCUSSION

4.1 Analysis of South Africa's exports of succulent plants

Representatives of 25 plant families, totalling 5,128 species, subspecies and varieties, were selected. Of these 2,227 were found advertised in plant catalogues and 1,158 appeared in export documents. Detailed analyses of export and catalogue data follow below.

4.1.1. CITES permits, non-CITES export permits and Exemption Certificates

The project entailed analysis of 1,203 CITES and non-CITES export permits. These permits included 24 exemption certificates, consisting of 11,587 records dated from 1981 to March 1995. Table 1 lists the type and total number of plant items involved in permitted transactions. South Africa exported succulent plants to 31 countries as well as small quantities to several unidentified destinations. The Netherlands, Germany, Switzerland, United Kingdom and Italy were the largest European importers (Table 1). Of these countries, the Netherlands imported the greatest amount of material. A European nursery survey conducted by Jenkins and Oldfield (1992) established that Germany was the largest specialist market for cacti and succulents. These results indicate that plant importation occurs via the Netherlands, and perhaps other countries into Germany. The largest non-European importers were the United States and Japan. South Africa recorded the largest export volumes during 1985 and 1992 (Table 2) with seedlings generally forming the bulk of exported plants. A total of 1,158 southern African succulent plant taxa (species, sub-species and varieties) were recorded on export documents (Fig. 1). Of total species exports, 835 (72%) were not listed by CITES, 321 (28%) were CITES Appendix II species and 2 (0.2%) CITES Appendix I species. The majority of succulent plants exported from 1992 to 1995 appeared in trade for only one year (See Appendix 1 of this document). South Africa exported 147 RDB species from 1981 to March 1995 (See Fig. 2 and Appendix 1), the majority of which were from the genera *Aloe, Euphorbia* and *Lithops.*

4.1.2. South Africa's CITES Annual reports

Examination of South Africa's Annual Reports (AR) for 1991, 1993 and 1994 highlighted minor discrepancies and problems in the reporting of actual permits issued. These are not discussed further here. However, the more serious omission from Annual Reports of exemption certificates issued by the former department of Cape Nature Conservation is highlighted here. During the period 1981 to 1992, selected nurseries traded CITES listed succulent plants under the authority of 24 exemption certificates. These certificates contained records for 73 *Euphorbia* species and 22 other genera covering 24 species. The estimated total number of seedlings and plant cuttings exported amounted to 18,881 items, none of which were included in the country's Annual Reports. This inadequate reporting continues currently. Despite implementation problems an advantage of the exemption certificate system is that the reported number of plants traded reflects actual nursery sales and is consequently more accurate than CITES permits issued. Other provinces were not found to have caused similar omissions which reflects well on the standard of reporting for these authorities.

4.1.3. Comparative Tabulations of International Trade with South Africa

Comparative tabulations obtained from WCMC for 1991, 1993 and 1994 were examined and compared to South Africa's Annual Reports for the same years. Three main problems were found during analysis. Firstly, the importing country may sometimes not report receiving plants declared as exported by South Africa. Secondly, South Africa may sometimes not report exports documented as imports by the recipient country. Thirdly, both countries could report the import and export of plant shipments but with a discrepancy in reported numbers.

Table 1: Quantity and description of succulent plant specimens exported from South Africa to importing countries, 1981 to March 1995.

Sum of Quantity	Quantity and Description of succulent plant specimens							
Country of Import	Dry Flower	Herbarium Specimen	Packets of Seed	Plants	Plant Cuttings	Seed Capsules	Seed	Seedlings
??	0	0	0	187	16	0	0	1,100
AN	0	0	0	10	0	0	0	0
AT	0	0	48	361	254	0	0	689
AU	0	0	1,795	318	110	0	0	233
BE	0	0	223	104	0	0	5	0
BR	0	0	0	60	0	0	0	0
CA	0	0	73	47	35	14	0	91
CH	0	0	102	409	181	21,651	5	980
DE	142	1,080	82	88,135	1,491	0	3,050	50,264
ES	0	0	0	129	0	0	0	10
FR	0	0	0	725	176	0	0	603
GB	0	0	865	16,357	717	34	220	2,635
HK	0	0	2	153	11	0	0	441
HO				20	0	0	0	0
ID	0	0	0	0	50	0	0	0
IE	0	0	0	100	0	0	0	0
IL	0	0	0	14	0	0	0	0
IN	0	0	0	40	0	0	0	0
IT	0	0	119	7,122	1,076	0	6,271	4,471
JP	0	2	649	22,255	448	0	6,003	4,760
KE	0	0	0	5	0	0	0	0
MC	0	0	0	0	0	0	0	3
MT	0	0	0	22	17	0	0	57
NA	0	0	0	259	0	0	0	0
NL	0	0	144	80,823	2,949	0	0	721,275
NZ	0	0	730	0	0	0	0	0
PL	0	0	0	2	3	0	0	0
PT	0	0	0	4	0	0	0	0
SE	0	0	8	28	0	12	0	0
SG	0	0	0	108	0	0	0	0
US	0	0	1,490	20,177	571	364	14,814	4,129
ZW	0	0	0	171	0	0	0	0
Grand Total	**142**	**1,082**	**6,330**	**238,145**	**8,105**	**22,075**	**30,368**	**791,741**

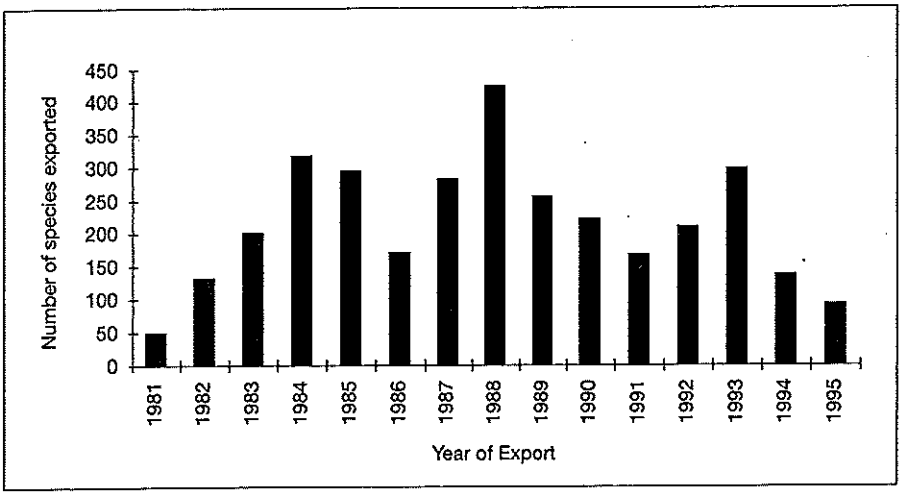
Source: South African CITES permits, non-CITES permits and Exemption Certificates.

Table 2: Annual exports of succulent plants from South Africa, 1981 to March 1995.

Sum of Quantity	Description							
Year	Dry Flower	Herbarium Specimen	Packets of Seed	Plants	Plant Cuttings	Seed Capsules	Seed	Seedlings
1981	0	0	0	76	176	0	0	320
1982	0	0	2,184	8,666	257	5,857	12,658	1,301
1983	140	0	1,381	2,108	0	10,913	350	30,650
1984	0	0	1,929	4,902	174	5,000	6,000	125
1985	0	0	780	32,405	448	0	20	479,344
1986	0	0	22	9,612	1,184	0	6	2,204
1987	0	297	0	12,488	1,119	0	0	42,303
1988	0	570	0	9,290	1,375	0	0	42,013
1989	0	0	0	38,486	1,113	0	5	11,389
1990	0	2	9	36,862	1,102	0	987	6,569
1991	0	0	0	57,485	590	0	542	20,102
1992	2	74	20	3,560	299	305	4,800	117,596
1993	0	139	5	5,270	44	0	5,000	22,945
1994	0	0	0	13,232	128	0	0	2,053
1995	0	0	0	3,703	96	0	0	12,827
Grand Total	142	1,082	6,330	238,145	8,105	22,075	30,368	791,741

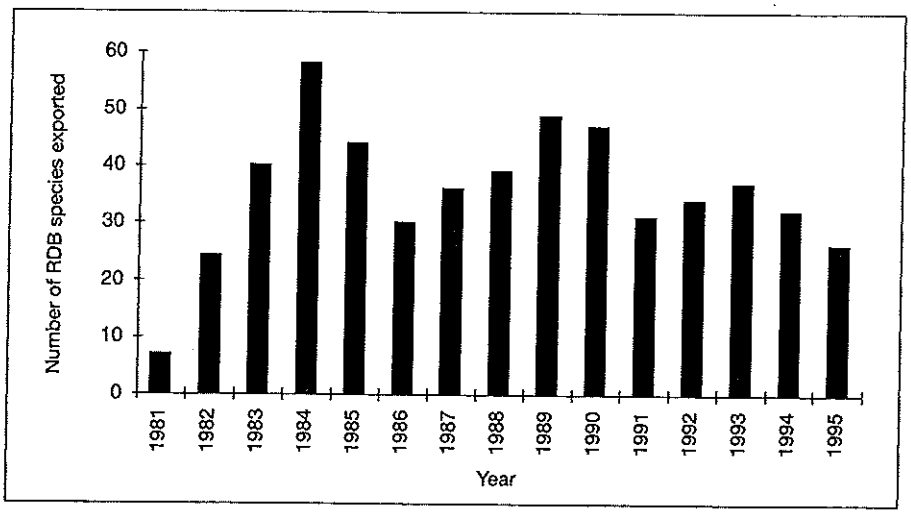
Source: South African CITES permits, non-CITES permits and Exemption Certificates

Fig. 1: Number of taxa exported per year from South Africa, 1981 to March 1995



Source: South African CITES permits, non-CITES permits and Exemption Certificates

Fig. 2: Number of RDB Species Exported from South Africa, 1981 to March 1995



Source: South African CITES permits, non-CITES permits, Exemption Certificates and the South African Red Data Book (Hilton-Taylor, 1996a; 1996b)

There are several possible explanations for recipient countries not having reported receiving plants:

- The export did not occur; the permit was not used but was reported in South Africa's Annual Report.
- The importer deliberately or by mistake did not declare the shipment on import.
- The exporter applied for a permit listing an export far larger than required. When the recipient listed a small import the large discrepancy became apparent. For instance, in 1991 there was a combined discrepancy of approximately 30,984 *Euphorbia sp.* plants between the annual reports of South Africa and recipient countries that may be due to this type of incident. However, the fact that South Africa reports different destinations to the recipients reporting imports indicates this may not be the case. Other reasons may be that the shipment did not occur or that the recipients did not, for one or other reason, report the shipment.
- The CITES MA in the importing country failed to report import.

Where South Africa has not reported exporting plants, the following reasons may apply:

- Exemption certificates were used as export permits instead of CITES documents. Although South African authorities do not include these certificates in Annual Reports or inspect shipments on departure, importing authorities do sometimes report them during inspections. This could be the explanation for *Euphorbia crispa, E. esculenta, E. gentilis, E. groenewaldii, E. squarrosa* and *E. symmetrica* exports during 1991. These species do not appear on any CITES permits but are logged on exemption certificates. Despite this reporting, the importing country may not recognise these as valid CITES documents and will question the import. United Kingdom, for example, has queried exemption certificates issued for cycad imports.
- Export permits issued but not included in the South African Annual Report. For instance in 1993 this occurred with *Euphorbia bupleurifolia, E. crispa, E. groenewaldii, E. prostrata, E. symmetrica* and *E. tuberosa.* Germany reported receiving the shipment.
- Export permits entered into Annual Report but not reflected in CITES data. For instance in 1994 this occurred with *Euphorbia arida, E. brakdamensis* and *E. bupleurifolia* amongst others. This may be due to the fact that WCMC does not enter artificially propagated plant data into comparative tabulations.
- No export permit or exemption certificate issued but reported by recipient country. For instance, Germany reported importing *Euphorbia memoralis* in 1991 but apparently without matching export documents from South Africa.

In conclusion, although there is no obvious indication of major illegal trade in South African CITES listed plants, administrative problems are causing over- and under-reporting in South Africa's Annual Report.

4.2 Analysis of succulent plant nursery catalogue data

The inaccurate nature of some provincial CITES permit data has complicated analysis of South Africa's trade in southern African succulent plants. Similarly, because plant catalogue data provides no information about trade quantities, this limits the conclusions which can be drawn from its analysis. However, simple comparisons between CITES permit data and plant catalogue information produce useful indicators of market trends. For instance, in the nine countries surveyed, excluding South Africa, 873 succulent plants species were offered for sale without any documented export record from South Africa. Many of these species were from the genera *Aloe, Brachystelma, Cheiridopsis, Conophytum, Crassula, Haworthia, Euphorbia* and *Pelargonium* (Table 3; Appendix 2). Appendix 2 also reflects the offer for sale of particular RDB species. The lack of export records, together with the criterion that seed of these taxa is not available in catalogues, indicates that the species were exported illegally as plants or seedlings. This criterion assumes that where seed is not available there is a greater chance that wild-collected specimens are utilized. It also takes into account the reality that wild-collected plants are sometimes declared as artificially propagated plants and seedlings to avoid CITES controls. Other possibilities which can explain the lack of permits are (1) that the species were exported prior to the study period, or (2) as pre-Convention plants and seed, or (3) that seeds were exported without CITES permits due to the exemption provided for seeds and sterile seedlings or tissue cultures of CITES-listed succulent plants or (4) that the species is endemic to or distributed in a neighboring country. The plants would then be subject to that country's export regulations and would not be documented in South Africa export records. The full implications of these possibilities are unknown.

The 873 species recorded for sale in catalogues, but not reported as exported by South Africa, excludes the majority of those species distributed free-of-charge as seeds by South African botanical organisations. Despite this procedure the question of documentation for reliable tracking of all seed exports arises as historical exports could explain how some taxa, now advertised in catalogues, left the country without documentation. Currently, many species of seed leave the country via the postal system without any record, contrary to the spirit of South Africa's developing policy for Biodiversity and Plant Genetic Resources. It also appears to be illegal, as provincial ordinances require permits for the export of all flora (see section 4.4 and Table 7). Several of the larger government and non-government botanical organisations mistakenly believe these rules do not apply to them for the sole reason that their material is artificially propagated in National Botanical Gardens. Conditions for the export of flora from each province are laid out in section 4.4.2.

The only exemptions to normal permitting requirements are in the former Transvaal and Orange Free State provinces who allow landowners, or other representative parties, to export any '*Indigenous*' plant, not otherwise protected, without permits (see section 4.2.2 and Table 7). This provision may allow organisations to grow some species, those with the lowest level of protection, on their own property and to export without permits. If listed on CITES, all provinces apply the normal permitting requirements and exemptions as laid out by the Convention. A point of concern arises in Section 13 of the Transvaal Ordinance which states that the government is not bound by the ordinance. This applies only to organisations having a mandate to work in the field of nature conservation, for instance, Gauteng Nature Conservation and the National Botanical Institute. It does not affect the provisions of CITES nor would it apply to departments such as the South African National Defence Force. According to Gauteng Nature Conservation sources this exemption is being written out of their new provincial ordinance. The closing of this exemption is in line with South Africa's Environmental White Paper (Government Gazette, 28 July 1997) which insists on the government being accountable to the South African public.

Table 3: The number of species per genus offered for sale overseas, but without export permits

Genus	Total Number of Species	Genus	Total Number of Species	Genus	Total Number of Species
Conophytum	68	*Drosanthemum*	4	*Chamaesyce*	1
Haworthia	94	*Hoodia*	4	*Cyphostemma*	1
Aloe	29	*Kalanchoe*	4	*Didymaotus*	1
Euphorbia	45	*Machairophyllum*	4	*Fenestraria*	1
Crassula	34	*Malephora*	3	*Fockea*	1
Pelargonium	36	*Nananthus*	4	*Hallianthus*	1
Cheiridopsis	32	*Orbeopsis*	2	*Herreanthus*	1
Brachystelma	25	*Pachycymbium*	4	*Jacobsenia*	1
Huernia	23	*Rhinephyllum*	4	*Jensenobotrya*	1
Adromischus	17	*Sceletium*	4	*Jordaaniella*	1
Gasteria	16	*Astridia*	3	*Kleinia*	1
Ruschia	24	*Carpobrotus*	3	*Luckhoffia*	1
Cephalophyllum	23	*Dracophilus*	3	*Mitrophyllum*	1
Lampranthus	20	*Eberlanzia*	3	*Monadenium*	1
Delosperma	20	*Erepsia*	3	*Namaquanthus*	1
Stapelia	18	*Leipoldtia*	3	*Nelia*	1
Anacampseros	3	*Mestoklema*	2	*Notechidnopsis*	1
Glottiphyllum	15	*Odontophorus*	3	*Orbeanthus*	1
Ceropegia	7	*Osteospermum*	3	*Peperomia*	1
Faucaria	12	*Pectinaria*	3	*Platythyra*	1
Plectranthus	14	*Rhombophyllum*	2	*Poellnitzia*	1
Tylecodon	11	*Vanheerdea*	3	*Psammophora*	1
Piaranthus	10	*Acrodon*	2	*Ruschianthus*	1
Duvalia	9	*Adenia*	1	*Sarcostemma*	1
Stomatium	11	*Aptenia*	2	*Schwantesia*	1
Gibbaeum	9	*Braunsia*	2	*Semnanthe*	1
Ophthalmophyllum	10	*Bulbine*	2	*Smicrostigma*	1
Othonna	10	*Carruanthus*	2	*Synadenium*	1
Cotyledon	5	*Disphyma*	2	*Tanquana*	1
Senecio	9	*Khadia*	2	*Trichodiadema*	1
Aloinopsis	8	*Lavrania*	1	*Tromotriche*	1
Juttadinteria	8	*Lithops*	1		
Argyroderma	6	*Orthopterum*	2		
Hereroa	7	*Rabiea*	1		
Bergeranthus	6	*Scopologena*	2	GRAND TOTAL	873
Lachenalia	5	*Sesamothamnus*	2		
Sarcocaulon	6	*Stapeliopsis*	2		
Cylindrophyllum	5	*Talinum*	2		
Ebracteola	5	*Antegibbaeum*	1		
Monilaria	2	*Arenifera*	1		
Orbea	3	*Aridaria*	1		
Ornithogalum	5	*Astroloba*	1		
Pleiospilos	1	*Bowiea*	1		
Titanopsis	4	*Bryophyllum*	1		
Tridentea	4	*Caralluma*	1		
Dinteranthus	1	*Cerochlamys*	1		

Source: South African CITES, non CITES and Exemption Certificates compared to Succulent plant catalogues

The Nature and Environmental Conservation Ordinance 19 of 1974, in force in the Western, Northern and Eastern Cape provinces, strictly applies the ruling that all plants, from the highest to lowest levels of protection, require permits for export. Depending on the species involved the permit could either be a CITES document or a Nature Conservation permit issued in accordance with the Ordinance. The collection of plants or seed for scientific purposes or other purpose also require permits issued on a case-by-case basis. All exporters, without exemption, of indigenous plants or seed whether artificially propagated or wild-collected must obtain export permits.

In conclusion, it appears that there is a large export trade in succulent plants which are not recorded by the South African government. This is explained to a limited extent by historical exports of seed, by post, to many international destinations which may have been used to propagate some of the taxa now advertised in catalogues. However, although the amount of seed involved in these exports is small there appears to be uncertainty and misunderstanding about the precise interpretation of provincial laws regarding the use of export permits for seed. This has exacerbated the situation and made identification of illegal trade difficult.

4.2.1 Price Distribution Histograms

As illustrated in histograms for Switzerland, Czechoslovakia, Germany, France, United Kingdom, Japan, United States and South Africa (Fig. 3 to 12) there is a predominant clustering of prices in the lower price categories. According to Fatti (pers. comm., 1996) this skewed distribution is a typical trend in market price data. Ireland and Netherlands do not show this distribution, caused mainly by the low number of succulent plant catalogues sampled for those countries and hence small data set.

4.2.2 Descriptive statistics on prices for each country

Table 4 presents descriptive statistics for succulent plant prices advertised in ten countries. There is a notable variation in price dynamics from country to country. The cost of living for each country is largely responsible for this variation. Although prices in Czechoslovakia seem low compared to Japan, they would be high for citizens in terms of that country's per capita income, inflation rate and currency value. The relative value of currencies heavily influences the likely level of demand for a species. For instance, due to lower pricing, international demand for plants advertised in a Czechoslovakian catalogue would be far higher than for plants advertised in a Japanese catalogue.

Table 4: Descriptive statistics on prices for 10 countries expressed in South African Rands

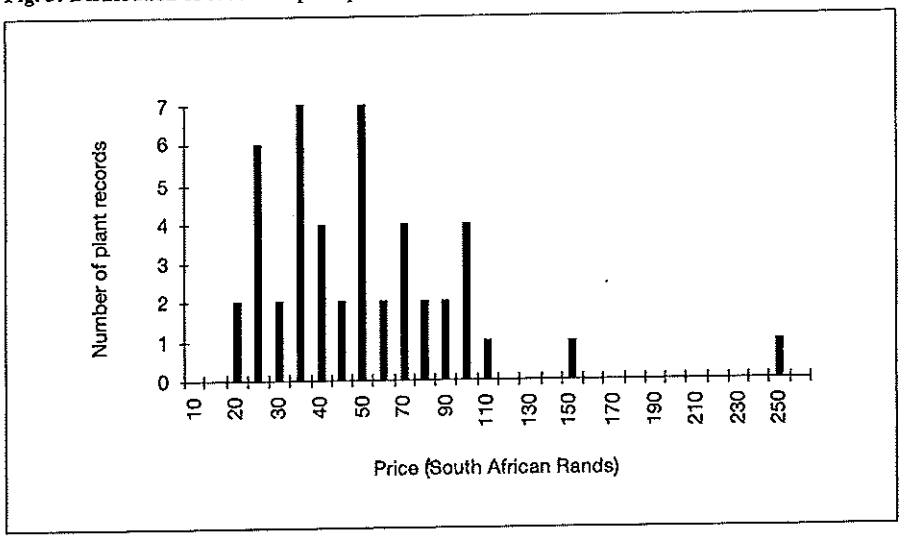
Descriptive statistics	CH	CS	DE	FR	GB	IE	JP	NL	US	ZA
Mean[1]	55.41	2.37	28.67	10.87	12.94	11.93	84.67	12.51	17.28	12.47
Mode[2]	24.63	1.24	19.67	8.95	8.16	10.60	13.88	9.74	10.65	4.39
Minimum	16.85	1.24	4.37	7.03	2.48	10.60	1.03	1.95	1.52	1.50
Maximum	246.31	5.33	522.79	31.96	97.93	13.26	6,246.92	83.77	213.07	106.53
No. records	47	12	360	43	993	4	722	167	2180	456

Source: Succulent plant nursery catalogues, 1990 to 1994.

[1] The mean is the average
[2] The mode is the most frequently occurring value in a range of data

CH – SWITZERLAND: Data were collected from one catalogue. Based on mode price Switzerland asks the highest prices for succulent plants (Table 4; Fig. 3). The most commonly advertised price is R24.63 compared to R1.24 to R19.67 for all other countries. Although Switzerland has the highest minimum price (R16.85), its maximum price of R246.31 is only the third highest after Japan and Germany. The mean price was R55.41. These statistics, derived from a small data set of 47 records, may be misleading. However, according to Jenkins (1993) the specialist market for succulents is small and consequently the small data set may be reflecting this fact. The country's total imports of 23,328 mixed plant items (Table 1) also shows the relatively small size of the market. Jenkins (1993) reported that imports are apparently well controlled and in 1993 there did not appear to be a significant trade in wild-collected plants. The emphasis on seed imports (21,651 capsules) from South Africa seems to reflect the importance of artificial propagation. This study found no evidence of an illegal trade.

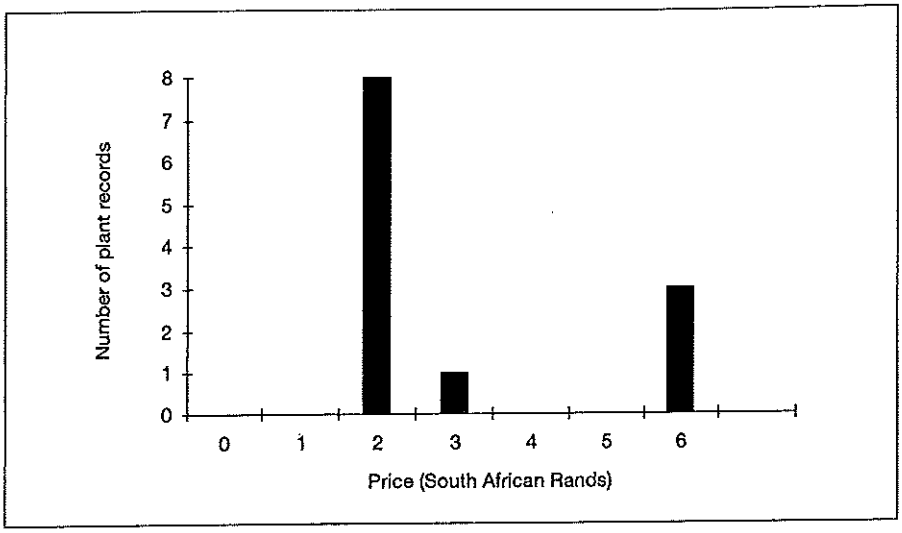
Fig. 3: Distribution of succulent plant prices for Switzerland (1990-1994)



Source: Succulent plant nursery catalogues.

CS – CZECHOSLOVAKIA (NOW DIVIDED INTO SLOVAKIA AND CZECH REPUBLIC): Data were collected from three plant catalogues. The mode price for succulent plants in the former Czechoslovakia is very low when compared to other countries (Table 4; Fig. 4) and is probably due to the low cost of living in that country. Most plants were offered for sale at R1.24 with R5.33 being the maximum price and the mean R2.37. According to Jenkins (1993) this country, at the time of their survey, had about 5,000 collectors of Mexican cacti, but did not have the economic or practical abilities to import wild-collected succulent plants from southern Africa. Jenkins (1993) did not mention interest in non-cactus succulent plants, although, in recent years one catalogue has started advertising succulent plants from South Africa for which no export documents have been issued.

Fig. 4: Distribution of succulent plant price for Czechoslavakia (1990-1994)



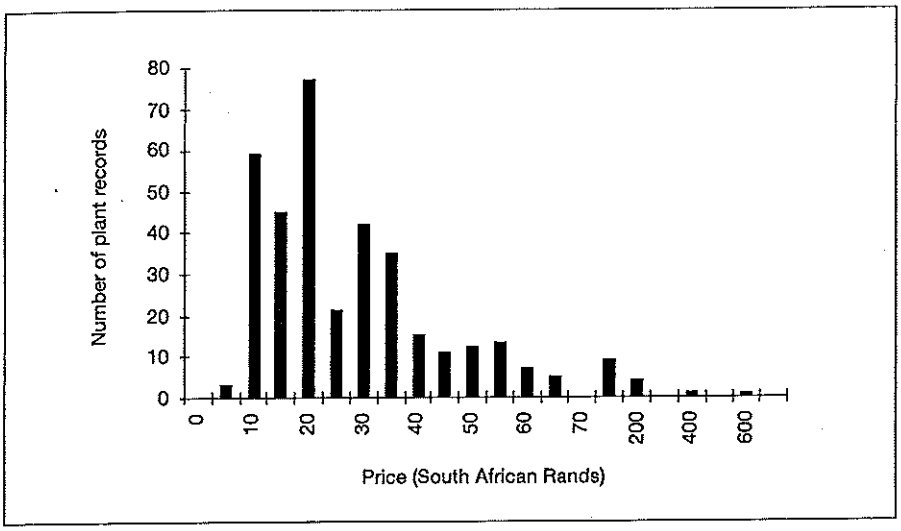
Source: Succulent plant nursery catalogues.

DE – GERMANY: Data were collected from eleven plant catalogues. Germany has the second highest mode price after Switzerland! Plants are most frequently offered for sale at R19.67 (Table 4; Fig. 5). The minimum recorded price in Germany is R4.37, the mean R28.67 and the maximum price R522.79. The latter is low compared to Japan's maximum of R6,246.92. According to Oldfield (1985), CITES reports from Germany's trading partners show the country to be a major importer of succulent plants. Jenkins (1993) reported that Germany was one of the largest specialist markets or epicentre for succulent plants in Europe. According to CITES permit data during the period 1981 to 1995, Germany imported 144,244 mixed plant items making it one of South Africa's largest succulent plant trading partners.

Oldfield (1985) reported that the most commonly available southern African succulent plant species, namely *Ceropegia debilis, Euphorbia obesa, E. caput-medusae, E. grandicornis, E. tirucalli, E. trigona* and *Pachypodium saundersii*, were grown from seed in the Mediterranean region.

According to Jenkins (1993) Germany had 57 listed producers of succulent plants and cacti in 1993. Apparently only two producers were major importers of wild-collected Madagascan and southern African succulents yet there is a steady demand for wild-collected specimens (Jenkins, 1993). Nurseries, collectors or dealers based in South Africa allegedly collect the plants from the wild, providing false declarations of artificial propagation. It is not possible to substantiate this allegation as South African Authorities inspect relatively few plant shipments. It is believed that traders use the postal system to export an unknown quantity of wild-collected plants to international destinations, as evidenced by documented confiscation's in section 4.4. Jenkins (1993) found that the number of wild-collected species on sale in Germany had increased in the two to three years leading up to the study. However, during his research the same author noted a new tendency to move away from supplying wild-collected plants to artificially propagated stock.

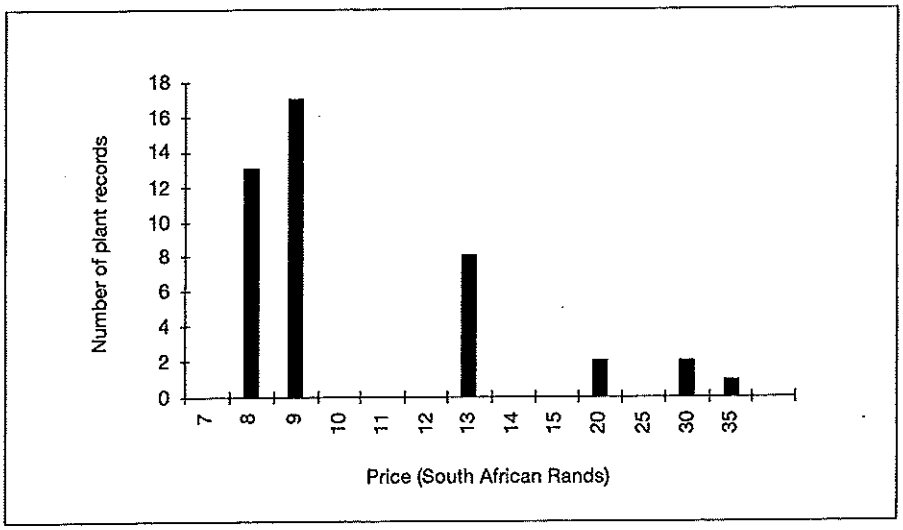
Fig. 5: Distribution of succulent plant prices for Germany (1990-1994)



Source: Succulent plant nursery catalogues.

FR – FRANCE: Data were collected from one plant catalogue. Over the 15 year period under review France imported 1,504 mixed plant items. This small trade reflects the finding of Jenkins (1993) that the specialist collector's market comprises 200 to 300 individuals supplied from only two nurseries. The price structure is similar to that of the United Kingdom and Netherlands with a mode price of R8.95 (Table 4; Fig. 6), mean of R10.87, minimum of R7.03 and maximum of R31.96. The limited amount of price data available for France also seems to reflect the small size of the market. According to Jenkins (1993) well-established facilities for commercial production of succulent plants are situated in the Cote du Midi. These nurseries supply the local and northern European market. Despite the large amount of propagation small numbers of wild-collected *Pachypodium bispinosum* plants were observed in many places. This indicates that an illegal trade exists but it is likely to be small.

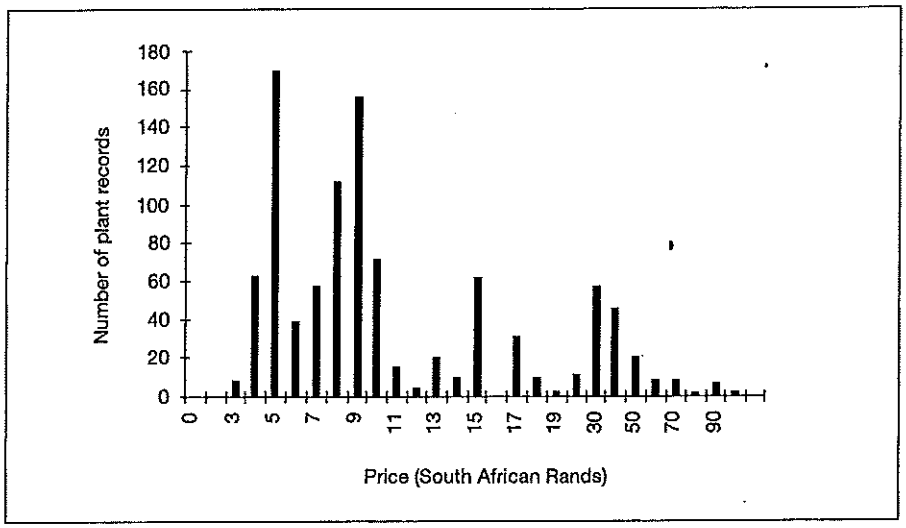
Fig. 6: Distribution of succulent plant prices for France (1990-1994)



Source: Succulent plant nursery catalogues.

GB – UNITED KINGDOM: Data were collected from 51 plant catalogues. Over a 15 year period from 1981 to 1995 United Kingdom imported 20,828 plant items from South Africa. A survey of British nurseries conducted by Oldfield in 1985 found very little evidence of wild-collected southern African succulents being sold, and artificial propagation seemed to be the norm. This historical dependence on artificially propagated plants seems to be reflected in current price trends. The mode price of R8.16 indicates that prices in United Kingdom are one of the cheapest of the countries surveyed (Table 4; Fig. 7). Although its mode price is greater than in South Africa and Czechoslovakia it is the only country with a maximum price less than South Africa's. The mean is R12.94 while the minimum is R2.48. However, some nurseries had wild-collected mother plants used for plant and seed production. The reason for the lack of wild-collected plants on the market was said to be that British consumers can easily order them from continental nurseries in Germany, Belgium and the Netherlands.

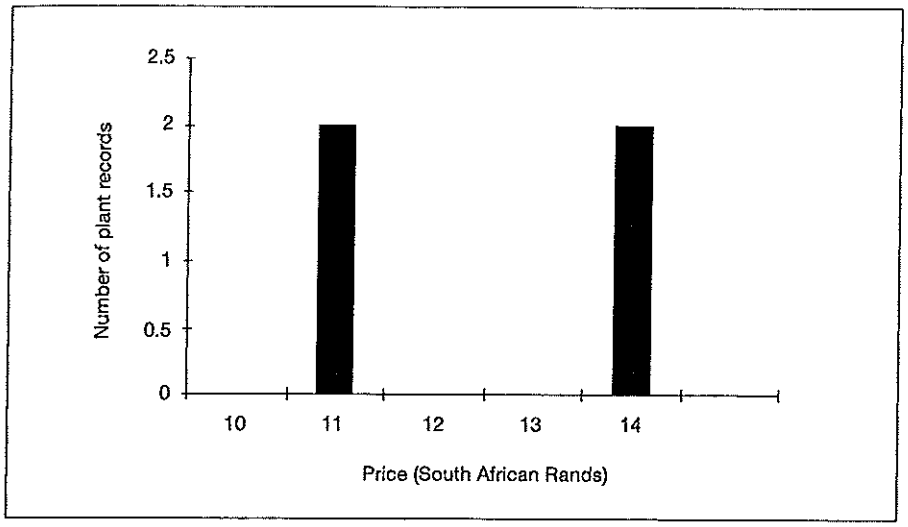
Fig. 7: Distribution of succulent plant prices for Great Britain (1990-1994)



Source: Succulent plant nursery catalogues.

IE – IRELAND: Data were collected from two plant catalogues. Oldfield (1985) reported that 1982 CITES statistics of exporting countries show a very small number of CITES listed succulents exported to Ireland. This low level of trade was also found during this study with total exports of only 100 plant items over 15 years being noted. Ireland's mode price is ranked the 5th highest of the 10 countries (Table 4; Fig. 8). However, these prices are not considered representative since the data set consisted of only 4 records. The mean is R11.93, the minimum R10.60 and the maximum R13.26. No other information was available on the Irish industry.

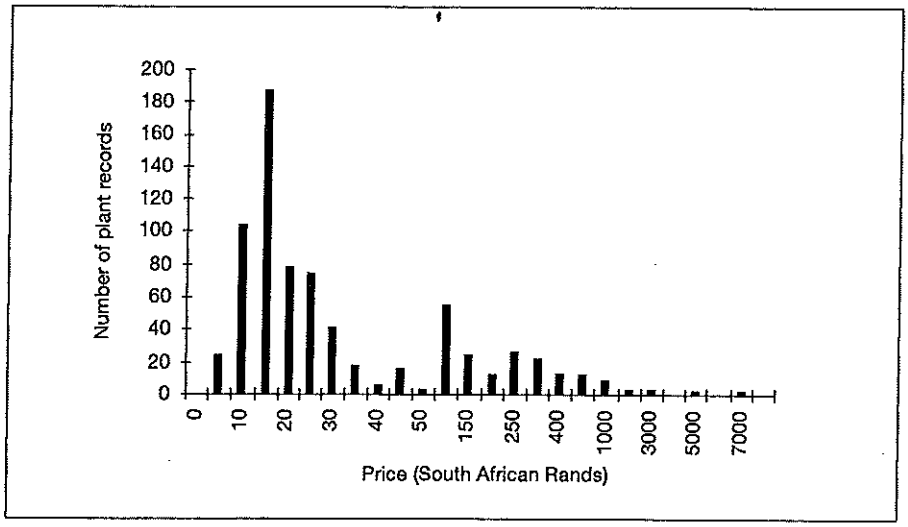
Fig. 8: Distribution of succulent plant prices for Ireland (1990-1994)



Source: Succulent plant nursery catalogues.

JP – JAPAN: Data were collected from 15 plant catalogues. Recorded exports to Japan amount to a modest 34,117 mixed plant items. However, prices charged for plants in Japan are amongst the highest out of the countries surveyed. Japan's mode price is the third highest after Switzerland and Germany (Table 4; Fig. 9). Prices in Japan vary widely from R1.03 to R6,246.92, which is the highest price asked for a succulent plant in the 10 countries surveyed. The mean price is R84.67. Japan thus appears to be a lucrative market for southern African succulents.

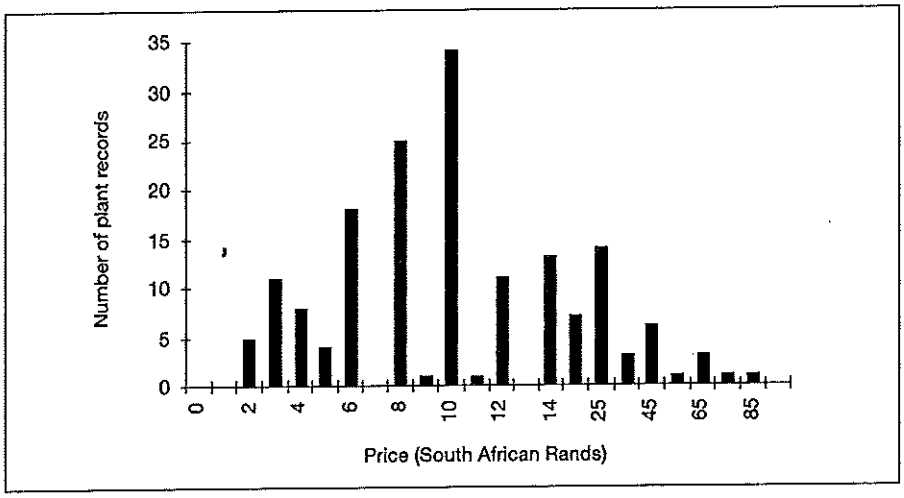
Fig. 9: Distribution of succulent plant prices for Japan (1990-1994)



Source: Succulent plant nursery catalogues.

NL – NETHERLANDS: Data were collected from six plant catalogues. According to Jenkins (1993) the Netherlands is a major producer of mixed, non-specific artificially propagated succulent plants for the general horticultural trade. Larger plants are often imported from nurseries in the Canary Islands and Morocco. There are several nurseries (eight to ten) catering for specialists but the majority of plants are reported to be artificially propagated with only a small proportion being wild-collected. In this study the Netherlands appears to be the largest importer of southern Africa succulents with imports totalling 805,191 plant items over a 15 year period. The Netherlands plays an important role in Europe as distributor of plants and many plants may be re-exported to other countries, especially Germany. Prices charged for succulents are relatively low indicating that most are artificially propagated. The country's mode price is ranked sixth with the maximum R83.77 (Table 4; Fig. 10), the mean R12.51 and the minimum R1.95.

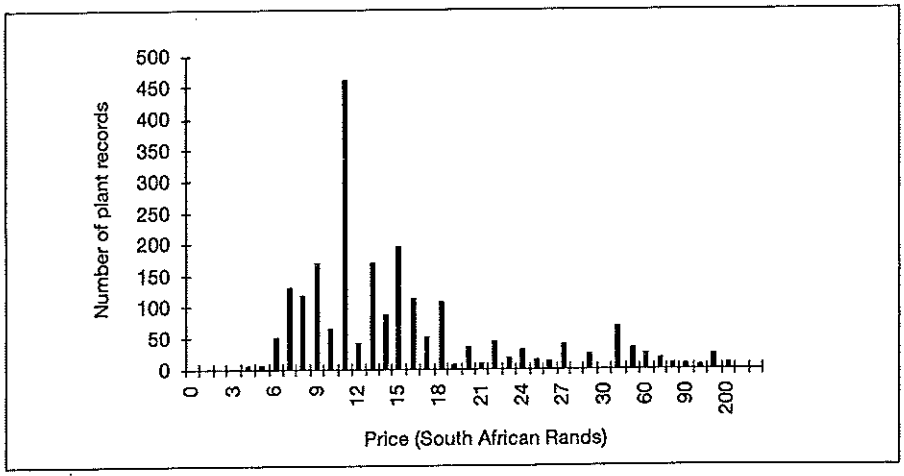
Fig. 10: Distribution of succulent plant prices for Netherlands (1990-1994)



Source: Succulent plant nursery catalogues.

US – UNITED STATES OF AMERICA: Data were collected from 56 plant catalogues. The United States is the third largest importer of succulent plants with 41,545 mixed plant items recorded over a ten year period. It ranks fourth in its mode price (Table 4; Fig. 11) and the mean is R17.28.

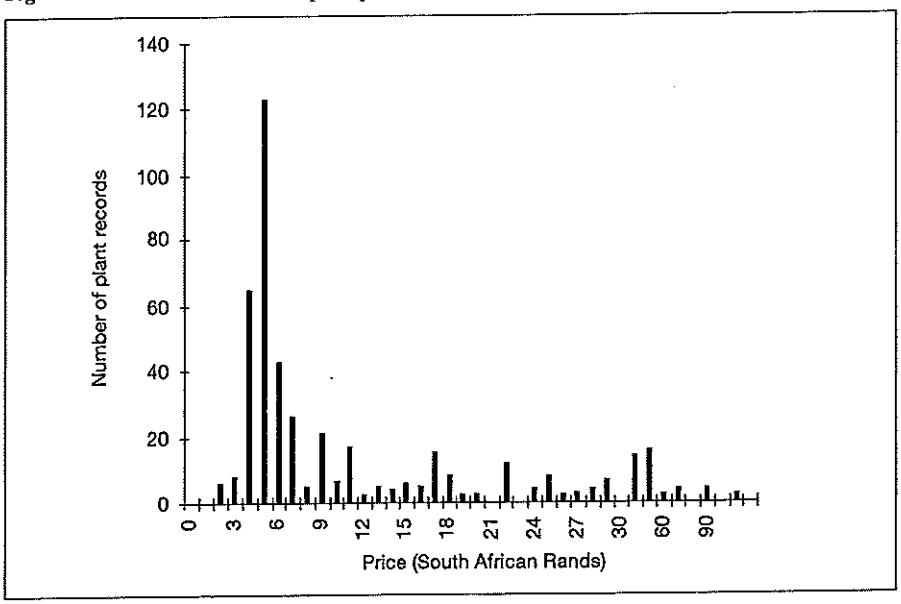
Fig. 11: Distribution of succulent plant prices for the United States of America (1990-1994)



Source: Succulent plant nursery catalogues.

ZA – SOUTH AFRICA: Data were collected from 25 plant catalogues. South Africa's mode price for succulents is the second lowest of all countries surveyed (Table 4; Fig. 12). This can be accounted for by South Africa's function as source of many endemic succulent plant species. Being the first rung in the market chain, prices are low compared to the country's main trading partners. The maximum price of R106.53 is exceeded by Japan, Switzerland, Germany and United States. The mean is R12.47 and the minimum R1.50.

Fig. 12: Distribution of succulent plant prices for South Africa (1990-1994)



Source: Succulent plant nursery catalogues.

4.2.3 Association between Higher Price and RDB species

Between 72 and 86% of South African RDB species occurred in the upper 50 % category of plant price histograms for Japan, South Africa, United Kingdom and United States (Table 5). Possibly due to a lack of data, Germany and Netherlands have an unexpected low 50% of RDB species in the upper 50%; Czechoslovakia and Switzerland have 33%; France and Ireland 0%. Thus for Japan, South Africa, United Kingdom and United States the number of RDB species in the upper 50% price category appears to indicate that RDB species are more likely to fetch higher prices, and conversely that species occurring in the upper 50 % category, but not listed in the RDB, are also more likely to be threatened by trade.

4.2.3.1 Independent Test of Association between High Price and RDB species

The Gini index for the main succulent plant importers Germany and the Netherlands (Figs 13 and 16) were extremely weak. This demonstrated the even distribution of RDB species throughout the price categories and supports the results expressed in Table 5. Explanations for this are speculative, but based on interpretation of available market information, have some merit. Firstly, the data sets for both countries are small and not fully representative. In contextualising this factor it is important to note the lack of catalogue data resulting from the low number of specialist succulent nurseries (Jenkins, 1993). Secondly, both countries either propagate or import propagated plants listed in the RDB; this may reduce the value of these species compared to wild-collected specimens. This in turn would reduce the number of RDB species clustering in high price categories. The approximately even distribution across all price ranges of fifty-six RDB species, including hard-to propagate species, supports this view.

To understand the dynamics of 'ease of propagation' as a measure of rarity and value TRAFFIC conducted a survey with the National Botanical Institute (Hilton-Taylor in litt., 1997). The survey included RDB species identified as popular in Germany and the Netherlands. Results indicated that species from the higher price bracket were not collectively harder to propagate than lower priced species. Hence, the use of propagation difficulty as a means to predict high price and market demand for a group of species does not appear to be reliable. This is not surprising as success in propagation often depends on individual growers using special techniques on a species-by-species basis. The development of individual propagation systems is probably the reason for the movement of some formerly high priced species into lower price brackets and resultant lack of RDB clustering. The survey revealed rare species in both groups but low prices for some indicated that propagation had ceased to be a limiting factor due to the activity of individual growers. *Brachystelma ngomense* illustrates this situation by its appearance in low price categories for Germany. In contrast, the species appears on the final priority list (Appendix 4) because two South African experts consider it difficult to propagate. They hold this view despite the fact that individual propagators in South Africa and the United States have successful propagation techniques and are feeding cheaper plants into the market, including Germany. A complicating factor expressed by a South Africa nursery owner is that historically, many advertised *B. ngomense* plants were actually *B. coddii* plants. This is an easily propagated species and could be the reason for the low price of so-called '*B. ngomense*' plants. Clearly, judgement of effects on species populations must be done individually, taking into account all species limiting and market demand factors.

Table 5: Number of RDB species represented in the upper percentage of price data for each country

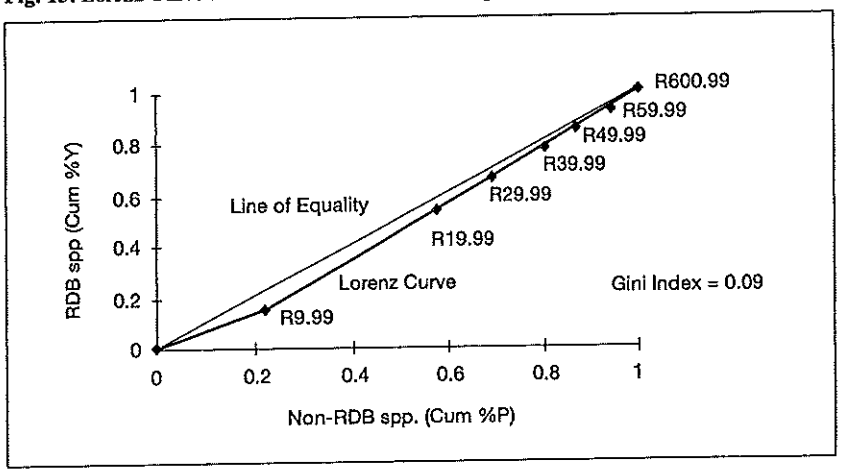
Upper Percentage of price data	CH	Percent	CS	Percent	DE	Percent	FR	GB	Percent	IE	JP	Percent	NL	Percent	US	Percent	ZA	Percent
5	1	17	1	33	2	5	0	11	25	0	1	4	0	0	17	20	6	13
10	2	33	1	33	4	10	0	14	32	0	5	17	1	6	31	37	12	25
15	2	33	1	33	9	23	0	14	32	0	8	28	1	6	45	53	15	31
20	2	33	1	33	9	23	0	22	50	0	14	48	3	19	50	59	16	33
25	2	33	1	33	11	28	0	24	55	0	18	62	5	31	58	68	21	44
30	2	33	1	33	11	28	0	30	68	0	18	62	8	50	58	68	21	44
40	2	33	1	33	14	35	0	32	73	0	22	76	8	50	60	71	31	65
50	2	33	1	33	19	48	0	32	73	0	25	86	8	50	66	78	35	73
100	6		3		40		0	44		0	29		16		85		48	
Total no. of records 100% category	**47**		**12**		**360**		**43**	**993**		**4**	**722**		**167**		**2180**		**456**	
Total no. of species 100% category	**34**		**11**		**180**		**15**	**373**		**2**	**234**		**116**		**604**		**278**	

Source: Succulent plant nursery catalogues, 1990 to 1994.

The Gini index for United Kingdom, Japan and United States confirms a weak tendency (0.3 to 0.38) for RDB species to be clustered in the higher price categories (Figs. 14, 15 and 18). Again, explanations for the clustering of RDB species are speculative. It is known that United Kingdom, Japan and the United States are significant, but not majority importers of succulent plants from South Africa and many other sources including the Netherlands and Germany. Hence it is possible to surmise that these countries do not propagate the rarer plants to the same degree as Germany and the Netherlands. This would require them to import propagated and wild plants. This was found to be the situation for the United Kingdom by Jenkins (1993). Consequently, market supply and demand pressures would push prices upwards for the rarer plant species such as those listed on the RDB and hence cause clustering. This explanation appears to be supported by the fact that many of the plants on the priority list are either hard to propagate and/or are rare, or at the other extreme are relatively common and very popular.

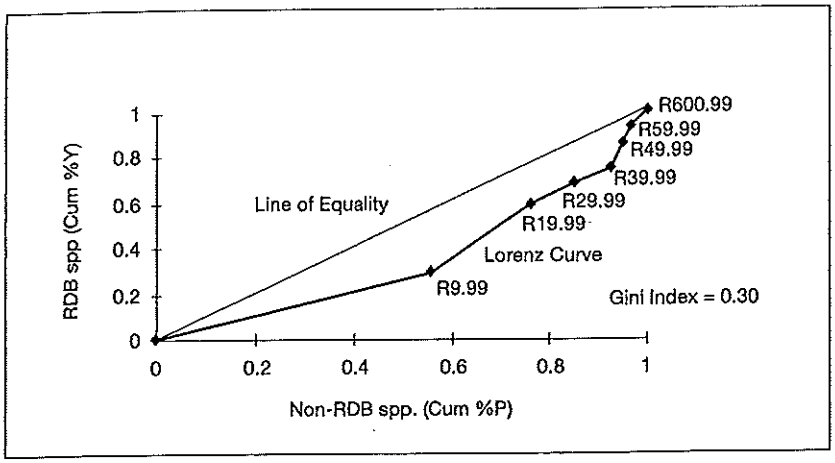
The Gini index for South Africa (0.23) places it in the middle of the field (Fig. 17). This could be explained by the fact that South Africa plays the role as supplier, producer and consumer of succulent plants. Much trade in artificially propagated plants occurs on the domestic market, while several nurseries and dealers also supply propagated and wild-collected plants to the international market. As there is little documentation recording the legal export of wild plants, it must be assumed that the majority of this trade occurs illegally and mainly through the postal system. The volume of this trade is unknown, but is thought to be limited to the specialist collector market. The South African traders alleged to be trading illegally overseas generally do not respond to local requests for plants, and quote US Dollar or British Pound prices for the plants. These quoted prices tend to be higher than local prices because the species are rare (for instance *Brachystelma* sp.) and are aimed at a more affluent market. These prices included in the South African analysis tend to cause a clustering of RDB and other rare species in the higher price brackets. This clustering would be counteracted by the trend for most other South African catalogue prices to be lower on the basis that they cater for the domestic market. The end result is a middle-of-the-road Gini index.

Fig. 13: Lorenz Curve and Gini Index for non-RDB species versus RDB species in Germany.



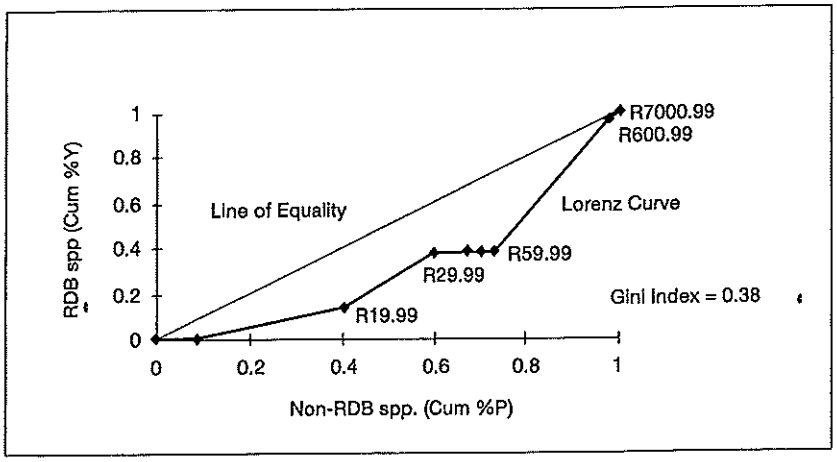
Source: Succulent plant nursery catalogues, 1990 to 1994.

Fig. 14: Lorenz Curve and Gini Index for non-RDB species versus RDB species in United Kingdom.



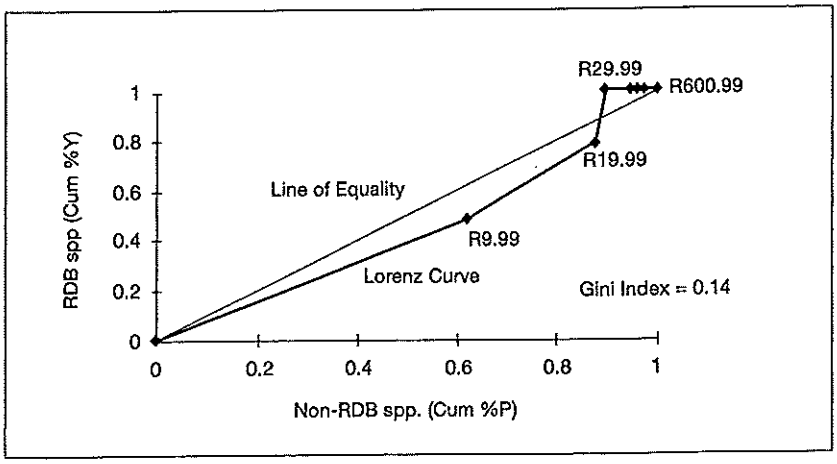
Source: Succulent plant nursery catalogues, 1990 to 1994.

Fig. 15: Lorenz Curve and Gini Index for non-RDB species versus RDB species in Japan.



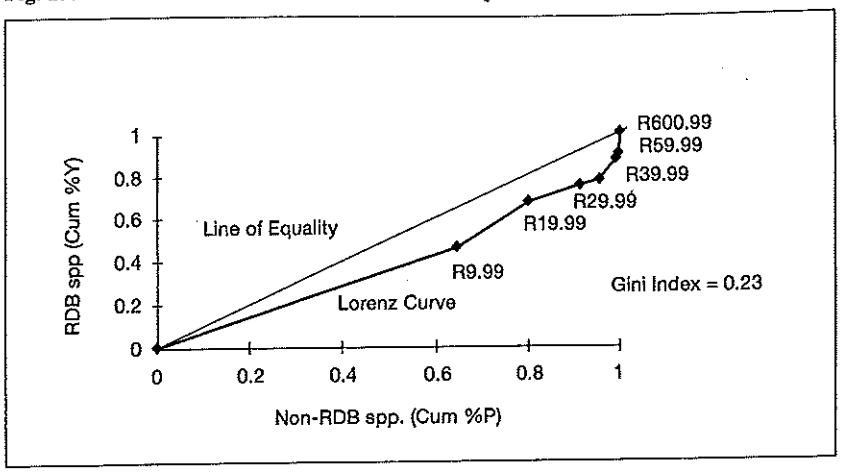
Source: Succulent plant nursery catalogues, 1990 to 1994.

Fig. 16: Lorenz Curve and Gini Index for non-RDB species versus RDB species in Netherlands



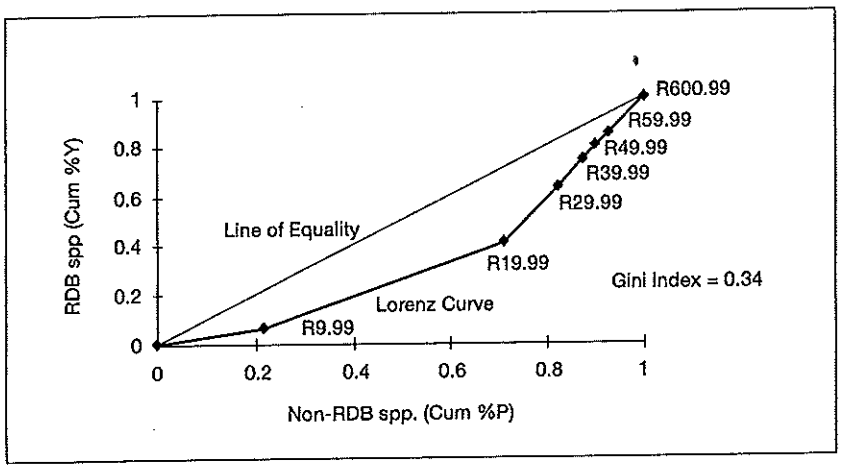
Source: Succulent plant nursery catalogues, 1990 to 1994.

Fig. 17: Lorenz Curve and Gini Index for non-RDB species versus RDB species in South Africa



Source: Succulent plant nursery catalogues, 1990 to 1994.

Fig. 18: Lorenz Curve and Gini Index for non-RDB species versus RDB species in the United States of America.



Source: Succulent plant nursery catalogues, 1990 to 1994.

4.2.4 Determination of a potentially threatened species list

The association between higher prices and RDB species, and the resulting relationship with non-RDB species is weak, but clear. Consequently, species occurring both in the upper 50% price category for all countries and (1) traded in volumes of 100 specimens or greater per annum in the past 15 years (see Appendix 1), or (2) exported without permits (see Appendix 2) were all selected to produce a **potentially** threatened species list.

Prices for species in the 50% category ranged from R6 (South Africa) to R6,246 (Japan), demonstrating that high price is subjective and relative to the country of sale. The potentially threatened species list contains 379 species and subspecies in 53 genera (Appendix 3). Seventy-one RDB species and 308 potentially threatened non-RDB species appear on this list. Most of the selected RDB species were from the genera *Aloe, Brachystelma, Euphorbia* and *Haworthia*. One species was listed as extinct. *Aloe, Brachystelma, Ceropegia, Conophytum, Euphorbia* and *Haworthia,* are the main genera potentially threatened by trade.

The potentially threatened species list should be seen as a broad cross section of Taxa requiring further intensive study to assess the impact of trade. Some species may not merit listing and could be discarded. Similarly, some species may have been mistakenly omitted (see section 4.2.4.1). Consultation with experts was followed to refine the list.

4.2.5 Determination of a final priority species list

4.2.5.1 Consultation with experts

There was a good response to the potentially threatened species questionnaire with 13 out of 19 being completed and returned. Experts confirmed 78 species out of 376, (21%) on the potentially threatened species list (Appendix 3) as threatened by trade (Appendix 4), citing factors of illegal collection, slow growth, difficulty in propagation and limited distribution. Experts identified an additional 50 species threatened by trade (Appendix 4). They regarded two hundred and forty-five (65%) species as not being threatened by trade. Information on the status of 53 species (14%) was not available.

The genera *Aloe, Adenia, Brachystelma, Dioscorea, Euphorbia, Haworthia, Pachypodium* and some species of the *Mesembryanthemaceae* family are the main species on Appendix 4. This agrees with Venter (pers. comm., 1992) who listed the same genera as the main collectable species along with exotic cacti. This selection overlaps with information from the European market showing a demand for caudiciform plants such as *Adenium, Brachystelma, Cyphostemma, Dioscorea, Fockea, Kedrostis* and *Raphionacme* (Jenkins and Oldfield, 1992; Bruyns in litt., 1996). Many of these species are slow growing in cultivation and wild-collected plants are offered for sale instead. Many European nurseries who grow artificially propagated plants favour a complete ban on these wild-collected plant imports because it undermines their efforts to sell artificially propagated plants. They also feel that the controlled import of small numbers of wild-collected plants should be allowed for obtaining parent stock.

Some species, such as those thought worthy of conservation action by Hilton-Taylor (in litt., 1994)(Table 6), have been left out of the final priority list. In exploring reasons for these omissions the following are valid. The genus *Conophytum* was well represented in the preliminary analysis (see Appendices 1 and 2) but the three tiered selection process substantially reduced its representation in the priority list due to its ease of propagation. Although the *Haworthia* spp. and *Pelargonium* spp. in Table 6 are not represented in the priority list the genus is represented by other species. Hence, if action is taken to protect those species it should include other members of the genera at a lower level of protection. This selection could be based on factors such as ease of propagation and availability of seed. The species *Didymaotus lapidiformis, Bulbine haworthoides, B. margarethae,* all *Astroloba*'s, *Pleiospilos simulans* and *Nelia schlechteri,* although reported as sought after, were eliminated because their listed prices fell below that of the upper 50% category. Although the species had been exported without permits from South Africa, they weren't included in the list because of their low asking price. However, it remains a concern that seed of these species is difficult to obtain, possibly resulting in low supplies of propagated plants. This may indicate they were incorrectly excluded from the priority list and require further analysis. Unless these species are easily propagated from cuttings, any increase in demand could have further serious consequences for wild populations. *Diplosoma retroversum* was excluded due to the fact that it is offered for sale in seed form in the international market and hence was not regarded as a priority. *Lithops*, also very easy to propagate from widely available seed and offsets, were completely eliminated during this process. This discussion reinforces the fact that the selection process is not fool-proof and that species must be examined individually before an impact assessment can be made.

Table 6: Species in demand but excluded from priority list.

Species Name	Status
Bulbine haworthoides	popular
Bulbine margarethae	popular
Astroloba spp.	popular
Haworthia lockwoodii	vulnerable, heavily collected
Conophytum smorenskaduense subsp. hermarium	vulnerable
Didymaotus lapidiformis	vulnerable
Diplosoma retroversum	endangered
Lithops comptonii var. comptonii	endangered/vulnerable
Lithops divergens var. divergens	vulnerable
Lithops dorotheae	vulnerable
Nelia schlechteri	rare
Pleiospilos simulans	endangered
Pelargonium hystrix	rare/vulnerable

Source: Hilton-Taylor (in litt., 1994)

From the expert consultation process it appears that one of the greatest threats to succulents is habitat destruction by agro-forestry and overgrazing (Plowes, in litt., 1996; Vlok in litt., 1996). A genus or species for which a monograph has been recently published or has been newly discovered in the field, is also thought to make a species vulnerable to collector pressure (Cole, in litt., 1996; McDowell in litt., 1996; Vlok in litt., 1996). Occasionally collector pressure is so low as to represent an insignificant impact on population dynamics, as reported by Raal (1986c; 1986d; 1987a; 1987b) for *Stapelia clavicorona, Orbeanthus conjunctus, Huernia nouhuysii* and *Pachypodium* sp. Some experts consider trade impacts to be partially species specific. For instance, Plowes (in litt., 1996) does not consider most stapeliads to be threatened by collectors because they are so easy to propagate and difficult to locate. Hilton-Taylor (in litt., 1997) reports that in the wild stapeliads are subject to major population fluctuations making it very difficult to review their conservation status. The conservation situation of many plant species is unsatisfactory as noted by Hilton-Taylor and Smith (1994) in a review of specific Red Data Book species. The fact that no species have moved into the 'Out of Danger' category, implies that there are no effective conservation measures in place to safeguard any species from the dangers facing them, whether trade or habitat destruction. A reason for this may be inadequate protection of succulent plant habitats, for example the succulent Karoo, within formal protected areas (Cowling and Hilton-Taylor, 1995). Furthermore, the impacts of invasive plants, afforestation, overgrazing, mining, agriculture and plant harvesting (collectors and traditional uses) all play a greater or lesser role in the decline of many genera and very often those with a high number of endemic species (Cowling and Hilton-Taylor, 1994).

4.2.5.2. Individual assessment of species in final priority species list

This section summarises available trade, biological and reproductive data of priority species in order to clarify reasons for their inclusion on the final priority species list. This process was conducted in conjunction with CITES listing criteria as laid out in Resolution Conf. 9.24 and its Annexes. By comparison with data contained in Table 4 the relative value of species from country-to-country and species-to-species is determinable. This comparison gives an approximate measure of demand and/or rarity for a species. Discussion of species occurs under their respective family and generic designations as follows:

Genus: *Adenia*
Family: Passifloraceae

Adenia pechuelii

- Is the species traded?: Although this study has highlighted *Adenia pechuelii* as being threatened by trade, Jenkins (1993) did not mention this as a genus of concern in Europe. The main concerns are the lack of seed offered for sale internationally and the high prices being charged for plants in Japan (R235 to R270 for plants in three centimetre diameter pots). Even though prices in the United States and Germany are lower, ranging from R19 to R125 per plant they are high enough to encourage an unsustainable illegal trade. Pressure on the species is exacerbated by the lack of propagation from seed. South Africa has recorded exports of only 125 specimens to Zimbabwe and Germany for the period 1981 to 1985. That quantity may be insufficient to meet the demand suggested by the high price structure, especially in Japan.
- What is the status of wild population: Hilton-Taylor (1996) states it is Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Limited to Namibia but range there is Unknown.
- Is the wild population in decline: According to de Lange (1989), wild populations are declining due to low seedling recruitment, their harsh environment and lack of suitable habitat.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years: Unknown.
- Wild collection: Suspected but there is no direct evidence.
- Artificial propagation: Nurseries in the United States do apparently artificially propagate plants advertising them as "rooted cuttings". According to Sajeva and Costanzo (1994), cultivation of the species occurs in Europe but did not state the scale of this activity. Sajeva (pers. comm., 1997) reports that the caudiciform species are offered for sale as wild-collected plants. Marx (pers. comm., 1993) reports that this is one of the most difficult Adenia's to propagate making it susceptible to collection from the wild. According to de Lange (1989), causes of this propagation bottleneck are scarcity of plants, dioescious flowers and slow growth (in the wild and propagation) and susceptibility to insect attack.
- Appendix II listing criteria of Res. Conf. 9.24: Satisfies Annex 2a, part B and precautionary principles.

Recommendation: Review status of wild populations for all caudiciform species. If in decline due to collection consider CITES Appendix II listing.

Genus: *Adenium*
Family: Apocynaceae

Adenium multiflorum

The name *A. obesum* subsp. *obesum* is a synonym of *A. multiflorum*(Rowley, 1983).

- Is the species traded?: South Africa recorded the export of approximately 590 artificially propagated specimens from 1981 to 1995. Sajeva and Costanzo (1994) described three southern African species of *Adenium* in commercial trade, namely *A. obesum, A. swazicum* (*A. obesum* subsp. *swazicum*) and *A. oleifolium* (*A. obesum* subsp. *oleifolium).* Some of these specimens are thought to be wild-collected.
- What is the status of wild population: Not threatened (Hilton-Taylor, 1996)
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Found in South Africa and Swaziland where its distribution is Wide.
- Is the wild population in decline: Yes, in parts of its range.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years: Unknown.

- Wild collection: Unknown.
- Artificial propagation: Jenkins (1993), reports that *A. obesum* is a widely cultivated species in Europe and does not represent a threat to wild populations. Seed of this species is easily available, for sale in quantities of five to 1,000, and apparently very easy to propagate. Apparently this species (and genus) is not under excessive trade pressure being commonly propagated. Expert opinion in South Africa appears to contradict this latter view. The sale of seed ameliorates the negative impact of trade on the species.
- Appendix II listing criteria of Res. Conf. 9.24: Due to concern from experts the precautionary principle applies.

Recommendation: Review status of wild populations. Conduct ongoing market review. CITES listing not a priority.

Genus: *Adromischus*
Family: Crassulaceae

Adromischus marlaniae var. immaculata (synonym *Adromischus herrei)*

- Is the species traded?: According to TRAFFIC's catalogue survey, plants but not seed are available on the international market. South African experts are concerned the species is being threatened by removal of plants from the wild for trade purposes. This view may be supported by the fact that this species has never been officially exported from South Africa.
- What is the status of the wild population?: Not evaluated.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Endemic to Cape Province, South Africa where distribution is Wide.
- Is the wild population in decline?: Unknown, but requires investigation.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown, further research is required.
- Are plants collected from the wild?: Suspected, requires investigation.
- Is the species artificially propagated?: Sajeva and Costanzo (1994) record *Adromischus herrei* as being cultivated in Europe. According to Sajeva (in litt., 1997) and Hilton-Taylor (in litt., 1997) ease of vegetative propagation from leaves apparently ensures the production of sufficient plants for this market.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Further expert review is required to assess the taxonomic status of the species advertised in catalogues. Expert review of wild populations and artificial propagation programmes is also necessary.

Genus: *Aloe*
Family: Asphodelaceae

Since this genus is already listed on the CITES Appendices, the listing criteria have not been applied here. It is noteworthy that despite their listing on Appendix II, a damaging illegal trade continues with the most likely destination being Japan. The information provided below emphasises the present lack of trade control in South Africa. The market place has a preference for non-treelike and easy to transport aloes. This appears to be placing pressure on specific populations. The popularity of plants also depends on the shape and attractiveness of their flowers. The evidence presented below indicates that an illegal trade in aloes exists, although it is impossible to quantify. It is likely that many species of smaller aloes, not listed here, are under pressure and trade controls should be strengthened.

Grass Aloes:

Many 'grass aloes' are not regarded as threatened by Van Wyk and Smith (1996) partly because of their ease of propagation.

Aloe albida

This CITES Appendix I listed species is not regarded by Van Wyk and Smith (1996) as threatened due to its ease of propagation, although Hilton-Taylor and Smith (1994) regard afforestation as a threat. *A. albida,* is advertised in Japanese plant catalogues as "wild-collected" for a price of approximately R355 per plant. This points to collection posing a threat to the species. Additional factors which may threaten the species are:

- Seed is not available in catalogues,
- South Africa has no export records for the species, and
- Advertisements for artificially propagated plants were not found during this research.

Consequently there is concern about the source of wild plants on sale, especially with regards to Japan and further research is required.

A. kniphofioides

Only one species out of the 14 identified as threatened in this study, namely *Aloe kniphofioides*, has been mentioned by Jenkins (1993). South Africa has recorded the export of only 20 artificially propagated plants to Japan over the period 1981 to 1995 yet the plant catalogue survey showed that the species is advertised in United Kingdom, United States, Switzerland, Germany and Japan. The latter country asked the highest prices for wild-collected plants. Faced with the lack of exports, evidence of wild collection, lack of seed for propagation and high market demands, this species requires careful study to determine whether there is a heavier trade impact than currently suspected. The wide distribution reported by Van Wyk and Smith (1996) for this species may substantially ameliorate the impact of trade.

A. nubigena

This species is not regarded by Van Wyk and Smith (1996) as threatened due to its ease of propagation. Recorded exports are limited to two wild-collected plants exported in 1983 to the United States. However, advertisements in catalogues have only been circulated in Japan. Wild-collected plants are offered for between R118 to R237 per plant. Apparently no seeds are available nor are artificially propagated specimens. These factors raise concern about the source of wild material and this requires additional attention particularly in Japan.

A. soutpansbergensis

A. soutpansbergensis is now Critically Rare due to injudicious collecting despite its ease of propagation (Hilton-Taylor and Smith, 1994). Although there are no records of export from South Africa, the species is advertised for sale in Japan, United Kingdom and the United States. In Japan plants are advertised as wild-collected. This species appears in the price list of a South African dealer who allegedly exports, without permits and with falsified documentation, to overseas clients. One of these clients has alleged that all plants received were wild-collected.

Dwarf Aloes:

A. bowiea

According to Van Wyk and Smith (1996), the 'dwarf aloe' *A. bowiea*, although easy to cultivate and relatively unattractive, is Endangered in its natural habitat due to urban and industrial expansion, over-grazing and over-collection. Over the period 1981 to 1995, 1,606 artificially propagated plants were

exported to a variety of destinations. Although seed was not advertised, plants were offered for sale in United Kingdom, South Africa, Germany and the United States at about R15 per plant. This low price indicates that supply through propagation is not a limiting factor. The conservation of this species would appear to be a domestic issue rather than an international trade problem.

A. brevifolia var. *depressa*

This species, although not threatened, is being exploited by collectors and destroyed by agriculture to the extent that some localised forms of the specie may become extinct (Van Wyk and Smith, 1996). The collector threat has persisted for many years as evidenced by Van Jaarsveld (in litt., 1985) who in 1985 stated that the species is hard to obtain and likely to be wild-collected. This species is advertised in the United States and Japan for between R6 and R30 per plant in pots 7 to 15 centimetre diameter, again a low price indicating lack of demand or easy supply. However, in Japan the highest prices were for plants advertised as wild-collected. During the catalogue survey no seed was found advertised nor are there any records of export from South Africa. This combination of factors indicates possible illegal trade and the need for careful scrutiny of markets, especially Japan, for evidence of wild-collected plants.

'Stemless Aloes':

The so-called 'stemless aloes' *A. buhrii, A. haemanthifolia, A. peglerae* and *A. polyphylla* all have very limited and specialised habitats. They are all regarded as Rare, Critically Rare or Endangered by Hilton-Taylor and Smith (1994) and Hilton-Taylor (1996a; 1996b) and all except *A. peglerae* are difficult to propagate.

A. buhrii

According to Van Wyk and Smith (1996), this species is uncommon in succulent plant collections, is relatively difficult to propagate and susceptible to specific diseases. It is limited to a small area near to Calvinia, Northern Cape province. Hilton-Taylor and Smith (1994) regard the species as Critically Rare, mainly due to its very localised habitat. Over the period 1981 to 1995, 301 artificially propagated plants and seedlings were recorded as exported from South Africa. Although no seed was advertised between the period 1991 and 1994 in catalogues, South Africa did record the export of 26 grams to Italy during 1991. Catalogues from Japan and South Africa advertised plants at prices ranging from R5 to R73 per plant. The highest price was for a wild-collected plant advertised in a Japanese catalogue. This indicated either the existence of fraudulent declarations on CITES permits issued by South Africa to Japan, or illegal trade. The state of the trade in Japan needs to be investigated thoroughly.

A. haemanthifolia

According to Van Wyk and Smith (1996), this is a very distinctive species that has a very limited distribution in the winter rainfall South Western Cape mountains near to Cape Town. They surmise that the inaccessible mountain habitat will contribute to the survival of this species. However, Hilton-Taylor and Smith (1994) regard the species as Critically Rare. The species is difficult to propagate from either cuttings or seed. Seed is available through international catalogues but only from South Africa and United Kingdom. Plants are advertised by the United States and Japan at prices ranging from R106 to R1,562 per plant. These high prices are indicative of the plant's rarity, and may stimulate an active illegal trade in wild plants. South Africa has recorded exports of 468 plants and seedlings over the period 1981 to 1995. The Japanese market in particular requires further study. This species should be considered for CITES Appendix I listing.

A. peglerae

This species is used by the horticultural industry for landscaping purposes and is considered reasonably easy to propagate. Owing to its restricted range in the Magaliesberg and Witwatersberg, near to Pretoria, South Africa, Hilton-Taylor and Smith (1994) regard the species as Critically Rare.

Catalogues contain many advertisements for this species ranging from packets of seed (15 to 10,000 seeds per packet) to plants priced at about R15 per plant. The maximum price of about R23 was recorded in a Japanese catalogue which advertised wild-collected plants. Given that South Africa has recorded exports of 415 artificially propagated plants and seedlings over the past 15 years there is evidence to suggest that an illegal trade in wild-collected plants exists. However, there is no indication that trade is currently threatening this species.

A. polyphylla

Jeppe (1969) reports that *A. polyphylla* grows high (above 2,000 metres) in the Lesotho mountains in rich peat soils with temperatures in winter often below freezing. Plants require specialist attention and do not grow well in warm or hot, dry climates where they turn yellow and frequently die. This species is known to be threatened by collectors in Lesotho. Hilton-Taylor and Smith (1994) regard the species as Endangered due to collector activity and increased accessibility to the area caused by dam construction (Lesotho Highlands Water project). The plants are also used for medicinal purposes and Swart (1983) reported coming across the remains of 50 plants whose leaves had been stripped off by local Basuto residents. The leaves were chopped into cubes, soaked in water and given to chickens as a remedy. Talukdar (1994) reported a steady decline in populations of this plant in Lesotho largely due to the plant's popularity as a garden plant and value as a status symbol. According to Van Jaarsveld (in litt., 1985), *A. polyphylla* is hard to obtain and likely to be wild-collected. This is supported by the fact that South Africa has no recorded exports for this species. Japanese catalogues advertise plants of unknown origin for between R97 and R417 per plant, suggesting a thriving illegal trade. Seed is advertised by only one nursery based in the United Kingdom. All evidence points towards an illegal trade in wild-collected plants and detailed research into Lesotho's trade controls and the Japanese market is required.

Multi-stemmed Aloes:

A. hardyi

The 'multi-stemmed' aloe *A. hardyi*, according to Van Wyk and Smith (1996), is a recent discovery not yet widely cultivated. Its Red Data Book status is reported as Insufficiently Known (Hilton-Taylor and Smith, 1994). South Africa has not issued any export permits for this species nor is seed available through catalogues. Three nurseries within the United States advertise plants at prices ranging from R14 to R20 per plant which does not seem to indicate a significant demand relative to supply. It's habit of growing on cliff faces, its unattractive growth form and large size, compared to grass, dwarf and stemless aloes, may protect it to some extent from collection which is negligible at this time.

A. erinacea

Bornman and Hardy (1971) describe *Aloe erinacea* as being confined to the southern Namib desert in Namibia. This is extremely arid country, where the winter rainfall rarely exceeds 125mm. Plants normally form clumps of up to ten heads and have short prostrate stems up to 50 centimetres and more in length. Hilton-Taylor and Smith (1994) regard the species as Critically Rare. Despite its rarity, this species seems to be relatively easy to propagate. Over the period 1981 to 1995, South Africa reported the export of 28,000 artificially propagated plants and seedlings. The species is very popular and appears regularly and for high prices in many plant catalogues especially those of Japan where prices ranged from R50 to R741 per plant, including some advertised as wild-collected. Although the high Japanese prices give an indication that there is trade in wild-collected plants, propagation is apparently not a problem and this species does not appear to be threatened by trade. Further study in Japan and Namibia is required to confirm this assessment.

Creeping Aloes:

A. meyeri

According to Van Wyk and Smith (1996), *A. meyeri* is small (stems up to one metre) with a restricted distribution in the Richtersveld and Namibia and is regarded as Rare. Van Wyk and Smith (1996) also stated that the species has not been widely introduced into horticulture. This assessment seems to be borne out by the fact that over the period 1981 to 1995, only three plants were reported as exported to the United States. Furthermore, the nursery survey did not identify any advertisements for seeds or plants of this species. No immediate trade pressure has thus been identified. If demand does increase, then its habit of growing on cliff faces may protect it to some extent.

Tree Aloes:

A. pillansii

The only 'tree aloe' to be highlighted in this research was *A. pillansii*. This CITES Appendix I listed species, with limited range in the dryer parts of South Africa and Namibia, is regarded as Endangered due to overgrazing and collection (Hilton-Taylor and Smith, 1994; Van Wyk and Smith, 1996). This species is utilised by the South African horticultural industry for landscaping purposes. The catalogue survey revealed that plants are advertised in Japan, South Africa and the United States. Japan posted the highest prices of between R88 for a wild-collected plant, and R972 for plants of unknown origin. In contrast, prices in the United States and South Africa were lower at between R8 and R61 per artificially propagated or unknown origin plant. There is clear evidence indicating a trade in wild-collected plants, especially to Japan. Field research to determine the status of wild populations is required. The species continued listing on CITES Appendix I is reinforced by these findings.

Genus: ***Brachystelma***
Family: **Asclepiadaceae**

According to Dyer (1977) specimens of *Brachystelma* are few and far between in the wild. Some species may occasionally be locally common but are seldom widely common. Most species' biology, distribution and conservation status are poorly known. Of the six species of Brachystelma cultivated in Europe (Sajeva and Costanza, 1994) only *B. swazicum* is regarded as threatened by trade (Appendix 4). Sajeva and Costanzo (1994) do not mention other species although many are present in the potentially threatened list (Appendix 3). There has been a recent upsurge in the supply of artificially propagated and wild-collected *Brachystelma* spp. to Europe and there are allegations of illegal trade occurring. Twenty-seven taxa have been noted for sale on overseas markets yet there is no evidence of recorded exports for these species. Furthermore, 19 (Appendix 4) taxa are regarded by experts as being threatened by trade. A South African dealer lists many *Brachystelma* species in a price list distributed exclusively to overseas clients. The trade threat is further confirmed by TRAFFIC Europe who in a 1992 nursery survey found only wild-collected specimens of many species of *Brachystelma*. They found that this genus was sought after by collectors and recommended that the state of natural populations be checked. According to Van Jaarsveld (in litt., 1985) plants of this genus are generally hard to obtain and are likely to be wild-collected. Bruyns (pers. comm., 1992) suggested that *Brachystelma* be listed on CITES Appendix II to control trade. His main concern was that many of the species are highly localised in the summer rainfall region of the Eastern Cape province and that they could easily be over-collected. Despite the lack of artificially propagated plants advertised, at least one South African nursery owner produces hundreds of seedlings of several 'hard-to-propagate' species per annum (Peckover pers. comm., 1997). Hence, under some nursery conditions, propagation does not seem to be a limiting factor. However, in general it appears that plants of this genus are hard to obtain and that a trade in wild-collected plants exists. In conclusion the trade situation for *Brachystelma* species requires urgent attention.

Brachystelma australe

- Is the species traded?: Plants, but not seed, are advertised in German, British and American catalogues at prices between R20 and R62 per plant. Some catalogues warn that stocks are limited and in one case limits customers to one plant each. There are no recorded exports for South Africa.
- What is the status of the wild population?: Hilton-Taylor (1996) lists the species as indeterminate. This means that it is Threatened but that there was insufficient information to classify it as Rare or Endangered.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted to shallow sandy pockets of humic soil on sheets of flat or gently sloping rock, amongst tufts of short grass near Port St Johns through to Port Shepstone, Eastern Cape province, South Africa. It is found less frequently amongst rock clusters on ridge summits (Craib, 1995; Dyer, 1977; Dyer, 1983).
- Is the wild population in decline?: Unknown. Suspected to be so.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to evidence of illegal collection and concern from experts Annex 2a, part B and the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. bruceae

This species includes two sub-species, namely *Brachystelma bruceae* subsp. *bruceae* and *Brachystelma bruceae* subsp. *hirsutum.*

- Is the species traded?: The species is advertised for sale in Switzerland for between R42 and R48 per plant and in Japan for between R219 and R243 per plant. No seeds were found advertised during this survey. There are no recorded exports for South Africa indicating that the trade is illegal. The caudex is large, up to 70mm in diameter which makes it attractive to collectors.
- What is the status of the wild population?: Rare (Craib, 1995; Dyer, 1977; Dyer, 1983).
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: *Brachystelma bruceae* subsp. *hirsutum* recorded from the mountains of the Barberton district and sparsely from the Graskop area, Mpumalanga province, South Africa. The species is Rare and restricted in occurrence in the Graskop area (Craib, 1995; Dyer, 1977; Dyer, 1983). *Brachystelma bruceae* subsp. *bruceae* has a limited distribution. Occurs in very sandy soil on the Kaapsehoop Mountains in Mpumalanga province. Some specimens have particularly large caudices (Craib, 1995; Dyer, 1977; Dyer, 1983).
- Is the wild population in decline?: Unknown, but suspected to be so.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle also applies.

Recommendation: Urgent review of wild population status and levels of wild collection required. Explore listing on Appendix II or III

B. caffrum

- Is the species traded?: Advertised prices for these plants ranged from R35 to R125 per plant. The United States quoted the highest prices and the United Kingdom and Germany the lowest. South Africa has no records for the export of this species indicating that the trade is entirely illegal.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species is Indeterminate. Since its discovery in 1893 when it was reported to be locally abundant in rocky ground, it has been reported in taxonomic collections only once. Dyer (1983) reports that a collection conducted in 1981 confirmed the species was still locally present in "quantity". Craib (1995) reports that this is one of South Africa's rarest species but notes that it has been located on a few occasions near Stutterheim in the Eastern Cape province.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. cathcartense

- Is the species traded?: Dyer (1983) noted that within a short time after the publication of the name caudices appeared for sale in the trade. Only one United States nursery advertised "extra-large" plants for sale at R160 per plant. The catalogue stated that the plant was very rare. It is not known if the plants were wild-collected but as caudices grow quickly in cultivation it seems unlikely. This is supported by Dyer (1983) who reports that in cultivation the caudices become considerably larger and more floriferous while the flowers retain their carrion scent. The relatively large size of the caudex, between 40mm to 50mm, makes this species attractive to collectors.
- What is the status of the wild population?: This species appears to be relatively common within its limited range (Dyer, 1983). Hilton-Taylor (1996) reports the species to be Indeterminate.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted. It is known only from the Cathcart district of the Eastern Cape province, South Africa (Dyer, 1983).
- Is the wild population in decline?: Unknown, but suspected to be so.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. chlorozonum

- Is the species traded?: Although there are no records of export for this species a German nursery advertises plants, of unknown source, at about R35 each. The catalogue states the plant is rare and customers will be limited to one each. The fact that the advertised plants are said to originate from Pietersberg, Northern province, well out of the known range of the species,

raises questions about whether this is truly *B. chlorozonum* being sold or not. This perennial dwarf herb has a caudex of about 70mm diameter which is very attractive to collectors.

- What is the status of the wild population?: Locally common. Hilton-Taylor (1996) reports this species to be Not Threatened globally.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The species is apparently widespread with confirmed collections from Barberton (Mpumalanga province, South Africa), Mpumalanga province/ Mozambique border and Zululand (KwaZulu-Natal province, South Africa) (Dyer, 1983).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: No.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: No urgent action required.

B. discoideum

- Is the species traded?: Despite the rarity of this species the species is advertised in the United States at R43 per plant although there are no export records from South Africa. The relatively low price does not reflect the rarity of the species and throws doubt on whether these plants are what they are advertised to be. This perennial herb has caudices growing up to about 70mm diameter which makes it attractive to collectors.
- What is the status of the wild population?: Only one collection of this species was recorded in 1971 near Pretoria, South Africa but none since then (Dyer, 1983). Hilton-Taylor reports the species to be Insufficiently Known.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Wide, known from Botswana, South Africa and Zimbabwe (Hilton-Taylor, pers.comm., 1996)
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: No.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: No urgent action required but a review of wild population status is essential.

B. minor

- Is the species traded?: There are no export records from South Africa, but plants of unknown origin are advertised in Germany at R26 per plant. The advert claims that supplies are limited and that quantities will be limited to one per customer, however, the low price indicates that demand is low relative to supply. This species is a perennial dwarf herb with a caudex growing up to 50mm and compressed to about 20mm thick. The flowers are reported to be attractive (Dyer, 1983).
- What is the status of the wild population?: Locally common but Hilton-Taylor (1996) reports it as Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The species occurs in the Wolkberg, Northern province, South Africa and near Graskop, Mpumalanga province, South Africa, where it is reported to be tolerant of shade and open conditions (Dyer, 1983).

- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: No.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. modestum

- Is the species traded?: There are no export records for this species, although plants are advertised in two South African and one Swiss catalogue as either artificially propagated or of unknown origin at R10 to R47 per plant. One South African catalogue, alleged to supply wild-collected plants, gives discount for bulk orders suggesting that supply is not a problem.
- What is the status of the wild population?: Plants are generally uncommon and as a result of their dwarf habit are easily overlooked (Dyer, 1983).
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted. Plants only grow on the crests of large hills in the Kranskop area of KwaZulu-Natal province, South Africa.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. ngomense

- Is the species traded?: No export records exist for this species yet it is advertised in South Africa, United Kingdom and Germany. Plants sell between R19 and R36 per plant. For a species that is "uncommon", the supply of plants does not appear to be a problem as a South African catalogue alleged to supply wild plants offers discount for bulk orders.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species to be Endangered.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This species has a limited distribution range in the vicinity of Ngome in northern KwaZulu-Natal province, South Africa. It is found growing in high altitude grassland on mountain crests at the edges of sheets of exposed rock or in shallow soil in depressions and pockets on sheets of exposed rock and gently sloping rocky domes (Craib, 1995).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. perditum

- Is the species traded?: Yes and it's rarity seems to be reflected in American catalogues where it is advertised as "the rarest *Brachystelma* of them all" for between R44 per seedling and R196 per plant. There are no export records for this species. Dyer (1983) describes this dwarf perennial herb as having a caudex growing to a diameter of about 40 to 60mm which makes it attractive to collectors.
- What is the status of the wild population?: Unknown. Based on the lack of collection records this species may be considered rare however, the fact that it is used as food by local inhabitants indicates that it may be more common than generally thought. Hilton-Taylor (1996) reports the species to be Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This species is apparently restricted to the Free State province and KwaZulu-Natal province of South Africa and the Lesotho Drakensberg mountains, where it is eaten by the local communities (Dyer, 1978; Hilton-Taylor, pers.comm.,1997).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. petraeum

- Is the species traded?: No export records exist, however the species has been offered for sale in South Africa and the United States as artificially propagated at R29 to R63 per plant. The caudices have an unusual tendency to proliferate like those of some geophytic *Pelargonium* species (Craib, 1995; Dyer, 1977; Dyer, 1983).
- What is the status of the wild population?: This species is locally common on rocky outcrops. Hilton-Taylor (1996) reports the species to be Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted. This species occurs on rocky outcrops and at the edges of rocky domes above the Byrne Valley in the Richmond district of KwaZulu-Natal. Plants grow in pockets of soil between the rocks and in shallow earth banks located on the rocky domes.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III

B. pulchellum

- Is the species traded?: No export records exist for the species, however, plants are offered for sale in South Africa, United Kingdom, Germany and the United States for R20 to R89 per plant. The lowest price is offered by a South African catalogue catering only for the export market and offering discount for bulk orders of allegedly wild-collected plants. The low overall price indicates that supply is not a problem but this may be having a significant impact on wild populations. According to Dyer (1983) this perennial herb, with beautiful flowers, has a caudex of about 50mm diameter making it attractive to collectors.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The species appears to be limited to an area between Pietermaritzburg and Durban (KwaZulu-Natal province, South Africa) where it grows in short grassveld associated with outcrops of Table Mountain sandstone.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III.

B. remotum

- Is the species traded?: No export records exist, however, plants are offered for sale in a South African and two British catalogues for prices between R18 and R66 per plant. The caudex of the species is about 25 to 40mm in diameter.
- What is the status of the wild population?: Unknown, but may be rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted. This species is found in Mpumalanga province, South Africa, in small numbers in isolated colonies on the Mpumalanga escarpment near Graskop (Craib, 1995) and in the mountains of northern KwaZulu-Natal (Dyer, 1983).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown
- Is the species artificially propagated?: Unknown
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III.

B. stellatum

- Is the species traded?: No export records are available for the species, however, it is advertised in South Africa, United Kingdom, Japan and the United States for sale at R17 to R122 per plant. The lowest price is for a South African catalogue giving discount for bulk orders of allegedly wild collected plants and the highest for Japan.
- What is the status of the wild population?: The species is considered frequent in its habitat (Dyer, 1983).

- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted. This species, with a caudex of about 25 to 50mm diameter, occurs in shallow sandy soil pockets amongst rock outcrops near Mount Anderson in the Lydenberg district of Mpumalanga province, South Africa (Craib, 1995; Dyer, 1983).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III.

B. swazicum

- Is the species traded?: No South African export records are available for the species. It is not known if specimens have been exported from Swaziland. It is advertised in South Africa, the Netherlands and the United States for sale at between R16 and R39 per plant. These prices indicate that supply is not restricted or that plants are not in demand.
- What is the status of the wild population?: Fairly common in habitat.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This species, with a caudex up to 50mm diameter, is found on rocky small cliffs and exposed steeply sloping rocky areas on the highest mountain peaks of North-Eastern Swaziland and the adjacent mountains of the Barberton district in Mpumalanga province, South Africa (Craib, 1995; Dyer, 1983).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: No urgent action required.

B. tenellum

- Is the species traded?: No exports documents are available for this species, however, it is advertised in South Africa and the United States for R34 to R43 per artificially propagated plant. The American catalogue describes the plant as "1 year old seedlings. Very rare". However, the relatively low prices asked indicates that supply is not too limited, possibly because a successful artificial propagation programme has been established.
- What is the status of the wild population?: This is a rare species with a caudex of 40 to 50mm diameter and apparently very specific environmental requirements. Hilton-Taylor (1996) reports the species to be Vulnerable.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: It is found on a few low hills near the Oribi Gorge in southern KwaZulu-Natal province. The plants are easily overlooked owing to their dwarf habit. The species appears to be limited to this area (Craib, 1995; Dyer, 1983).
- Is the wild population in decline?: Unknown, but suspected.

- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III.

B. tenue

- Is the species traded?: No export documents are available, although, the species is advertised in United Kingdom, Germany and the United States for relatively low prices of R27 to R39 per plant. This perennial herb has a caudex of 40 to 50mm diameter. Dyer (1983) considered the species rather featureless compared to other species.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species status as Indeterminate. The population is apparently threatened by afforestation and agricultural development.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted.
- Is the wild population in decline?: Unknown, but suspected.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Unknown.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required.

B. vahrmeijeri

- Is the species traded?: No evidence of trade in catalogues or South African export documents. This is a perennial tufted herb with a caudex of about 50mm diameter which may make it attractive to collectors.
- What is the status of the wild population?: Although collected only once it has been recorded as frequent in its habitat. Hilton-Taylor (1996) reports species as Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted. Occurs on the coastal belt of northern Zululand, KwaZulu-Natal province, South Africa (Dyer, 1983).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected
- Is the species artificially propagated?: Unknown.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Urgent review of wild population status required. Explore listing on Appendix II or III.

Genus: *Ceropegia*
Family: Asclepiadaceae

Since this genus is already listed on the CITES Appendices, the listing criteria have not been applied here. Jenkins (1993) reports that species such as *Ceropegia woodii, C. armandii* and *C. volubilis* are widely available in the horticultural trade in Europe from artificially propagated stock. Other species are less commonly seen. The genus attracts collector interest, but as most climbing species are relatively easy to propagate from stem cuttings, Jenkins (1993) concludes that wild collection is unlikely to be a cause for concern. He cautions that caudex rooted forms from South Africa are sought after and traded as wild-collected plants. Apparently numbers of these in trade were small at the time of the survey. This observation, that it is largely species with caudices that are traded, is supported by Clark (in litt., 1992) who comments that only half of the South African species have caudices and most are too small to be of interest. Large caudices are to be found in the closely related genus *Brachystelma*. Clark (in litt.,1992) also commented that Ceropegias tend to be difficult to collect because they are widely scattered, are masters of disguise and often grow within thorny shrubs and this makes their over-collection difficult. Their high growth rates and ease of propagation further reduces the pressure on wild populations. For example *C. radicans,* as well as its subspecies *smithii* is one of the most popular Ceropegias in cultivation. It is far more common in cultivation than in the wild. *C. cimiciodora* is a rope-like creeping plant with much reduced leaves and thin roots (Peckover, 1993). Following the observations of Jenkins (1993) about the ease of propagation of creeping plants, this species is unlikely to be a cause for concern. There is little information available for *C. insignis,* another species highlighted during this study. Hilton-Taylor (1996) reports the latter species to be Vulnerable in the wild.

In conclusion there does not appear to be evidence indicating urgent conservation action for this genus or the species listed in Appendix 4. Indeed this CITES-listed genus could be considered for down-listing to Appendix III or removal from the Appendices.

Genus: *Cheiridopsis*
Family: Mesembryanthemaceae

Cheiridopsis pecularis

- Is the species traded?: Yes. According to catalogues, seed of this species are currently available in amounts ranging from 10 to 10,000 at prices from R2 to about R40. Plants are also on sale internationally. Most recorded exports of seed from South Africa occurred during the mid 1980's. The ease of propagation, in the hands of experienced nursery owners, is likely to have reduced pressures on wild populations and consequently this genus and species is not likely to be a cause for concern.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species to be Vulnerable. Kiehn (in litt.,1997) regards the small wild populations on farmland in the Steinkopf area of the Northern Cape province, South Africa as sensitive to over-collection.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Jacobsen (1960) and Brink (1988a) believe the species *Cheiridopsis pecularis* to have a very limited distribution in South Africa. Following Hartman's revision of the genus, this species is regarded as being Restricted (Hilton-Taylor, pers.comm.,1997)
- Is the wild population in decline?: Unknown, but suspected.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.

- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population. Explore listing on Appendix II or III if the population survey yields significant evidence of wild collection.

Genus: *Conophytum*
Family: Mesembryanthemaceae

In addition to the Conophytum species discussed below, there is evidence of wild collection of other species. For instance, *C. smorenskaduense* subsp. *hermarium,* not identified as a problem in this study, has had large numbers of plants removed from the wild by collectors presumably for resale (Hilton-Taylor, 1994). In 1994, seven plants of *C. saxetanum* were confiscated by Namibian wildlife authorities in a successful prosecution against succulent plant collectors. From results of the expert review and analysis of trade data, it appears that there are individual species of the genus *Conophytum* which require conservation action.

Conophytum burgeri

- Is the species traded?: According to Hammer (1993), *C. burgeri* is highly sought after by collectors and relatively easy, but slow, to grow from seed. From catalogue information seed is available in quantities ranging from 20 to 1000 seeds, indicating that supply is not limited. It is noteworthy that much of the seed advertised in British catalogues is said to be wild-collected. In Japan plants, the source of which is unknown, sell for R93 to R209, this indicates a high level of demand. Prices at this level could make wild collection a lucrative business. Another worry is that the only recorded export of this species from South Africa occurred in 1993 and involved two plants. This discrepancy indicates there may be a significant illegal trade in mature plants to all destinations. The source of mature plants, if not obviously seed grown, on the market is unknown and requires further attention especially in Japan.
- What is the status of the wild population?: Hilton-Taylor (1996) regards the species as Vulnerable.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: As the plant is only known from a single locality at Aggenys, Northern Cape province, South Africa any illegal collecting is cause for concern.
- Is the wild population in decline?: Unknown, but suspected.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population before exploring a listing on Appendix II or III.

Conophytum comptonii

- Is the species traded?: During the catalogue survey, no seed was found for sale, but one nursery was offering plants or cuttings of the species at a price of approximately R17 to R25 per plant. The plants were advertised as coming from Vanrhynsdorp Pass, although there are no recorded exports for this species from South Africa over the past 15 years. The lack of advertised seed and propagated plants is cause for concern. It is also not an easy species to propagate.

- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This species has a narrow range at several localities near Vanrhynsdorp Pass and on the Matsikammaberg, Western Cape province (Hammer, 1993).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of population to assess levels of collection from the wild.

Conophytum phoeniceum

- Is the species traded?: A worrying factor is that neither seed nor plants are available internationally suggesting that the only source of plants is from the wild. There are no recorded exports of this species from South Africa. As this species was only described in about 1991, it is in its period of greatest danger from wild collection until sufficient numbers of artificially propagated plants can be accumulated. This species deserves special attention in the short term. Unlike *C. burgeri* this species is easy to propagate from seed and is fast growing.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species to be Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: *C. phoeniceum* is limited to only several hundred plants at one locality near Steinkopf, Northern Cape province, South Africa (Hammer, 1993).
- Is the wild population in decline?: Unknown, but suspected.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes, easily.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of population to assess levels of collection from the wild.

Conophytum ratum

- Is the species traded?: Both plants and seeds are occasionally available in plant catalogues and prices are relatively high (R30 per plant; R4 per 25 seeds) though not as high as for *C. burgeri.* This indicates supply is easier. There are no recorded exports of this species from South Africa.
- What is the status of the wild population?: Said to be Endangered.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This species has a very restricted distribution being known from only one locality near to Pofadder, Northern Cape province, South Africa (Hammer, 1993).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes, the species is very easy to propagate. This species

deserves special attention in the short term to increase the amount of propagated material available in the trade.

- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of population to assess levels of collection from the wild.

Genus: *Crassula*
Family: Crassulaceae

Crassula mesembryanthoides

- Is the species traded?: The reason for this plant's popularity was not determined in this study, but one catalogue advertised the "green leaves covered in fuzz" as one of its characteristics indicating this may be attractive for growers. The only export record for the species is for a herbarium specimen sent to Germany in 1987. Despite lack of export data, the species is advertised in United Kingdom, Japan and the United States in six different catalogues. The prices asked for the plants are low, at between R5 to R13 per plant which indicates a low level of demand or very easy supply. No seeds are available in catalogues, which suggests that propagation is from cuttings, the source of which is unknown. Expert advice is the main reason for it's listing as a priority.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Wide distribution. This is a multiple-branching shrub with peeling bark found amongst karoid scrub from Port Elizabeth to Graaff Reinet, Eastern Cape province, South Africa (Court, 1981).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Unknown.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population.

Crassula susannae

- Is the species traded?: There are no recorded exports for this plant, but even so it has been offered for sale in five catalogues from South Africa, Japan, United Kingdom and the United States at prices R5 to R22 for plants and approximately R3 per packet of 25 seeds. The South African price was the highest with Japan's being second. This plant has an unusual buried turnip-shaped or caudaceous tuber, making it attractive to collectors (Court, 1981). Since expert advice is the reason for its listing in this study and there are no recorded exports, the effect of trade on this species deserves further study.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Court (1981) this species is restricted to Riethuis, Northern Cape province, South Africa.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.

- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population.

Genus: *Cyphostemma*
Family: Vitaceae

Jenkins (1993) concluded that as large plants of *C. juttae* were available from nurseries on the Canary Islands, wild-collected plants were not likely to be in demand. However, he cautioned that for some of the other species, wild collection could be a feature of the trade. TRAFFIC Europe in a 1992 nursery survey, found that plants of this genus are wild-collected and imported directly by dealers. Furthermore, they felt that the state of these species in the wild was insufficiently known. In this study two smaller species of the genus have been highlighted, they are *C. humile* and *C. uter*. The latter species is also used by the South African horticultural industry for landscaping purposes. *C. hardyi* has been offered for sale by a South African dealer who allegedly only supplies wild-collected plants. With trade interest being shown in the genus, further attention needs to be paid to the state of wild populations in southern Africa and Madagascar.

Cyphostemma humile

- Is the species traded?: There are no recorded exports of this species, or its subspecies, from South Africa. However, it has been advertised in German and American catalogues as a rare species for R19 to R160 per plant, but not seed, of unknown origin. The lack of export documents suggest that an illegal trade exists and further research into wild populations is required.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Unknown range within its distribution in South Africa and Swaziland.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population before exploring listing on Appendix II or III.

Cyphostemma uter

- Is the species traded?: South African export records show that 140 plants left the country over the period 1981 to 1995, destined mainly for Germany and the United States. Only German catalogues advertise it at prices ranging from R45 to R62 per plant of unknown origin.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species to be Rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted in Namibia and Angola.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected. One report indicated that plants

had been exported from Namibia and Angola to South Africa and then re-exported (Hilton-Taylor, pers comm., 1997).

- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population before exploring listing on Appendix II or III.

Genus: *Dioscorea*
Family: Dioscoreaceae

Dioscorea elephantipes

- Is the species traded?: Jenkins (1993) noted a trade in *D. elephantipes,* but discounted the effect that it was having on wild populations because of the ease of propagation and rapid growth of the caudex from seed. This opinion is backed up by Rowley (1987). Although mature plants are sought after, it is possible to produce a "show" specimen within about five years from seed. This plant will then be about 12,5 cm diameter. Brink (1988b) reports that a seedling can reach a diameter of 200mm in ten years. Apparently the species is undemanding in cultivation, durable and long-lived as long as it is protected from frost. South Africa has recorded the export of 2,661 specimens to numerous destinations, largely declared as artificially propagated between 1981 and 1995. Furthermore, both seed and plants are commonly advertised in Europe, America, Japan and South Africa. The highest price asked for a plant is R87 in Japan. Supplies of this species are apparently easily obtainable and the threat to its survival may instead come from other quarters of trade such as traditional medicinal use and commercial pharmaceutical exploration.
- What is the status of the wild population?: Hilton-Taylor (1996) reports the species to be vulnerable.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Widespread, but only in the former Cape province, South Africa (Hilton-Taylor, pers comm., 1997).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown, but unlikely.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts about medicinal trade the precautionary principle applies.

Recommendation: Conduct further research into status of wild population and the impact of the medicinal trade before exploring listing on Appendix II or III.

Genus: *Diplosoma*
Family: Mesembryanthemaceae

Diplosoma spp.

- Is the species traded?: The species is considered "a jewel of succulent plants" by Schwantes (1957) and became known to German horticulturists in the early 1950's. No export records are available for this genus from South Africa. It is also not commonly advertised in catalogues, with seed of *D. retroversum* the only representative of the genus on offer. Seed does not appear to be commonly available, perhaps reflecting the difficulty of propagation. The impact of the collector market on the genus appears minimal.

- What is the status of the wild population?: *D. lueckhoffi* and *D. retroversum* are regarded by Hilton-Taylor (1996) as Rare. They are endangered mainly by agriculture.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Both species have very restricted range within the former Cape province, South Africa .
- Is the wild population in decline?: *D. lueckhoffi* is stable while *D. retroversum* is declining (Hilton-Taylor, pers comm., 1997).
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes. Plants of the genus Diplosoma are very difficult to grow due to their specific requirements for wet and dry seasons (Jacobsen, 1960). The species is habitat-specific enjoying limestone soils. For the specialist, it is regarded as an easy species to grow, although, mortality of these plants is likely to be high in inexperienced hands. Plants can be generated from leaf cuttings and seeds can be germinated readily under ideal conditions.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population before exploring listing on Appendix II or III.

Genus: ***Euphorbia***
Family: **Euphorbiaceae**

Since the succulent members of this genus are already listed on the CITES Appendices, the listing criteria have not been applied here. According to Jenkins (1993) the trade emphasis is on Madagascan species of *Euphorbia*. He believes that trade in wild-collected southern African plants exists, but is limited due to low demand in most species. During this latter study at least two nurseries were found to offer a wide range of species from Madagascar and southern Africa. One of these which dealt in a large proportion of wild-collected stock, listed around 80 species in its catalogue. The other, dealing in only artificially propagated stock, listed about 130 species. Evidence of illegal trade in Europe comes from a 1993 shipment of two *E. eustacei* and one *Euphorbia* sp. plants seized by British wildlife authorities *en route* to other international destinations.

The apparently low demand discussed by Jenkins (1993) does not correspond with views expressed by local conservation authorities. For instance *E. groenewaldii* is not only under pressure from urban development and agricultural activities, but very high collector pressure in some populations means that this plant has been given a high priority rating for immediate protection (Fourie, 1983; Raal, 1986a). *E. soutpansbergensis* is regarded as rare, but no mention was made about declining populations or collector pressure (Fourie, 1983). Fourie (1983) mentions *E. barnardii*, not identified as a priority in this research, as being threatened by mining, overgrazing, trampling and collector pressure coupled with vandalism. *E. tortirama* is reported to be a valuable collector's item with one dealer exporting 10,000 plants over a few years. Despite this, the species is still relatively widespread although populations are scattered and low in number. Hilton-Taylor (1996) regards this species as Vulnerable. *E. perangusta* and *E. restricta* are other extremely rare species subject to moderate to very low collector pressure (Fourie, 1983). However, pressure on the latter has been ameliorated due to the proclamation of a nature reserve (Fourie, 1986) and in the case of *E. perangusta* collecting has declined (Raal, 1986b).

Marx (pers. comm., 1993), described the closely related species of *E. obesa, E. valida* and *E. symmetrica* as all being very rare. The *E. symmetrica* population could very easily be wiped out through the activities of one or two farmers. A single plant poacher also removed 860 plants of *E. obesa* from the wild, severely impacting the total population. Despite their rarity, all these species are easy to propagate from seed.

According to Bruyns (pers. comm., 1992) and Marx (1987), the biggest threat to *E. obesa* is now caused by grazing animals. This species, together with *E. symmetrica*, is largely protected by two concerned land owners. However, these farmers do not own all the range habitat for these species and the populations on that land remain at risk. Marx (1988; 1989) reports that *E. valida* has a very restricted habitat and its natural populations have been declining. To prevent further degradation of the plants habitat by livestock, some populations have been fenced off.

E. arida

South Africa recorded exports of 325 artificially propagated plants from 1981 to 1995 to Germany. Catalogues in Germany and the United States offer seedlings and plants, but no seeds, for sale. The species is not listed on the RDB at present. The impact of trade is uncertain and further field research is necessary.

E. groenewaldii

According to Fourie (1988) this species is endemic to Northern province and occurs over an area of approximately 300 square kilometres. Agriculture and housing developments threaten its habitat throughout its range and extinction is apparently looming for the species. Collectors have also played a role in the decline of the species, with hundreds having been removed. At that time some plants were held *ex-situ* until they could be reintroduced to safe and analogous sites elsewhere. South Africa has recorded the export of 422 specimens of mainly (25 plants were of unknown origin) artificially propagated seedlings and plants for the period 1981 to 1995. The species is commonly advertised in catalogues as artificially propagated, plants and seedlings being offered for between R7 and R98 per specimen. The highest price is asked in Japan where the origin of the plants is unknown. Given the precarious situation of the plant in South Africa and the interest from overseas collectors, this species requires further study especially on the main consumer markets. The extent to which the apparent ease of propagation ameliorates the danger the species faces needs to be assessed.

E. hypogaea

South Africa has no export records for this species, yet seedlings are advertised in an American catalogue for R35 each indicating that seed is available from an unknown source. As a dwarf species, demand is expected to be higher than for larger species and an assessment of wild populations should be conducted. The species is not listed in the RDB.

E. obesa

This species is very popular in the horticultural market place and South Africa has recorded the export of 15,098 artificially propagated seedlings and plants over the period 1981 to 1995. This large number is several times greater than the total known wild population of the species. However, this figure may be inflated due to the fact that South African CITES permits do not reflect actual exports but simply the number placed there by the exporter. The enthusiasm for the species is also shown in plant catalogues where plants, seedlings and seeds are offered for sale at prices generally below R55 per plant and substantially lower for a packet of seeds. Japan has the highest price per plant of R356. Given plentiful supply options, this species does not appear to be threatened by trade and conservation of the species is largely a domestic issue revolving around habitat destruction.

E. rowlandii

The species is vulnerable due to decline in population sizes (Fourie, 1987). This is possibly caused by the lack of ability to propagate sexually under the naturally severe conditions under which it lives. Despite these pressures the populations are healthy covering an area of approximately 400 square kilometres and possibly more in Zimbabwe. Hilton-Taylor (1996) lists the species as Rare. South Africa has no export records for the species and is offered for sale in only two United States catalogues for R17 to R32 per plant. There are no reports of collector pressure on this species. This apparent lack

of interest may be due to the fact that this species grows up to two metres tall and is not an ideal glass house subject for hobbyists and collectors unlike other miniature species.

E. susannae

This species is characterised by its relatively small size and subterranean habit where only the apices of its many branches protrude above the soil surface. This growth form makes it attractive to growers. South Africa has recorded the export of 82 plants and seedlings from 1981 to 1995. Catalogues from six countries advertise plants, seedlings and seed for prices ranging from R2,70 per five seeds to a maximum of R54 for plants of unknown origin. The market appears to be well catered for in this species but wild populations should be monitored to assess the level of wild collection. The species is not listed in the RDB.

E. symmetrica

According to Van Jaarsveld (in litt., 1985) this species is hard to obtain and is likely to be wild-collected. Hilton-Taylor (1996) lists the species as Vulnerable. South Africa has recorded the export of 223 seedlings and plants of this species. The species is advertised in plant catalogues from five countries with seeds and plants advertised with prices between R3 for a packet of five seeds to a maximum of R70 per plant. The maximum price is from a Japanese catalogue for a plant of unknown origin. Although there does not appear to be a shortage of supply, the concern about wild collection needs to be addressed with further market and field surveys.

E. valida

This species is another highly sought after collectors item due to its unusual barrel-like shape and relatively small size. Hilton-Taylor (1996) lists the species as Vulnerable. South Africa has reported the export of 1,140 seedlings and plants from 1981 to 1995. Plant catalogues from seven countries advertise seed, seedlings and plants for sale at low prices ranging from approximately R1.60 per five seeds to a maximum of R30 per plant in Japan.

E. wildii

This species is endemic to Zimbabwe and restricted to the Great Dyke which runs across the country from the south to the north. South Africa therefore has no export records for it and Zimbabwe's Annual Reports must be consulted for exports. Only one advert for plants was found in a United States catalogue for this species. The species does not appear to be in huge demand and there is no documented evidence of wild collection. As seed is not available internationally this could place pressure on wild populations of plants.

E. woodii

This striking coastal species is common to the sand dunes from Durban southwards to Pondoland. Hilton-Taylor (1996) lists the species as Rare. South Africa has recorded exports of 215 artificially propagated specimens from 1981 to 1995 to thirteen countries indicating wide interest in the species. This apparent popularity is not carried through into catalogues as only one American catalogue offers plants for sale at approximately R22. Three other South African catalogues list the species and it seems that South Africa is the main supplier of plants.

E. zoutpansbergensis

This species is endemic to the Northern province and is listed as Rare (Fourie, 1985; Hilton-Taylor, 1996). Forests of these small 'trees' occur and it is reported that the Wylies Poort locality has been heavily exploited by collectors. As a result of this it is now protected by former Transvaal province legislation (Fourie, 1985). *E. zoutpansbergensis* can be easily propagated from seed or cuttings but the plants grow slowly. The large size the mature plants can reach in glass houses may discourage collection by overseas growers. South Africa has no recorded trade in the species but plants are

nevertheless offered for sale in two American catalogues at prices between R13 and R22 per specimen. This low number of advertisements indicates minimal interest in the species.

Genus: *Gasteria*
Family: Asphodelaceae

According to Van Jaarsveld (1994) once a *Gasteria* plant is established from seed, vegetative reproduction in most species usually occurs either by means of proliferation from the base or by subterranean stolons to form dense groups. The tendency to prolific vegetative reproduction is probably also a means to survive predation by herbivores. Broken leaves rapidly take root and form new plants. This is true of all Gasteria's except for *G. rawlinsonii* which Hilton-Taylor and Smith (1994) regard as Critically Rare due to its highly localised habitat. Some Gasteria's have become rare due to habitat destruction, however, for the most part species grow on rocky outcrops or vertical cliff faces where development poses no threat. Propagation of plants in this genus pose few problems.

Gasteria nitida

- Is the species traded?: Although South Africa has no record of export plants are commonly offered for sale in overseas catalogues thus indicating the possibility of illegal trade from South Africa.
- That is the status of the wild population?: Hilton-Taylor and Smith (1994) give the Red Data Book status as Insufficiently Known.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)? *G. nitida* is widely distributed in the south eastern Cape coastal regions of South Africa, and would not seem to be threatened by trade although the traditional medicinal trade and development is placing populations under pressure.
- Is the wild population in decline?: Unknown, but unlikely.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes, widely.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild population before exploring Appendix II or III listing or stricter domestic protection.

Genus: *Gibbaeum*
Family: Mesembryanthemaceae

Van Jaarsveld (in litt., 1985), regards both *G. schwantesii* and *G. newbrownii* as hard to come by and likely to be field collected. No mention was made of *G. esterhuyseniae* identified in this study. Jacobsen (1960) reports that these species are very valuable, that propagation from seed is easy and that cuttings root readily.

Gibbaeum esterhuyseniae

- Is the species traded?: Despite its Extinct status and the fact that South Africa has no record of export the species is advertised in four international catalogues. A British catalogue advertises the fact that the seeds are wild-collected, either indicating the plant is not extinct or that the advertising is inaccurate. The prices asked for plants are low at about R5 per plant and about R8 per 100 seeds indicating that demand is low or supply is not a problem.
- What is the status of the wild population?: According to the Red Data Book (Hilton-Taylor,

1996a; 1996b) it is now regarded as Extinct in the wild. However, Hilton-Taylor (in litt., 1997) reports the species was rediscovered about two years ago and hence it is possible that plants from the wild are being traded.

- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The former distribution of the *G. esterhuyseniae* was very limited within South Africa (Jacobsen, 1960).
- Is the wild population in decline?: Yes, it was until recently thought to be extinct.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part A and B apply. Due to concern from experts the precautionary principle also applies.

Recommendation: Due to uncertainty about status of wild populations an urgent review of wild population is required followed by consideration of CITES Appendix I listing.

Genus: ***Haworthia***
Family: **Asphodelaceae**

According to Scott (1985), the propagation of Haworthia's from seed gathered from cultivated plants is not recommended unless the selected specimen is well separated from all other flowering Haworthia's and is hand pollinated. This prevents hybridisation. Little difficulty is experienced in cultivating Haworthia's from seed, leaf cuttings or suckers. Apparently, the problem with keeping these plants alive arises from people making use of incorrect husbandry techniques and especially in cold climates mortality can be high. It is this mortality rate that can contribute to sustained demand for plants, whether wild-collected or artificially propagated. Hilton-Taylor and Smith (1994) have expressed concern about the joint effects of habitat destruction and collector activity on the survival of many of the rare endemic species. They say that the number of threatened species has increased from six to 40 as a result of illegal collection, agriculture and overgrazing. Another problem facing this genus is the ongoing taxonomic revision with constant changes of names. These changes impact negatively on the accuracy of tracking species through catalogues and permits.

Although there are historical indications of illegal trade, this may have been limited to parent stock from which many plants are now artificially propagated. This may mitigate the past trade to some extent. However, for countries like Japan having a tendency to demand wild-collected plants, the existence of illegal trade mechanisms requires further attention especially for rare species like *Haworthia emelyae var. comptoniana.*

Haworthia unicolor (synonym: Haworthia aristata)

- Is the species traded?: South Africa has no recorded exports of this species. However, it is commonly advertised in American, British and Japanese catalogues at prices ranging from R10 to R16 per plant.
- What is the status of the wild population?: Common.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: It has a relatively restricted distribution from Barrydale to Oudthoorn in the Western Cape province, South Africa (Bayer, 1982).
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.

- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a. part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of populations to assess levels of collection from the wild.

***H. mirabilis* subsp. *badia* (synonym: *H. badia*)**

- Is the species traded?: South Africa has no recorded exports of this species. It is advertised in a Japanese catalogue a medium to high price of R56 per plant. This seems to indicate great rarity and the existence of an illegal trade.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the subspecies as Endangered due to agriculture, development and quarrying. According to Bayer (in litt., 1983) the main population has been destroyed by collectors and any plants offered for sale are likely to be wild-collected.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South African endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2b, part A and B apply. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. bayeri

This name was recently accepted as valid and published. There are no records of trade or advertisements in plant catalogues. It is reported by Hilton-Taylor (pers comm., 1997) to be fairly abundant.

H. bruynsii

- Is the species traded?: South Africa has no recorded exports for the species and it has only appeared in one South African catalogue during 1984. No other trade data is available.
- What is the status of the wild population?: According to Bayer (in litt., 1983) this species is known from only one locality. Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to collector activity.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Restricted to one locality in South Africa.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part A and B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. emelyae var. comptoniana (synonym: *H. comptoniana*)

- Is the species traded?: Bayer (1982) states that this species, together with others having flattened ends to the leaves, is highly sought after by collectors. There has been excessive collection of this species. South Africa has recorded the export of four plants to Japan and Germany, however, the number of catalogues (>20) advertising plants far outweighs the number of plants legally exported. Plants and seed offered for sale overseas are very expensive with prices ranging from R10 to R34 per 8 seeds and on average R97 per plant. These factors, together with expert opinion, seems to indicate the existence of a large illegal trade.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Endangered due to collector activity and agricultural development. According to Bayer (in litt., 1983), this plant is rare and has been reduced to two plants at one of its localities.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South African endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, it is very easily cultivated.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part A and B apply. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. cooperi

- Is the species traded?: South Africa has no recorded exports for this species, however, plants are advertised widely in more than 20 domestic and overseas catalogues. One British nursery advertised wild-collected plants for sale in 1993. The low prices of R3 to R27 indicates that demand is low or supply is not problematic either through wild collection or artificial propagation.
- What is the status of the wild population?: According to Bayer (1982) this species is very common and widespread in its Eastern Cape province habitat. It is not listed in the RDB.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South African endemic is Widespread.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2b, part A and B apply. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of populations to assess levels of collection from the wild.

H. glauca var. herrei (synonym: *H. eilyae*)

According to Bayer (1982) this is a synonym for *H. glauca*. South Africa has no export records for this species but an American catalogue advertises it at R10 to R14 per plant.

H. emelyae

The subspecies *H. emelyae var. comptoniana* discussed above should be included here.

- Is the species traded?: South Africa has recorded the export of two plants to Germany over the period 1981 to 1995. No catalogues advertise this species or varieties listed in Appendix 4.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard *H. emelyae* var. *emelyae* as Vulnerable and *H. emelyae* var. *multifolia* as Endangered due to collector activity.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Bayer (1982) states that the species *H. emelyae* is a generally widely distributed species occurring from Uniondale to Ladismith in the Eastern and Western Cape provinces, South Africa. However, *H. emelyae* var. *multifolia* is known from only one population of about 50 plants (Bayer, in litt., 1983).
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part A and B apply. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

H. floribunda

Bayer (1982) describes this species as interesting with twisted lanceolate leaves with blunt rounded tips.

- Is the species traded?: South Africa has no recorded exports of this species, but it is advertised in five catalogues for the low price of between R13 and R45 per plant. No seeds are advertised.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range (Hilton-Taylor, pers comm., 1997)
- Is the wild population in decline?: Yes, due to agricultural development.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

H. graminifolia

- Is the species traded?: South Africa has no recorded exports for this species. However, it is advertised in one international and three domestic catalogues for R55 to R98 per plant. This price structure indicates demand, limited supply and possible illegal trade for this rare species.
- What is the status of the wild population?: According to Bayer (1982) and Bayer (in litt., 1983) this species is very rare. Hilton-Taylor and Smith (1994) regard the species as Critically Rare due to collector activity.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.

- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part A and B apply. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. venosa **(synonym:** *H. granulata)*
According to Bayer (1982), *H. granulata* is a synonym for *H. venosa* which is a widespread, slow-growing, species that is easy to propagate from offsets. There are no export records for this species. Plants, but not seed, are advertised in two catalogues at prices ranging from R22 to R28 per plant.

H. coarctata **(synonym:** *H. greenii***)**
According to Bayer (1982), *H. greenii* is a synonym for *H. coarctata*. The species is stem forming and is widespread in the Eastern Cape province. There are no records for the export of this species from South Africa. Plants, but not seed, are offered for sale in four catalogues, including one from Japan, at prices ranging from R10 to R28 per plant.

H. heidelbergensis
- Is the species traded?: South Africa has no record for the export of this species. However, thirteen plant catalogues offer plants for sale at prices ranging from R8 to R42 per plant.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to wheat farming.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Bayer (1982), this is a small species known only from one locality in South Africa.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes, but does not proliferate easily and is difficult in propagation.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part A and B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. kingiana
- Is the species traded?: South Africa has no record for the export of this species. However, nine catalogues offer it for sale at prices ranging from R4 to R33 per plant. Catalogues did not offer seed for sale.
- What is the status of the wild population?: Hilton-Taylor (1996) regards the species as Vulnerable. Agricultural development, collector activity and road construction are the main threats to the population.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.

- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, but according to Bayer (1982), its propagation is slow because offsetting occurs irregularly.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2b, parts A and B apply. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I and II listing.

H. koelmanlorum

- Is the species traded?: South Africa has no records for the export of this species, however, it is in demand from collectors as illustrated by advertisements in 14 catalogues asking relatively high prices from R14 to R174 per plant. This high value indicates that an illegal trade in wild-collected plants may exist.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to over-collection and use as traditional medicine. According to Bayer (1982), this species, although collected out in its original habitat, is still known from other localities.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The range of this South African endemic is unknown.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, plants can be grown from whole leaves but are slow.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a. part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. limifolia **and varieties.**

- Is the species traded?: South Africa has recorded exporting 350 seedlings and plants from 1981 to 1995. Prices in catalogues range from R3 to R97, the latter being for a large plant in a 19 centimetre pot. Seed was not available for the species but this is not seen as a limiting factor as propagation from leaf is a standard and successful technique. This species is under severe collection pressure from traditional healers, the contribution of hobbyist collectors simply exacerbates the problem. A recent medicinal overview study conducted by TRAFFIC identified this species as a priority due to medicinal use alone (Newton, 1997).
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) report the Red Data Book status of *H. limifolia* var. *ubomboensis* as Indeterminate, and for *H. limifolia* var. *gigantea* as Vulnerable due to its use as a medicinal plant.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Widespread range.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Yes.

- Is the species artificially propagated?: Yes, according to Bayer (1982), the species propagates readily from stolons.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing or stricter domestic protection.

H. magnifica var. *atrofusca* and var. *major*

Bayer (1982) reports that *H. maraisii* and *H. paradoxa* are synonyms of *H. magnifica* subspecies.

- Is the species traded?: South Africa has no record of exports for this species, but in excess of 15 catalogues advertise plants for sale at prices ranging from R4 to R71 per plant. There is apparently no shortage of plant material for the collector market but because of the apparent rarity of the species the origin of plants requires further investigation.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species and sub-species as Endangered due to agricultural development. According to Bayer (in litt., 1983), this species is very rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

H. maraisii

See *H. magnifica* above. Despite the fact that this species was added to the list by experts there is no precise information available in standard references. South Africa has not recorded any exports for this species, however, it is advertised in plants catalogues for between R10 and R33 which fits into the price range for *H. magnifica*.

H. marginata

- Is the species traded?: South Africa has not recorded any exports for the species but plants and seed are offered for sale in five United States and one British catalogue. The latter catalogue states that the seed has been obtained from wild plants. A puzzling fact is that the prices asked for plants are extremely low, from R10 to R43 per plant, for such a rare species. Part of the reason for this could be that plants are artificially propagated by American nurseries. This may also indicate that wild-collected plants do not form a component of the industry.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Endangered due to agricultural development. Its main habitat in Cape Renosterveld[1] is the

[1] Renosterveld vegetation comprises a variety of non-succulent small-leafed and broad leafed shrubs, which are distinctly not fynbos (part of the Cape Floral Kingdom). They are generally restricted to the fine grained, very fertile soils derived from the Malmesbury, Bokkeveld shales. The vegetation is dominated by a gray shrub, Renosterbos *(Elytropappus rhinocerotis)*. Renosterbos has probably become dominant as the result of past disturbance, particularly frequent burning and over-grazing. It was thought that Renosterveld was at some time in the past a Rooigras/Red Grass *(Themeda triandra)* grassland. There are three Renosterveld types.

most under-protected vegetation type in the Fynbos Kingdom of the Western Cape province. According to Bayer (in litt., 1983), this species is rare and limited to one population of 30 plants. Fifty plants were rescued from a quarrying operation.

- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, but it is apparently slow in cultivation and not common in the nursery industry.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. maughanii

- Is the species traded?: The abruptly truncated leaves make this species popular amongst collectors. South Africa has reported the export of 854 artificially propagated plants of this species to mainly Japan. Advertisements for this species occur regularly in Japanese plant catalogues. Prices are generally very high but range from R7 to R1,041 per plant. The average price is R186. All plants in Japanese catalogues are of unknown origin and it is not known if artificial propagation occurs. To the contrary prices in American and European catalogues are substantially lower at between R10 to R40 per plant and many plants are said to be artificially propagated. A British catalogue again advertises seed as wild-collected. It appears that the Japanese market needs to be monitored for wild-collected specimens.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to collector activity and ostrich farming.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Bayer (1982), this South African endemic species occupies a small habitat.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. mirabilis

According to Bayer (1982), there appears to be some uncertainty about the relationship between this species and *H. magnifica*. Until this taxonomic problem is resolved it is not possible to say what the effects of trade are on this species. Similarly *H. mundula*, identified by experts, has been placed by Bayer (1982) under *H. mirabilis* as the subsp. *mundula*. South Africa has no records for the export of this species nor do any plant catalogues reviewed mention it. Hilton-Taylor and Smith (1994) regard the species *H. mirabilis* subsp. *badia* as Endangered due to agricultural development and quarrying and *H. mirabilis* subsp. *mundula* as Endangered due to agriculture.

H. mucronata

According to Bayer (1982), this is an invalid name and the species does not exist. Whether taxonomic confusion exists or not this species, although not officially exported from South Africa, is listed in several plant catalogues. The listed prices are low ranging from R5 to R24 per plant. Until the taxonomy of the species is settled it is difficult to make an assessment of trade impacts on the taxon.

H. mundula

See *H. mirabilis* above.

H. mutica

- Is the species traded?: South Africa has not recorded any exports for this species, however, plant catalogues in United Kingdom, South Africa and the United States advertise plants at prices between R4 and R60 per specimen. The origin of many of the plants offered for sale is stated to be artificially propagated but some are unknown. It is difficult to make an impact finding on available information but the low prices being asked indicates a low demand and threat.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to agriculture and collector activity. Bayer (1982) reported that the species leads a precarious existence in an intensively farmed area and survives on rocky shale ridges.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. paradoxa

See *H. magnifica* above. Although this is considered to be a subspecies of *H. magnifica* the taxonomy has not yet been consolidated and it is difficult to make an impact assessment. The species is offered for sale in catalogues at prices ranging from R10 to R25 which fits into the price range for *H. magnifica.*

H. parksiana

- Is the species traded?: South Africa reported exporting two plants to Germany in 1993. Despite these low export volumes it is advertised in catalogues from Germany, United Kingdom, Japan and the United States. This indicates that illegal trade may exist. Prices asked are low ranging from R9 to R27 per plant suggesting low demand and easy availability possibly through artificial propagation as stated in some catalogues.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Endangered due to collector activity. According to Bayer (in litt., 1983), this species is known from two locations where it is quite common.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.

- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes. It is easy to propagate although growth is slow.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. pehlemanniae

- Is the species traded?: South Africa has not recorded exports for this species, however, it is advertised in one United States catalogue for R177 per plant of unknown origin. This high price indicates the possible existence of trade in wild-collected plants. The lack of propagation stock and seed heightens this concern and this species should be closely monitored.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Endangered as a result of collector activity. According to Bayer (in litt., 1983), this species is known from only two plants. It is thought to be conspecific with *H. archeri* which is also very rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. poellnitziana

- Is the species traded?: South Africa has no records for the export of this species, it is however, advertised for sale in British and American catalogues for prices ranging from R10 to R30 per plant which does not seem to reflect its great rarity. This can be accounted for in part due to the claim that some of the advertised plants are artificially propagated.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Endangered due to agricultural development. Bayer (in litt., 1983) reports that this species is very rare.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The range of this South African endemic is unknown
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. pubescens

South Africa has not reported any exports for this species, but it is advertised at relatively high prices in three catalogues from R15 to R72 per plant. Only the South Africa catalogue claims to sell artificially propagated plants all other plants are of unknown origin. Given the rarity of the species the wild populations should be monitored.

- Is the species traded?:
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due its highly localised habitat and collector activity.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Bayer (in litt., 1983), the species is restricted to one locality in South Africa with 50 to 100 plants and is practically unknown in collections. More recent field research conducted by this author, for a new taxonomic reference book, is expected to provide an update on the distribution of this species.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, but it is very slow from normally scarce seed.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. pulchella

- Is the species traded?: South Africa has not reported any exports of this species and it seems to be scarce in the nursery industry as there are only 1986 listings from the United States. One South African catalogue advertised the species in 1993 at a price of R25 per plant the origin of which is unknown. From this data there does not appear to be an excessive demand for the species but wild-collection is considered to be a danger.
- What is the status of the wild population?: Unknown, but Bayer (in litt., 1983), reports it as uncommon.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The range of this South African endemic species is unknown.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, but Bayer (in litt., 1983), reports it to be difficult to propagate and slow growing.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

H. serrata

- Is the species traded?: South Africa has no recorded exports for this species, but it is advertised

in several overseas and domestic catalogues. For prices from R5 to R43 per plant. The most concerning development is its appearance in a Czechoslovakian catalogue at an asking price of R5 to R6 per plant. The owner of this catalogue has allegedly conducted several plant and seed collecting expeditions to South Africa since 1994 expanding the species selection in the catalogue. Wild-collected specimens have been allegedly transported back to Czechoslovakia illegally via the postal system. The low prices, on an international level, but high for Czechoslovakia (Fig. 5), asked are likely to stimulate exceptional consumer demand and further collecting trips. This situation requires careful monitoring.

- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Endangered due to agriculture and collector activity.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Bayer (in litt.,1983), this South African endemic species is known from only two small populations.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. sordida

It is a very slow growing species and produces few offsets.

- Is the species traded?: Four plants were recorded as exports to Japan during 1988, but plants and seedlings are advertised in catalogues from United Kingdom, South Africa and the United States at prices ranging from R4 (US$1.76) to R74 per plant. No seed is offered for sale. The highest prices are advertised in overseas catalogues indicating that supply is a problem. Another concern is that one South African catalogue owner, with an alleged reputation for providing wild-collected plants, advertises this species. Careful monitoring is required.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to over-collection and grazing by livestock. Craib (1990) reports that the species sets abundant seed and slow-growing seedlings rapidly colonise overgrazed areas once livestock are removed.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Bayer (1982), this South African endemic species is very localised and scarce even though its distribution is relatively wide.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. springbokvlakensis

- Is the species traded?: South Africa has recorded the export of 44 specimens to Germany and Japan over the period 1981 to 1995. Catalogues from countries other than the recorded importers, now advertise the species at prices ranging from R10 to R122 per plant reflecting its rarity and collector demand. A British catalogue advertises wild-collected seed. As it is unknown where the sale plants originate these rare populations should be monitored.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to collector pressure. According to Bayer (in litt., 1983), this species is rare in its habitat and is subject to illegal field collection. Hilton-Taylor (pers comm., 1997) reports that one protective farmer guards populations on his farm using a shot-gun.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The range of this South African endemic is unknown.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. truncata

- Is the species traded?: South Africa has recorded the export of 891 specimens to mainly Japan. Plant catalogues from Czechoslovakia, Germany, United Kingdom, Japan, Netherlands, South Africa and the United States advertise plants for up to R694 per plant. Seed is also widely available. According to Bayer (1982), this species has abruptly truncated leaves, like *H. maughanii*. This character is likely to make it popular in the collector market.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to collector activity.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Widespread range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, it is easy to grow and propagates from leaf and from root as long as some stem tissue remains on the cuttings
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

H. venosa subsp. granulata

- Is the species traded?: South Africa has not recorded any exports for this species. No catalogues surveyed list this taxon.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Widespread range.

- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown.
- Is the species artificially propagated?: Yes. Propagation is not problematic, although growth and proliferation may be slow (Bayer, 1982).
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: No urgent action required.

H. wittebergensis

- Is the species traded?: South Africa has no records for the export of this species, however, several catalogues mainly South African, and one from United Kingdom, do list this species at R10 to R52 per plant. Seed does not appear to be available. A South African based catalogue alleged to supply wild-collected plants advertises this species.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Critically Rare due to overgrazing and collector activity. According to Craib (1990), pastoral practises in this species habitat pose little danger to the plants since they are dwarf plants occupying specific niches that enable them to escape the attention of grazing animals.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: The range of this South African endemic is unknown.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: According to Bayer (1982) this species grows and proliferates slowly but is not problematic. Hilton-Taylor (pers comm., 1997) reports that it is problematic to maintain in cultivation.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

H. woolleyi

- Is the species traded?: South Africa has no recorded exports for this species. However, catalogues from Germany, United Kingdom and South Africa advertise plant at prices ranging from R8 to R72 per plant. One South African catalogue alleged to normally supply wild-collected plants offers plants for sale and it seems that careful monitoring of wild populations is required.
- What is the status of the wild population?: Hilton-Taylor and Smith (1994) regard the species as Vulnerable due to the pressure of grazing and collectors. According to Bayer (in litt., 1983), this species is known from one locality with about 20 vigorous clumping plants. Craib (1990) reports that the plant's habitat is being reduced through overgrazing by angora goats and sheep. The species survives because plants grow under tough bushes that protect them from grazing animals.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South Africa endemic has a Restricted range.
- Is the wild population in decline?: Yes.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.

- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes. According to Bayer (1982), cultivation appears to be difficult and growth extraordinarily slow. Offsetting is very slow and it is as quick to propagate this species from seed as from offset.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix I or II listing.

H. xiphiophylla

- Is the species traded?: South Africa has no record of export for the species, however, it is offered for sale in catalogues from United Kingdom, South Africa and the United States at R10 to R39 per plant. The price structure does not indicate great popularity but lack of available seed and export documents suggest that populations should be monitored.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South African endemic species apparently has a restricted range but has not been reported as threatened.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

Genus: ***Muiria***
Family: **Mesembryanthemaceae**

Muiria hortensae

- Is the species traded?: In 1993, South Africa reported exporting one plant to Germany. The only time the species has appeared in a catalogue was in 1986 when it was advertised by a South African organisation at R3 (US$1.32) per plant. Hence it appears that recent collecting activity has not at this time resulted in increased advertising.
- What is the status of the wild population?: According to Hilton-Taylor (in litt., 1994) there has been recent evidence of collecting in the wild for *M. hortensae* and this is cause for concern. This is an intriguing monotypic species that is very rare in its habitat (Jacobsen, 1960; Graham, 1987). Van Jaarsveld (in litt., 1985) reports that the species is hard to come by and specimens are likely to be wild-collected.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South African endemic has a Restricted range.
- Is the wild population in decline?: Unknown, but suspected.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Unknown.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix II or III listing.

Genus: *Othonna*
Family: Asteraceae

Graham (1987) reports that the number of specimens of *Othonna* being grown in collections has reduced over the years probably due to their inability to adapt to cold northern climates and through negligent husbandry. Some species can be propagated from stems but seed is the normal, and sometimes only, means of propagation. Trade seems to have increased since this report because Schippman (pers. comm., 1994) reports that *Othonna herrei* is now traded regularly in Europe. This is supported by a 1992 TRAFFIC Europe survey of nurseries, which found that many Othonna plants were wild-collected and directly imported by dealers into Germany where they were sold. Evidence backing this finding comes from a 1994 confiscation of two *O. lasiocarpa* (synonym: *O. litoralis*) plant from plant collectors by Namibian wildlife authorities. The dealers were apparently exporting plants directly out of Namibia. According to Hilton-Taylor (in litt., 1994) *O. herrei* although not listed in the Red Data book at present has been cited as a potential candidate for listing on the CITES Appendices. Very little appears to be known about the species identified by this research and surveys of their respective habitats are required for further assessment. Detailed trade information for these species is lacking indicating that most trade may occur illegally.

As very limited trade data was available for all Othonnas in Appendix 4 only one CITES listing criteria assessment was conducted for the entire genus.

- Is the species traded?: The only species recorded as exports by South Africa are *O. cacalioides* and *O. herrei* where 36 plants and one herbarium specimen respectively were traded. On the other hand each *Othonna* species on Appendix 4 was advertised for sale in one or other catalogue from Germany, United Kingdom, Japan, Netherlands, South Africa, Switzerland and the United States. This reflects an illegal trade that has possibly involved wild-collected specimens. Prices varied from R8 to R235, and on average R67 per plant indicating that this is a valuable genus in demand from collectors.
- What is the status of the wild population?: Generally unknown but Hilton-Taylor (1996) reports *O. cacalioides* as Insufficiently Known.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Unknown.
- Is the wild population in decline?: Generally unknown, but suspected for some species.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown, but evidence points to this tendency.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

General Recommendation for Genus: Conduct further research into status of wild populations before considering CITES Appendix II or III listing for genus.

Genus: *Pachypodium*
Family: Apocynaceae

Pachypodium namaquanum
As this species is already listed on CITES the listing criteria were not applied. According to Van

Jaarsveld (in litt., 1985), *P. namaquanum* is hard to obtain and likely to be wild-collected. This situation has apparently changed as Hilton-Taylor (pers comm., 1997) reports that several South African and United States nurseries artificially propagate large numbers of plants. According to Jenkins (1993), at the time of their survey, *Pachypodium* species were popular plants in the general and specialist trade. Wild-collected plants of *P. bispinosum* were widely seen although it was reported that the Canary Islands can produce large sized artificially propagated plants within six to seven years. The large number of wild-collected plants were conjectured to come from a large export consignment sent by a South Africa nursery in 1989. There was little evidence for trade in wild *P. namaquanum* as the species was observed to being propagated from seed in reasonable numbers in Italy, Germany and the Canary Islands. TRAFFIC found that this species is used for landscaping by South African horticultural companies; the source of the plants is unknown. Rowley (1983) reported that collectors reduced the number of habitat plants in accessible areas through the removal of small specimens. In confirmation, Retief (1988) reports that legal and illegal collecting caused the species to disappear from certain localities. Furthermore, it was estimated that only about five percent of the wild-collected plants would have survived the trauma. Rowley (1983) reported that the species grows rapidly from seed up to about four centimetres tall under the correct conditions, thereafter growth slows down considerably. Due to this characteristic Rowley (1983) states that the species is always likely to remain a rarity in cultivation and much sought after by collectors. Since this latter report propagation systems have improved and Retief (1988) reports that under ideal condition plants can reach 30 cm height and 10 cm diameter and produce flowers within ten years.

Recommendation: This species was recently down-listed from CITES Appendix I because trade was not considered to represent a threat to the species. Further review of this species is not urgent.

Genus: ***Pelargonium***
Family: **Geraniaceae**

According to Jenkins (1993) a number of *Pelargonium* species are sought after by collectors and are sold as wild-collected plants. One specialist nursery offered ten species, at least eight of which were from wild-collected stock. In 1994, one *P. ceratophyllum* plant was confiscated from plant collectors by Namibian wildlife authorities serving as direct evidence for trade in wild-collected plants. There is evidence that many species are supplied as wild-collected specimens by at least one dealer in South Africa who is alleged to supply plants taken from habitat. This dealer advertises most of the *Pelargonium* species highlighted by this study in a catalogue distributed exclusively to overseas clients. TRAFFIC Europe, in a survey conducted during 1992 concluded that some to all of the wild-collected specimens of *Pelargonium* of various sizes were wild-collected and likely to be supplied directly from nurseries in South Africa. The number of plants involved in this trade is unknown but since many species are exported without documents the combined numbers are suspected to be large. As very limited trade data was available for all Pelargoniums in Appendix 4 only one CITES listing criteria assessment was conducted for the entire genus.

- Is the species traded?: With respect to current trade in this genus South Africa has no records for the export of any of the species listed in Appendix 4. In spite of this each species is advertised for sale in one or other overseas catalogue. In addition, a South African based catalogue that allegedly advertises wild-collected plants for sale to foreign customers only, lists all but one of these species. This supports claims that a proportion of the trade is likely to be in wild-collected plants and illegal because of the lack of permits.
- What is the status of the wild population?: Unknown. Varies from species to species.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Unknown. Varies from species to species.

- Is the wild population in decline?: Unknown, but evidence points to decline for individual species.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown, but considered possible for individual species.
- Are plants collected from the wild?: Yes.
- Is the species artificially propagated?: Yes, but material is limited for rarer species.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B applies. Due to concern from experts the precautionary principle applies.

General Recommendation for Genus: Conduct further research into status of wild populations before considering CITES Appendix II or III listing for genus.

Pelargonium articulatum

This geophytic (not succulent) species appears to be relatively widely spread in the western and south western Cape, South Africa. Van der Walt and Vorster (1981) suggested that the underground rhizome and contracted aerial stem could be used to propagate this species. They also assumed that propagation by seed would be possible but had no first hand experience of this. As stocks of rhizomes, stems and seed are not readily available for propagation, collectors may resort to wild-collected plants. Van der Walt and Vorster (1981) found that this species is not easy to keep in cultivation due to its fussy water requirements.

Pelargonium bowkeri

This geophytic species is wide-spread from KwaZulu-Natal to the Eastern Cape province, South Africa. Van der Walt and Vorster (1981) report that this species has striking flowers and deserved to be propagated more widely. Apparently it is not difficult to transplant and has proven adaptable to a wide range of climatic conditions.

Pelargonium crassicaule

This species has a fairly limited distribution along the coast of Namibia from Luderitz to just south of the Orange River in South Africa (Van der Walt and Vorster, 1981). The environment is extremely harsh and any removal of plants from the wild is cause for concern. According to Van der Walt and Vorster (1981) this species is recommended for cultivation as it is not difficult to root cuttings under suitable conditions. Plants set profuse amounts of seed that germinate freely. It requires careful watering and frost must be avoided.

Pelargonium crassipes

According to Van der Walt (1977), this species is confined to a small area of Namaqualand in the Succulent Karoo, South Africa. Hilton-Taylor (1996) reports the conservation status to be Indeterminate.

Pelargonium karooicum

Van der Walt and Vorster (1988) report that this species has a wide distribution through the arid karoo parts of the south western and Western Cape province, South Africa, from near Oudtshoorn in the south east to the vicinity of Kleinsee in the north-west. Fieldwork suggests that the species is probably not as rare as meagre herbarium data indicates. Some field workers have reported that this species is eagerly grazed by sheep. This may be true in view of the succulent nature of its branches and absence of unpleasant (to grazers) aromatic oils. The species has little horticultural appeal always looking as if it were more than half dead. It is however, not hard to grow and is easily propagated from cuttings. It is highly resistant to drought (Van der Walt and Vorster, 1988).

Pelargonium pulchellum

According to Van der Walt (1977), this species grows in the semi-desert conditions of Namaqualand, South Africa. The species is easily grown from cuttings provided that it is not over-watered.

Pelargonium punctatum

This geophytic species appears to have a very limited distribution in the Northern and Western Cape province, South Africa, and is known from very few collections. Hilton-Taylor (1996) reports the species status to be Indeterminate. Marais and Condy (1995) report that colonies are small but that plants are abundant within populations. According to Van der Walt and Vorster (1981), the value of this species as a pot plant is limited. This is because it flowers once a year for a relatively short period after which the leaves die. Plants require specialist care throughout the year. Seed set in cultivation is poor, whereas in the wild it is good indicating that a specialist pollinator is involved (Marais and Condy, 1995). Propagation is from tuber or seed, however, as artificially propagated tubers are likely to be in short supply this means that wild-collected plants may be in demand.

Pelargonium sibthorpiifolium

This geophytic species grows in desert to semi-desert areas of the extreme north-western Cape, South Africa, and adjacent parts of Namibia. According to Van der Walt and Vorster (1981), propagation occurs through separation and transplantation of the tubers. It is difficult to maintain these propagated plants in a healthy form because of their susceptibility to mildew, drought and over-watering. It requires specialist attention. This requirement for tubers places pressure on limited artificially propagated stock and wild plants.

Pelargonium sidoides

This species has a wide distribution throughout Lesotho, the Eastern Cape, the Free State and southern and south western parts of the former Transvaal, South Africa. It is reported to be tolerant of a wide range of environmental conditions (Van der Walt and Vorster, 1988). The well developed underground parts are thought to be an adaptation enabling plants to survive unfavourable weather and fire. When cut, the insides of the underground parts shows bright red, a property commonly associated with *Pelargonium* species used for traditional medicinal purposes and resulting in the colloquial name 'Rabassam'. It is used for a variety of traditional medicinal puposes. Vernacular names alluding to these uses include 'Kalwerbossie', 'T'nami', and 'Khoaara e nyenyane' (Sesotho). Although not showy the species is considered an interesting horticultural subject because of its unusual flower colour. It is easily propagated by transplanting from seed or from basal cuttings. It is a hardy plant which thrives in plentiful sunlight (Van der Walt and Vorster, 1988).

Pelargonium xerophyton

The species, with semi-succulent stems, occurs in southern Namibia and north-western parts of the Northern Cape province, South Africa, from the vicinity of Maltahohe in the north to near Kamieskroon in the south. It is noteworthy that the southernmost known locality is almost 100km further south of the next most southerly site. Not being floriferous the species is considered by Van der Walt and Vorster (1988) as hardly being an inspiring horticultural subject. It is apparently grown easily from cuttings provided that they are watered sparingly in the rooting period. Once rooted the plants should be kept in strong, direct sunlight and watered regularly but sparingly throughout the year (Van der Walt and Vorster, 1988).

Genus: ***Poellnitzia***
Family: **Asphodelaceae**

Poellnitzia rubriflora

This is a small plant that used to be in the genus *Haworthia* and is similar in appearance to several species of that genus.

- Is the species traded?: South Africa has no record for the export of the species but several catalogues from three countries, including South Africa, advertise it for sale. It is not clear what

impact trade has on populations. The lack of available seed for propagation, of official export documents and apparent widespread demand, albeit at low prices (R6 to R33 per plant), indicates that monitoring is essential.

- What is the status of the wild population?: Critically Rare (Hilton-Taylor and Smith, 1994).
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: According to Hilton-Taylor and Smith (1994), this monotypic genus has a very restricted habitat being endemic to the Robertson and Bonnievale districts in the south western Cape, near to Cape Town, South Africa. They do not regard current levels of urbanisation or agriculture to be having any effect on populations.
- Is the wild population in decline?: Unknown, but considered likely.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Yes.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Annex 2a, part B and Annex 2b applies. The latter applies due to similarity with the genus Haworthia. Due to concern from experts the precautionary principle applies.

General Recommendation for Genus: Conduct further research into status of wild populations before considering CITES Appendix I or II listing for species.

Genus: ***Pterodiscus***
Family: **Pedaliaceae**

Pterodiscus ngamicus

This is a perennial herb up to 300mm tall. The basal organ is a swollen stem arising from a subterranean tuber of approximately the same diameter. Occurs in sandy often calcareous soil and clay (Retief and Herman, 1997). The species caudaceous tuber may make the species attractive for collectors.

- Is the species traded?: South Africa has recorded the export of 500 artificially propagated plants of this species to Germany. It is advertised for sale as "an easy to grow", white flowered plant in five catalogues from Germany and the United States. Prices asked vary between R9 and R57 per specimen of unknown origin. It is not clear what impact trade has on populations. The lack of available seed for propagation indicates that monitoring of wild-populations is essential.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Within its distribution through South Africa, Botswana and Swaziland this species is Widespread.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations to assess impact of trade before considering CITES listing.

Pterodiscus speciosus

This is a perennial herb up to 200mm tall. The basal organ is a short woody stem, not distinctly swollen arising from a subterranean usually pyriform tuber. Occurs in alluvial soil in grassland (Retief and Herman, 1997).

- Is the species traded?: South Africa has recorded the export of 1,087 plants of artificially propagated and unknown origin to Germany, United Kingdom, Japan, United States and Zimbabwe. It is advertised for sale as an "easy to grow" plant in 14 catalogues from ten countries. Prices asked varied between R5 and R118 per specimen of unknown origin. The highest price was advertised in a Japanese catalogue. It is not clear what impact trade has on populations. The lack of available seed for propagation indicates that monitoring of wild-populations is essential.
- What is the status of the wild population?: Unknown.
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Within its distribution through South Africa and Botswana this species is Widespread.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations to assess impact of trade before considering CITES listing.

Genus: *Quaqua*
Family: Asclepiadaceae

This genus is the subject of ongoing taxonomic revision which makes assessment of individual species difficult (Bruyns, pers comm., 1997; Plowes, 1993). It is essential that the wild populations of this taxon be fully investigated to ensure that they are not being damaged by over-collection or other cause.

Genus: *Sarcocaulon*
Family: Geraniaceae

This genus, according to Jenkins (1993), is sought after by collectors and at the time of their survey available from largely wild-collected stock. One nursery offered six species, all wild-collected. In 1994, one *S. patersonii* plant was confiscated from plant collectors by Namibian wildlife authorities. During this research *Sarcocaulon multifidum* and *Sarcocaulon vanderietiae* were identified as priorities. Both these plants, and many others, appear in advertisements issued by a South African based dealer allegedly selling wild-collected plants to overseas clients. This evidence supports concern about the trade in wild-collected specimens requiring ongoing monitoring of populations.

S. multifidum

- Is the species traded?: This species is generally popular amongst enthusiasts of the family Geraniaceae and Craib (1995) states that it probably has the most varied and beautiful flowers in the genus and a compact thornless habit. South Africa's only recorded trade is that for one herbarium specimen to Germany in 1992. However, the real indication of illegal trade is found with the appearance of advertisements for the species in catalogues from four countries including South Africa.
- What is the status of the wild population?: According to Craib (1995), *S. multifidum* is well represented within most of its distribution range in South Africa and Namibia. Colonies to the north of the Orange River are protected in the Sperregebiet, Namibia, to which access is controlled. Mining activities are reported to have had limited impact on the general status of the species.

- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: Widespread.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: Yes. Apparently the main factor limiting propagation is the low availability of seed from cultivated plants.
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of wild populations before considering CITES Appendix III listing for species.

S. vanderietiae

- Is the species traded?: This is reflected by the 2,400 plants exported from South Africa during 1985 and by the large number of advertisements contained in plant catalogues from five countries. Since the last recorded export in 1985 all trade has apparently proceeded illegally.
- What is the status of the wild population?: This species is common throughout most of its range and populations are healthy except in the former Ciskei homeland, Eastern Cape province, South Africa, where habitat destruction could threaten its continued existence there (Craib, 1995).
- What is the distribution range of wild population (i.e. restricted, wide, etc.)?: This South African endemic is Widespread.
- Is the wild population in decline?: Unknown.
- Is the species likely to satisfy one or more of the Res. Conf. 9.24, Annex 1 criteria within five years?: Unknown.
- Are plants collected from the wild?: Unknown, but suspected.
- Is the species artificially propagated?: It is reportedly the easiest of the *Sarcocaulon*'s to propagate as it grows easily from seed and cuttings (Craib, 1995).
- Do Appendix II listing criteria of Res. Conf. 9.24 apply?: Due to concern from experts the precautionary principle applies.

Recommendation: Conduct further research into status of populations to assess levels of collection from the wild.

Genus: ***Senecio***
Family: **Asteraceae**

Senecio laticipes

There are neither records of trade nor documented advertisements for this species. This species was only described in 1992 by Bruyns (1992). There is insufficient information to make a full assessment but expert concern requires that this species is analysed to determine the extent of the threat posed by trade.

Recommendation: Conduct further research into status of wild populations.

4.3 Effectiveness of national and provincial legislation in controlling the succulent plant trade

4.3.1 National legislation

A new national environmental policy for South Africa is being developed through the Consultative National Environmental Policy Process (CONNEPP) and a White Paper was released on 28 July 1997.

Additionally, a national Endangered Taxa Protection Act is being developed to co-ordinate and standardise the terms of disparate provincial and national nature conservation legislation, thereby enhancing species conservation legislation. Until completion of this new legislation, indigenous plant exports remain under the control of provincial ordinances and, at an international level, by CITES. CITES provisions theoretically have legal standing at two levels in South Africa. Firstly, CITES is included in the Environmental Conservation Act (ECA) of 1989 through a clause referring to "International Conventions". However, CITES is not specifically referred to in the Act and there is doubt about whether this reference has legal standing. Secondly, CITES is incorporated and referred to in the Provincial Ordinances (POs) the four former provincial Nature Conservation Authorities and the Department of Sea Fisheries. Each former province, plus the Department of Sea Fisheries, has it's own Management and Scientific Authority. The four provincial authorities were Cape Nature Conservation; The Chief Directorate Environmental Conservation – Orange Free State Nature Conservation; The Chief Directorate Environmental Conservation – Transvaal Nature Conservation and Natal Parks Board. Circumstances under which species and populations listed in various schedules can be traded are given in the body of the Ordinances. Changes made to the CITES Appendices at CITES Conferences of the Parties are automatically taken up into each of the PO's except in the case of KwaZulu-Natal where the schedule has to be specifically updated. Each province can make its ordinance more effective by adopting policy not included in the PO but enforceable through the discretionary powers of the Director (Bodasing and Mulliken, 1996).

Until each of South Africa's nine new provinces develops its own provincial ordinance, the former provincial legislation still applies (Table 7). The Department of Environment Affairs and Tourism (DEAT), based in Pretoria, acts as the co-ordinating body for all provincial Management and Scientific Authorities. It also chairs the Biodiversity Subcommittee (formerly the Fauna and Flora Subcommittee) that meets on a regular basis to discuss CITES and other issues.

In addition to nature conservation regulations, the Department of Agriculture lays down strict plant health regulations for the export of succulent plants as explained in Newton and Vaughan (1996). Other national statutes applicable to flora protection in South Africa include:

- The *Forest Act 122 of 1984* applies only to trees and not to other plants. In 1976 the *Forest Act* was amended to include tree ferns, certain *Aloe* sp., *Encephalartos* sp., *Podocarpus* sp., *Pachypodium* sp., *Protea* sp. and *Widdringtonia* sp. However, this amendment was repealed.
- The *Sea Fisheries Act 12 of 1988* covers aquatic plants which includes any plant, alga or plant organism in the sea or seashore up to the high water mark.
- The *National Parks Act 57 of 1976.*
- The *National Monuments Act 122 of 1984.*
- The *Defence Act 44 of 1957.*
- The *Conservation of Agricultural Resources Act 43 of 1983.*
- The *Mountain Catchment Areas Act 63 of 1970.*

4.3.2 Overview of provincial legislation

Table 7 presents a summary of legislation relevant to the protection of succulent plant species in South Africa. As the provincial system is undergoing significant changes and each new province does not yet have its own nature conservation legislation, the ordinances have been listed according to the new provinces where old provincial legislation is currently in force.

KwaZulu-Natal

The Nature Conservation Ordinance 15 of 1974, Chapter XI still applies in this province. However, a new ordinance is destined to become law when the provinces two official nature conservation administrations (KwaZulu Bureau of Natural Resources and Natal Parks Board) are united at some point in the future.

Picking of flora: A permit is required to pick any *Indigenous Plants* (Table 7) (any plant excluding weeds, indigenous to South Africa, Namibia or an independent state formally part of the Republic) within a private nature or wildlife reserve, on any public road. A permit and written permission from the owner is necessary to pick *Specially Protected Plants*. No permit is necessary to pick *Specially Protected Plants* if the plants hinder lawful agricultural or developmental activity

Sale, purchase, possession, donation or exchange of flora: A permit is required for the sale of *Protected Plants*, but it may be freely donated or exchanged.

A licence is required for the sale of *Specially Protected Plants*, but it may be donated or exchanged if accompanied by a document containing:

- The names, addresses and signatures of the donor and recipient.
- Date and place of delivery.
- Species and quantity to be donated/exchanged.
- How the donor obtained the plants.

However, any bloom, cutting or seeds from cultivated *Specially Protected Plants* may be donated or exchanged within KwaZulu-Natal without such a document. No permit is needed to sell or buy cultivated *Indigenous Plants.*

Rare and *Endangered Flora* can only be sold if a license and permit has been obtained. An invoice reflecting the name and address of the buyer and seller, quantity and species sold, date of transaction must be issued to the buyer with each sale.

Export and import of flora: No *Indigenous Plants* may be exported without a permit, except for preserved flora. *Specially Protected Plants* may not be imported without a permit except for preserved flora.
Fines and penalties: Penalties range from R500 (US$116.55) and six months imprisonment to R2,000 (US$466.20) and two years imprisonment. For a subsequent conviction for the same offence, the court may impose double the fine or double the term of imprisonment or both such fine and imprisonment.

Eastern Cape, Northern Cape and Western Cape provinces (former Cape province)

Specific ordinances for each of these provinces are in various stages of preparation but none are due for parliamentary approval in the short term due to administrative, economic and human resource deficiencies. In the interim each province implements the Ordinance of the former Cape province, namely the Nature and Environmental Conservation Ordinance 19 of 1974 (Table 7).

Picking of flora: Permits are needed to pick *Protected, Endangered* or *Indigenous Flora* (on a public road or within 90m of the centre of the road). Written permission of the landowner is needed to pick a *Protected* or *Unprotected* (any *Indigenous* plant not listed in Schedule 3 and 4) *Flora.*

Sale, purchase, donation and *possession of flora*: *Indigenous, Unprotected, Protected* and *Endangered Flora* may only be sold or bought on the premises of a registered flora grower or flora seller or at a

place designated by the local authority. To sell *Endangered Flora* a permit is needed and a document must be provided to the recipient reflecting: the names and addresses of the permit holder and recipient; the description and quantity of each species sold; the number and date of the permit. Provided the recipient possesses such a document then he/she does not require a permit for the purchase, receipt as donation, transport or possession of *Endangered Flora*.

For the donation of *Unprotected* and *Protected Flora* a document must be given to the recipient reflecting: the names and addresses of the donor and recipient; the description and quantity of each species donated; the date of donation. A permit is required for the donation of *Endangered Flora*.

The possession of *Unprotected* and *Protected Flora* requires written documentation from whom the flora was acquired or written documentation from the landowner granting permission to remove flora from the land or receipt of purchase/acquisition. Possession of *Endangered Flora* requires a permit.

Export and import of flora: The export or import of *Endangered* and *Protected Flora* requires permits. *Indigenous Flora* can only be exported if it has been legally obtained from a registered flora grower or seller who has a permit to export such flora. The *Indigenous Flora* must be accompanied by a document showing the number and date of this export permit.

Fines and penalties: A fine not exceeding R100,000 (US$23,310.02) or imprisonment not exceeding 10 years or both fine and imprisonment, and a fine not exceeding three times the commercial value of the flora concerned is applicable to:

- Picking flora in a provincial or local nature reserve without a permit, and
- Picking, selling, purchasing, donating, exporting, importing, transporting or receiving as a donation any *Endangered Flora* without a permit.

A fine not exceeding R10,000 (US$2,331) or imprisonment not exceeding two years or both fine and imprisonment, and a fine not exceeding three times the commercial value of the flora concerned is applicable to:

- Picking *Protected* and *Unprotected Flora* without a permit and without permission of the landowner.
- Purchasing or selling *Protected Flora* other than on the premises of a registered flora seller or grower.
- Exporting CITES Appendix II plants without a permit.

A fine not exceeding R5,000, (US$1,165.50) or imprisonment not exceeding one year, or both fine and imprisonment and a fine not exceeding three times the commercial value of the flora concerned, is applicable to any other contravention's of the Cape Ordinance for which no specific penalty is prescribed

Gauteng, Mpumalanga, Northern and North-West provinces (former Transvaal province)

These four provinces are currently developing their own ordinances. However, it is only Gauteng and Mpumalanga who have well-developed outlines for such legislation. Even so, parliamentary approval is not expected in the immediate future. The ordinance presently in force is the Nature Conservation Ordinance 12 of 1983. Chapter VII and VIII.

Picking flora: *Indigenous Flora* may not be picked in a nature reserve, public road or 100m from a public road without a permit. No person may pick *Indigenous Flora* unless they are the relative of the owner/occupier or carry written permission from the owner. A permit is required for the picking of any

Protected, Specially Protected, Endangered or *Rare* plant. *Endangered* or *Rare* plants are all CITES Appendices I and II plants. However, the owner or any person carrying written permission from the owner may pick without a permit: *Indigenous Plants* which are not *Protected* or *Specially Protected Plants*; flowers of *Protected Plants, Protected Plants* if they or the land is required for grazing , burning of the veld or any development which requires the destruction of vegetation.

Sale, purchase, possession, donation of flora: No *Specially Protected, Rare* or *Endangered* plants may not be sold, purchased, donated, possessed without a permit.

Protected Plants may not be sold or donated without a permit. However, a permit is not required for:

- Landowners and their relatives who are authorised to pick *Protected* or *Indigenous Plants* and wishing to donate flowers of such plants.
- The donation of cultivated *Protected Plants,* or
- The donation and sale of *Protected Plants* by a botanical garden or licensed person.

Protected Plants may only be purchased and possessed from a person selling or donating the plants legally.

Export, import, removal and transport of flora: No *Protected, Specially Protected, Rare* or *Endangered* plants may be exported, imported, removed or transported without a permit. However, permits are not required for:

- The import and transport of *Protected Plants* if the plants have been lawfully donated, sold or cultivated in an authorised nursery and documents from the donation, sale, dealer are carried during conveyance. No permits are required for the transport of *Protected Plants* if the landowners and their relatives have permission to pick of *Protected Plants.*
- The export or removal of *Protected Plants* by a botanical garden or a person licensed in terms of Licenses Ordinance 1974, or
- The export, removal and import of *Rare* or *Endangered* plants to or from another South African province or territory formerly part of the Republic, unless there are other provisions in the Ordinance or notices preventing the export, import and removal of such plants without a permit.

Fines and penalties: The picking, possession, sale, purchase, donation, receive as a donation, import, export or removal of a *Specially Protected* plant without a permit results in a maximum fine of R1,000 (US$233.10) or imprisonment up to 12 months or both. Subsequent convictions increase the fine to an amount not exceeding R1,500 (US$349.65) or imprisonment not more than 18 months or both such fine and imprisonment.

The import, export and removal of *Rare* or *Endangered* plants without a permit (except under certain conditions) will result in a maximum fine of R1,500 (US$349.65) or imprisonment up to 18 months or both. Subsequent convictions increases the fine to an amount not exceeding R2,000 (US$466.20) or imprisonment not more than 24 months or both such fine and imprisonment.

For any offence in terms of the Transvaal Ordinance for which no penalty is expressly provided, the fine shall not exceed R750 (US$174.83) or to imprisonment not exceeding 9 months or both such fine and imprisonment.

Free State (former Orange Free State province)

The Free State has the same geographic boundaries as the former Orange Free State and hence the ordinance (Nature Conservation Ordinance 8 of 1969, Chapter IV) applies, completely unchanged, in

the new province. However, departmental restructuring has caused considerable disruption in the day to day running of nature conservation in this province.

Picking of flora: Permits are required to pick *Protected Plants*. No *Indigenous Flora* can be picked within 100m of a public road without a permit. The picking of *Indigenous Flora* in a provincial or private nature reserve or any other land requires the written permission of the Administrator of the (Orange) Free State or owner. Permits are not needed for the picking of *Indigenous* or *Protected Plants* if:

- The plants hinders lawful agricultural or developmental activity, or
- The owner, relative or full time employee of the owner wishes to pick the flowers of such plants or pick *Indigenous* or *Protected Plants* being cultivated on the land.

Sale, purchase, donation and possession of flora: No *Protected, Endangered* or Scarce plants may be sold or donated without a permit. The buyer/donee must obtain from the seller/donor a document reflecting the names and addresses of the seller/donor and purchaser/donee; the species and quantity of the plants sold/donated and date of the sale/donation for the purchase and possession of *Protected, Endangered* or Scarce plants.

Import, export and transport of flora: No *Protected, Endangered* or *Scarce* plants may be imported, exported without a permit. *Protected, Endangered* or *Scarce* plants may not be transported without a transport permit, export or import permit and a document proving the sale or donation of the plant(s).

Fines and penalties: Any person selling, donating, importing or exporting *Protected, Endangered* or Scarce plants without a permit (except under certain conditions) shall be fined an amount not exceeding R100,000 (US$23,310) or imprisonment not exceeding 10 years or both such fine and imprisonment.

For any other offences the fine shall not exceed R20,000 (US$4,662) or imprisonment not exceeding 5 years or both such fine and imprisonment.

Table 7: Summary of Provincial Ordinances Protecting Succulent Plants in South Africa.

South Africa Province	Ordinance	Protection of succulent plants
KwaZulu/Natal (formerly Natal)	Nature Conservation Ordinance 15 of 1974. Chapter XI	◦ Indigenous flora – any plant, or part thereof, indigenous to the Republic of South Africa, Namibia or an independent state formerly part of the Republic, with the exclusion of noxious weeds. ◦ Unprotected flora – any indigenous plant listed in Schedule 10 of the Ordinance ◦ Rare and Endangered flora – defined as Specially Protected flora ◦ Schedule 10 – No succulent plants listed ◦ Protected Plants – Schedule 11 includes all plants indigenous to South Africa and NA and excluding those listed in Schedule 10 and 12 ◦ Specially Protected Plants Schedule 12 includes all: – CITES Appendix I and II species – Liliaceae e.g. aloes, haworthias – Dioscoreaceae – Apocynaceae i.e. all *Adenium* spp. and *Pachypodium saundersi* – Ascepliadaceae i.e. all spp. belonging to the genera *Ceropegia, Stapelia, Huernia, Caralluma, Duvalia, Brachystelma* and *Stultitia*
Eastern Cape, Northern Cape and Western Cape (formerly Cape Province)	Nature and Environmental Conservation Ordinance 19 of 1974. Chapter IV	◦ Indigenous flora – any plant, or part thereof, indigenous to the Republic of South Africa or Namibia with the exclusion of noxious weeds. ◦ Unprotected flora – any species of indigenous flora not specified in Schedules 3 or 4 of the Ordinance. ◦ Endangered Flora – Schedule 3 includes: – *Pachypodium namaquanum* (Apocynaceae) – *Aloe pillansii, A. buhrii, A. erinacea* (Liliaceae) – all species on CITES Appendix I i.e. *Aloe albida, A. polyphylla, A. thorncroftii, A. vossii* ◦ Protected Flora – Schedule 4 includes: – all *Pachypodium* spp. not listed in Schedule 3 – all Asclepiadaceae – *Crassula columnaris, C. perfoliata var. minor, C. pyramidalis, C. coccinea, Kalanchoe thyrsiflora* – *Dioscorea sylvatica, D. elephantipes* – *Euphorbia bupleurifolia, E. fasciculata, E. globosa, E. horrida, E. meloformis, E. obesa, E. schoenlandii, E. symmetrica, E. valida* – all *Aloe* spp. except those listed in Schedule 3 and *Aloe ferox* – *Gasteria nitida var. nitida* – all *Haworthia* spp. – all *Lachenalia* spp. – all spp. from Mesembryanthemaceae – all spp. from Portulacaceae – all CITES Appendix II spp. i.e. all *Pachypodium* spp., *Ceropegia* spp., succulent *Euphorbia* spp., *Aloe* spp., *Anacampseros* spp.
Gauteng, Mpumalanga, Northern and North-West (formerly Transvaal Province).	Nature Conservation Ordinance 12 of 1983. Chapter VII and VIII	◦ Indigenous flora – any plant, herb, shrub or tree, or part thereof, indigenous to the Republic of South Africa, Namibia or an independent state formally part of the Republic, with the exclusion of any plant declared to be a weed in terms of any law. ◦ Endangered and rare flora – any plant specified in Appendices I and II of CITES. ◦ Protected Plants – Schedule 11 includes: ♦ *Aloe* spp. excluding *(1)* species not occurring in the Transvaal *(2) Aloe aculeata, A. ammophila, A. arborescens, A. barbertoniae, A. davyana, A. greatheadii var. davyana, A. castanea, A. globuligemma, A. grandidentata, A. lutescens, A. marlothii, A. parvibracteata, A. transvaalensis, A. wickensii* ♦ *Gasteria* spp. ♦ *Haworthia* spp. ◦ Specially Protected Plants – Schedule 12 includes: ♦ *Dioscorea* spp. ♦ *Frithia pulchra, Lithops lesliei.* ♦ *Euphorbia barnardii, E. clivicola, E. grandialata, E. groenewaldii, E. knobelli, E. perangusta, E. restricta, E. rowlandii, E. tortirama, E. waterbergensis* ♦ *Adenium obesium, A. oleifolium, A. swazicum* ♦ *Pachypodium saundersii* – *Brachystelma* spp., *Ceropegia* spp., *Riocreuxia* spp., *Huerniopsis* spp., *Huernia* spp., *Duvalia* spp., *Stapelia* spp., *Hoodia lugardii, Orbeanthus* spp., *Orbea* spp., *Pachycymbium* spp., *Orbeopsis* spp., *Tavaresia spp.*
Free State (formerly Orange Free State)	Nature Conservation Ordinance 8 of 1969. Chapter IV	◦ Indigenous flora – any plant, or part thereof, indigenous to the Republic of South Africa or Namibia with the exclusion of any plant declared to be a weed. ◦ Endangered flora – any species of plant specified in Appendix I of CITES. ◦ Scarce flora – any species of plant specified in Appendix II of CITES. ◦ Protected Plants – Schedule 6 includes: – *Aloe* spp, *Haworthia venosa* subsp. *recurva* – *Dioscorea* spp. – *Lithops* spp., *Neohenricia sibbettii, Pleiospilos* spp., *Titanopsis calcarea* – *Anacampseros* spp. – *Euphorbia* spp. – *Pachypodium* spp. – all *Stapelia* spp, *Ceropegia* spp., *Trichocaulon* spp.

Source: Provincial Nature Conservation Ordinances of the former Transvaal, Cape, Orange Free State and Natal Provinces and Glavovic (1993).

4.3.3 Discussion of national and provincial legislation

South Africa has succulent plant species of several families listed on the CITES Appendices. These include all *Aloe* spp. (Asphodelaceae, formerly the Liliaceae), *Anacampseros* spp. (Portulacaceae), *Ceropegia* spp. (Asclepiadaceae), succulent *Euphorbia* spp. (Euphorbiaceae) and *Pachypodium* spp. (Apocynaceae). According to CITES, all parts and derivatives of the above genera are subject to the terms of the Convention except seeds and pollen; and seedlings or tissue cultures obtained *in vitro*, in solid or liquid media, and transported in sterile containers. The succulent plant export trade industry involves mainly live plants but also occasionally some parts and derivatives as for example with *A. ferox* (Newton and Vaughan, 1996). All recognisable parts such as leaves, stems, stem sections, flowers and inflorescences are subject to normal CITES permit requirements. A ban on the export of adult plants of some specific Madagascan *Pachypodium* sp. was in effect up to the tenth meeting of the CITES Conference of the Parties. Although several commercial growers and individuals do regularly obtain CITES permits for these genera and some non-CITES listed species, there is evidence suggesting that a significant, undocumented trade still exists. The most notable examples are for CITES-listed species such as *Aloe* spp., and *Euphorbia* spp.. The fact that non-CITES species require national permits (for details on legislation protecting succulent plants in section 4.4 and Table 7), but that few are issued lends support to this view. The reasons for this may be that exporters either are unaware of CITES and non-CITES export provisions or they purposely avoid these measures. The blame for lack of recording is not limited to traders as there is direct evidence showing that one province regularly omits large numbers of succulent exports, as 'Exemption Certificates', from South Africa's CITES Annual Report. This laxness in administration makes it difficult to identify illegal trade through assessment of national and international trade statistics. This does not reflect well on South Africa's CITES authorities as a whole.

Other problems with the current arrangement are that penalties are not consistent throughout the provinces and they are insufficiently severe to act as a deterrent. In addition plants, contained in various provincial schedules should be protected in all provinces but are not. For example, all *Aloe* sp. are protected in KwaZulu-Natal, the former Cape province (except for *Aloe ferox*) and Free State, but the former Transvaal ordinance only protects aloes endemic to the province and those listed on CITES Appendices; this leaves obvious loopholes in the law. These same loopholes have caused problems with effective prosecution of illegal cycad traders in the past. The lack of an integrated national legal system for the conservation of *Indigenous Flora*, represented by inconsistent provincial legislation, has resulted in the lack of co-ordination between conservation agencies (Glavovic, 1993; Bodasing and Mulliken, 1996). There is an urgent need for an integrated national conservation statute as outlined in Bodasing and Mulliken (1996). Revised legislation should take into account the need for indigenous people to sustainably harvest natural resources such as succulent plants bulbs and bark (Glavovic, 1993) as many rural people depend on natural resources for food, medicine and building materials. Current legislation also does not adequately address the environmental impacts of population growth, subsistence and commercial agriculture and urbanisation (Glavovic, 1993). For example, in KwaZulu-Natal, Free State and the provinces applying the former Transvaal ordinance, no permit is required to pick and destroy *Specially Protected* and *Indigenous Plants* if they hinder any lawful agricultural or developmental activity. This has led to allegations of uncontrolled picking of flora in areas bordering development zones by botanical groups and commercial concerns making use of this clause.

Another problem regularly highlighted is that law enforcement is negatively affected by staff shortages, limited budgets and vast geographic areas under the control of nature conservation departments (Bodasing and Mulliken, 1996). This is often the reason why plant inspections of exports are done superficially or not at all.

4.4 The illegal trade in southern African succulent plants

Two succulent plant experts asked about illegal trade said that collectors were most active during the 1960's and 1970's, before CITES (Anon., pers. comm., 1992; Anon., pers. comm., 1995). For example, in 1967, a botanist visiting the site of *Lithops pseudotruncatella* subsp. *voulkii* in Namibia found the population destroyed allegedly by a visitor he introduced to the site. Fortunately the seed bank for that species was considerable and the population recovered. At that time, reports indicated that individual botanists would collect plants in large numbers to sell to nurseries, presumably to defray travel expenses. A person closely associated with the discovery and naming of *Lithops julii* subsp. *fulleri* var. *rouxii* allegedly wiped out the type locality population. It was with these 'non-commercial' collectors that commercial collection and trade commenced (Anon., pers. comm., 1995).

In approximately 1972, a nature conservation official, in charge of a Northern Cape province reserve, was convicted of illegally collecting and selling succulent plants by the truckload. Dismissal from his post followed this conviction. This person also allegedly sent 'crate' loads *of Pachypodium namaquanum* to Japan mislabelled as *Euphorbia*. Two other commercial collectors were said to be active in the 1970's. One allegedly ran trucks filled with succulent plants out of Namibia and the Richtersveld, but was never prosecuted. The other was caught and forced to close their business. The 1980's saw the appearance of individual foreign collectors of German, American, Australian and Czechoslovakian extraction trading in the succulent plant market (Anon., pers. comm., 1993; Anon., pers. comm., 1995). These dealers allegedly sponsor their collecting trips from the proceeds of their activities.

Collectors are sometimes involved in other collecting activities, for example cycads. It has been alleged that these collectors sometimes travel under the banner and with staff from reputable botanical gardens in order to obtain permits and credibility. They are often allowed access to herbaria where they are alleged to gather sensitive locality data on rare species. In South Africa these collectors have been alleged to collect without or after the revocation of permits.

According to Venter (pers. comm., 1992), there are only approximately 500 specialist collectors in the world. However, the huge international demand for plants overwhelms the limited production of nurseries and wild-collected plants are used to supplement the shortfall. Historical reports that plants such as *Aloe dichotoma* have been collected by the truckload from the Hester Malan Nature Reserve in the Northern Cape province to support this trade lends credibility to this view. Ignorance sometimes plays a role as evidenced by a police officer who allegedly collected *Haworthia blackburnii* by the sackfull for a police station rockery garden. In addition, there have been problems with raising interest among local farmers and communities to care for their plants. For instance the municipality of Napier, Western Cape province, South Africa, allegedly opened up a quarry without seeking advice and have all but eliminated a colony of rare Haworthias. In addition, some South African businesspersons conduct botanical tours for Japanese and German tourists. Allegedly these tourists, not allowed to collect during the tour, collect all species required during follow up visits to the same sites. In other cases, South Africans collect plants and post them from the collection area to their home addresses. This occurred in 1986 when two collectors from Pretoria posted two parcels of wild gathered plants from Laingsburg, Northern Cape province, to themselves in Pretoria, Gauteng province. A post office official discovered the shipment and as a result the collectors were convicted. The estimate value of plants was R30,000 (US$13,157.89) but the fine only R300 (US$131.58).

In another instance a South African businessperson, with two convictions for collecting rare Haworthias and other plants species, allegedly paid workers to collect large numbers of plants from the wild. Some farm owners have allegedly evicted this trader because of unauthorised collecting

activities. Apparently Haworthias, Lithops and some bulbous (geophytic) plants are in demand because they are easy to transport and fetch high prices. The same trader allegedly makes frequent use of the postal system to get plants out of South Africa, mislabelling the contents to avoid national and international plant trade controls. Another businessperson allegedly sends small packets of plants to individuals, who did not order them, as a smuggling technique, where they can be fetched at a later stage. This trader also allegedly abuses contacts with botanical scientists to find the localities of species.

At least two South African traders are reported to advertise wild-collected South African succulents, including *Aloe* spp., *Bowiea* spp., *Brachystelma* spp., *Cyphostemma* spp., *Frithia* spp., *Haworthia* spp., *Pelargonium* spp. and *Sarcocaulon* spp. in overseas journals. It has been reported that the dealers involved do not respond to South African requests for plants. Research into permits issued show that these two dealers have rarely or never obtained permits for exports. Another dealer, based in the Northern Cape province, allegedly abused a collecting permit issued for research work conducted jointly with a botanical researcher, to collect commercial quantities of *Lithops* spp. plants and seeds from habitat. Northern Cape Nature Conservation subsequently withdrew this permit.

In 1993, United Kingdom authorities seized a consignment of South African bulbs and succulent plants labelled as "African curios". The shipment, containing many Aloes and Euphorbias, and was accompanied by Namibian and South African collection site details. The plants were mislabelled, with Euphorbias being passed off as *Monadenium* spp. Also included in the shipment was one *Aloe comosa* plant and various numbers of plants from the following genera, namely, *Eriospermum, Gethylis, Lachenalia, Massonia, Ornithogalum, Othonna, Pelargonium, Polyxene, Quaqua, Sarcocaulon, Strumaria, Trachyandra* and *Tylecodon*. The shipment was numbered, which indicated that the confiscated part had been part of a much larger consignment. The name and address of the South African sender were found to be false which according to law enforcement officials is a standard smuggling technique. Interestingly, TRAFFIC Europe in a 1992 nursery survey of Germany observed that *Eriospermum* and *Gethylis*, plants observed for sale were always wild-collected and not artificially propagated (Jenkins and Oldfield, 1992). This gives some measure of the size of the illegal trade in these genera. In 1993 and 1994, United States wildlife authorities reported confiscating a total of 14 succulent plant specimens identified as *Aloe* spp. The country of origin of these plants was reported to be South Africa.

During 1994, the Namibian Ministry of Wildlife, Conservation and Tourism caught and successfully prosecuted a local resident for illegally collecting succulents on the Luderitz Peninsula. Authorities confiscated 555 succulent plants including: 483 *Lithops optica,* 52 *L. optica* forma *rubra,* seven *Conophytum saxetanum,* one *Pelargonium ceratophyllum* plant, three clusters of *Tylecodon schaeferianus,* two *Psammophora modesta* plants and single plants of *Sarcocaulon patersonii, Eberlanzia clausa, Drosanthemum paxianum, Limonium membranaceus, Othonna litoralis* and *Juttadinteria* spp. This case was the first confirmed evidence of an illegal plant trade in Namibia that included allegations of smuggling across the border into South Africa.

The illegal trade in southern African succulents is suspected to be large, but this has not been confirmed due to difficulties with detection and prosecution of offenders. This is shown by the fact that the former Transvaal Nature and Environmental Conservation Department and the Orange Free State Nature and Environmental Directorate reported that there had been no seizures or prosecutions for succulent plant offences from 1989 to end 1993 (Erasmus, in litt, 1994; Robbertse, in litt., 1993). Ongoing investigations by the Endangered Species Protection Unit of the South African Police Services and other nature conservation departments have not yet resulted in prosecutions. Further evidence of the size of the trade comes from the number of species recorded in plant catalogues, but

without any record of export from South Africa for endemic species. Although some exports maybe accounted for by activities of seed exporters selling artificially propagated seeds, and in permits issued by neighbouring countries, many cannot be explained. Regrettably, it is almost impossible to identify illegal shipments due to the large number of clerical errors and omissions arising from poor government administrative practices.

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5. CONCLUSIONS AND RECOMMENDATIONS

This study has highlighted succulent plant taxa requiring conservation attention. The largest documented importers of southern African succulent plants are Germany, Japan, the Netherlands and the United States. The Netherlands is well ahead in trade volumes especially for artificially propagated seedlings. The fact that illegal trade exists is undeniable. This is illustrated by documented confiscations and the fact that the number of taxa recorded in trade (1,158) are similar to the number advertised internationally but not documented as exports by South Africa (873). Unfortunately, poor government administration in the form of over and under-reporting of exports has made identification of illegal trade difficult. Consequently, even in conjunction with comparative tabulations, it has not been possible in many cases to identify sources or destinations of this trade.

It is clear that there has been inadequate recording of both the legal and illegal trade in succulent plants. Even genera and species currently listed on CITES have been inadequately monitored. In addition, export of seed from managed sources by seed distributors has gone unrecorded on official documents. These practices have gone on for more years than the period covered by this study. For these reasons South Africa should not consider listing more plant species on CITES until current management problems have been rectified. Without these remedial measures the country will not be able to effectively monitor the trade in plants.

Concerning Annual Reports, South Africa has a long way to go in improving the recording of plant exports. This is especially true for Western Cape Nature Conservation (formerly Cape Nature Conservation) who have consistently omitted Exemption Certificates from South Africa's Annual Reports. Nevertheless, Exemption Certificates have one clear advantage over normal CITES and non-CITES permits in that they report the exact number of plants exported. This is because they act as a sales receipt for the issuing nursery. Although self-regulation of private industry is problematic, it may still be feasible for national government to modify and implement the Exemption Certificate system by adopting the nursery registration rules outlined by CITES. This would improve the accuracy of export records and reduce governments administrative burden.

The above factors, together with the limited usefulness of plant catalogue data, have made it very difficult to directly identify species requiring conservation interventions. Hence the need for the development of alternative techniques to identify species threatened by trade in this study.

Analysis of price information from catalogues has shown that the succulent plant market is subject to the same rules of supply and demand applicable to other industries. The succulent market tends to be trait-focused on aspects such as attractive flowers, interesting growth form, attractive (or unpleasant) scent, small size (for glass houses and transport), rarity or ease of propagation. Different sectors of the market demand different traits according to their circumstances and skills. Species demanded by the uninitiated are those requiring minimum care, are attractive in some way and which propagate easily. The nursery trade will generally supply those species (for instance *Ceropegia woodii*) *en masse* to the horticultural trade at prices considered low in each country. Large scale artificial propagation definitely helps to keep prices low.

This study has highlighted very rare along with supposedly common species as requiring conservation attention. Common factors between them are their higher advertised prices, the lack of available seed, evidence of export without permits or the relatively large size of documented shipments. In this study these elements have been used to assess species individually. The approach allows for the fact that a popular common species can be subjected to the same pressure as rarer species subjected to lesser but equally damaging demand.

An association where rare plants tend to be offered for higher prices, although not absolute, was identified. This association along with others selected for this study are not infallible in that some important species may have been omitted. The possibility that species have been omitted has been reduced as much as possible by verification of the Potential Priority Species List by experts. Despite this, some taxa may still have been omitted and will require ongoing review to detect. The technique developed requires refining especially to exclude species obviously not under any threat from trade.

The main recommendations from this study are the following:

- Taxonomic revisions of taxa must be completed. The problems experienced with taxonomy in this report may account for a species being regarded as threatened when in actual fact it is not a recognised species or is synonymous with a more widely spread taxon. When viewing rarity in succulent plants one has to be very specific about the taxonomic status of the plant. This is particularly applicable to the genus *Haworthia* where several taxa mentioned by experts as being threatened no longer exist, are synonyms of larger species or are disputed.
- Taxa listed in the priority species list require further investigation and possible listing on the CITES Appendices and/or application of stricter domestic controls.
- South African national and provincial authorities need to control the issuing of Exemption Certificates to nurseries ensuring the inclusion of these data into Annual Reports.
- The standard of Annual Reports issued by South Africa requires improvement to eliminate over- and under-reporting and other clerical mistakes committed during compilation. One way of achieving this is to regulate nurseries, through a process of domestic registration as outlined by CITES, who would record sales and exports using Exemption Certificates which reflect more accurately actual trade figures.
- In the case of inadequate data for plants said to be threatened by trade, national government should initiate investigations into the status of plants in the wild and to determine whether current levels of trade are adversely affecting the wild populations.
- That DEAT must work with government department such as Customs, Trade and Industry, Water Affairs and Forestry, the Post Office and Agriculture in co-ordinating comprehensive measures aimed at improving wildlife trade monitoring and the full and effective implementation of CITES. The South African government has committed itself to this process in the new environmental White Paper. The White Paper states that with regard to international agreements (Goal 7, Pg. 37) the South African government is "to meet all requirements arising from international environmental agreements and obligations".
- Adequate funding should be made available to nature conservation departments so that levels of enforcement are consistent in all provinces.

In many cases, the greatest threat to succulent plants is habitat destruction by agriculture and urban development, not collector pressure. This study has identified a list of species considered to be at risk mainly from trade but in some cases also from habitat destruction. Habitat destruction requires urgent action. The recommendation of this report is:

- DEAT work with other government departments such as Agriculture, Water Affairs and Forestry and Transport to formulate integrated environmental management procedures. This should include the implementation of compulsory Environmental Impact Assessments for all government and industrial developments. The aim of this would be to minimise habitat destruction during essential developments and consequently contribute to species conservation. The South Africa government commits itself to this philosophy in the new environmental White Paper (Government Gazette, 28 July 1997). Under Goal 2, Pg. 30 the government states its intention to "Integrate environmental impact management with all economic and

development activities to achieve sustainable development with the emphasis on satisfying basic needs and ensuring environmental sustainability."

Of the genera listed on the priority list, *Aloe spp., Euphorbia spp., Ceropegia spp.* and *Pachypodium namaquanum* are already listed on CITES. However, South Africa's control over this trade is inadequate. The other genera, namely, *Adenia spp., Adenium spp., Adromischus spp., Brachystelma spp., Cheiridopsis spp., Conophytum spp., Crassula spp., Cyphostemma spp., Dioscorea spp., Diplosoma spp., Gasteria spp., Gibbaeum spp., Haworthia spp., Muiria sp., Othonna spp., Pelargonium spp., Poellnitzia sp., Pterodiscus spp., Quaqua spp., Sarcocaulon spp. and Senecio spp.* are protected only by inadequately co-ordinated provincial nature conservation ordinances. For many species on the final priority list the individual findings have been that trade is a threat.

With regard to the illegal or undocumented trade in succulent plants, it is apparent that the postal system plays an important role in supporting this trade. Succulent plants, many being small and hardy, are easily packaged into small parcels and sent abroad. This form of export requires urgent attention from South Africa law enforcement authorities. Another aspect of illegal trade encountered is based on the access which amateur botanists have to sensitive botanical information in southern Africa. In the past, especially the 1960's and 1970's several botanists were allegedly sponsoring collecting trips from the proceeds of commercial quantities of plants removed from the wild. This practise allegedly continues today and may lead to the local extermination of popular and rare plants.

It is also clear that seed distributing organisations in South Africa play a role in disseminating southern African succulent plants abroad and may be responsible for some undocumented exports. Contrary to the intention of postal smugglers, the aim of many seed distributors, especially non-government organisations, is to supply plants from controlled and managed sources to aid conservation efforts. However, there appears to be some confusion in the interpretation of provincial laws regarding the permits required for the export of these propagules. Recommendations stemming from this are:

- South African conservation authorities need to examine the extent of postal smuggling and develop strategies to contain it.
- All organisations involved in the distribution of seed for conservation reasons need to ensure that this is done according to national and provincial laws. The provisions of South Africa's developing policy on Plant Genetic Resources should also be considered by these organisations when revising seed distribution policies.
- Botanical researchers should only be allowed access into herbaria and other places where locality data is stored if a *bona fide* member of a nationally recognised university or botanical garden. These measures are not aimed at excluding keen amateur botanists, but those whose intentions are to collect commercial volumes of plants while carrying out 'botanical research' based on information imparted to them by the herbarium or professional botanists.
- Locality information for plants should not be made available in any form to non-accredited botanists.
- Eco-tourism to rare plant localities should be strictly controlled to prevent post-tour visits by collectors.

Finally, it must be acknowledged that artificial propagation of plants, especially rare taxa, has an important role to play in preventing further declines of wild populations. All rare plants must be protected *in situ*; however, this should not preclude them from being artificially propagated especially if they respond well. In this regard the following recommendations can be made:

- For plant populations which cannot withstand any form of commercial exploitation the collection of a carefully selected proportion of wild seeds should be allowed by specialist

growers. Depending on the species the proportion of the total seed production collected could vary from one percent to approximately 20 percent.

- The artificial propagation of rare species with the aim of producing seed and plants should be encouraged. Artificially propagated material in many cases grows faster and is more suited to commercial trade. This activity could be expanded to encourage exchange and propagation of rare plant material amongst plant propagators.
- The controlled removal of small numbers of wild-collected plants could be considered for establishing parent stock for artificial propagation.
- Nature conservation departments should take the initiative to make seeds of endangered species available to nurseries for propagation.
- Nature conservation departments could make confiscated succulent plants available to registered nurseries, scientific institutions or botanical gardens who have the expertise to care for them. This would entail the development of plant and animal rescue policy as part of a national conservation statute. South Africa currently has no integrated policy on this matter but it is a requirement for the effective implementation of CITES.

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Experts Consulted for Review process

Surname	First Name	Occupation/Expertise	Answered Questionnaire
Aslander	Etwin	Selecta Succulents nursery owner.	✓
Bayer	Bruce	*Haworthia* expert.	✓
Bruyns	Peter	Asclepiadaceae expert, Bolus Herbarium, Cape Town.	✓
Cole	Desmond	*Lithops* expert.	×
Hammer	Steve	Mesembryanthemaceae & *Conophytum* expert.	✓
Heunis	Emile	Grey Heron Nurseries nursery owner.	×
Marx	Gerhard	*Euphorbia* expert.	×
McDowell	Clive	*Haworthia* expert &Botanist. Botany Dept, University of Cape Town.	✓
Peckover	Ralph	*Brachystelma* expert & nursery owner.	✓
Plowes	Darrel	Stapeliad expert.	✓
Schwegmann	Winnie	Sheilam Cactus Garden nursery owner.	×
Smith	Gideon	Mesembryanthemaceae expert, Director Research, National Botanical Institute, Pretoria.	✓
Swart	Priscilla	Succulent plant horticulturist, National Botanical Institute, Pretoria.	×
Van Jaarsveld	Ernst	Succulent plant expert & horticulturist, Kirstenbosch Botanical Gardens.	✓
Venter	Fanie	Botanist.	✓
Venter	Kobus	*Haworthia* expert.	×
Vlok	Jan	Botanist, Cape Nature Conservation.	✓
Wiese	Buys	Kernkwekery nursery owner.	✓
Williamson	Graham	*Euphorbia* & *Othonna* expert.	✓

APPENDICES

Appendix 1: Lists the number of years succulent plant taxa have been reported as exports from South Africa, the RDB status of exported species and those species exported in quantities of 100 units or more. Period of review from 1981 to March 1995.

Scientific name	Subspecies or varieties	Number of years species has been reported as an export from ZA	RDB status of exported taxa	Species exported in quantities of 100 units or more
Adenia fruticosa		5		Y
Adenia glauca		8		Y
Adenia hastata		1		
Adenia pechuelii		4	R	Y
Adenia repanda		1		
Adenia spinosa		6		Y
Adenium boehmianum		3		Y
Adenium multiflorum		7		Y
Adenium oleifolium		2		
Adenium swazicum		5		Y
Adromischus alstonii		2		
Adromischus hemisphaericus		1		
Adromischus maculatus		2		
Adromischus marianiae		2		
Adromischus maximus		1		
Adromischus nanus		1	R	
Adromischus spp.		4		
Aloe aculeata		2		
Aloe affinis		2		Y
Aloe africana		3		
Aloe arborescens		4		
Aloe arenicola		3	V	
Aloe argenticauda		1		
Aloe aristata		12		Y
Aloe asperifolia		2		
Aloe bainesii		13		Y
Aloe bellatula		3		
Aloe bowiea		13	E	Y
Aloe boylei		2		
Aloe branddraaiensis		1		
Aloe brevifolia		10		Y
Aloe broomii		3		
Aloe buhrii		7	R	Y
Aloe cameronii		1		

Aloe candelabrum		2		
Aloe castanea		3		
Aloe chabaudii		2		
Aloe chortolirioides		1		
Aloe chortolirioides	var. woolliana	1		
Aloe ciliaris		8		
Aloe claviflora		5		Y
Aloe comosa		2	R	
Aloe comptonii		7		
Aloe cooperi		4		Y
Aloe cryptopoda		7		Y
Aloe dichotoma		14		Y
Aloe dinteri		1	R	
Aloe distans		8	R	
Aloe dolomitica		1		
Aloe dominella		4		
Aloe ecklonis		4		
Aloe erinacea		10	R	Y
Aloe excelsa		1		
Aloe falcata		2	V	
Aloe fosteri		1		Y
Aloe fouriei		1		
Aloe framesii		2		
Aloe gariepensis		7		Y
Aloe glauca		1		
Aloe globuligemma		3		
Aloe greatheadii		1		
Aloe greatheadii	var. davyana	4		
Aloe haemanthifolia		9	R	Y
Aloe hereroensis		8		Y
Aloe hereroensis	var. lutea	1		
Aloe hlangapies		2		
Aloe humilis		12		Y
Aloe inconspicua		1	R	
Aloe khamiesensis		1		
Aloe kniphofioides		1		
Aloe komatiensis		1		
Aloe krapohliana		10	V	Y
Aloe kraussii		2		
Aloe lineata		1		
Aloe littoralis		1		
Aloe longistyla		10	V	Y
Aloe lutescens		4		Y
Aloe maculata		4		
Aloe marlothii		8		
Aloe melanacantha		9		Y
Aloe meyeri		1	R	

Aloe microcantha		4	R	
Aloe microstigma		11		Y
Aloe minima		1		
Aloe mitriformis		5		
Aloe monotropa		1	R	
Aloe mudenensis		2		
Aloe mutabilis		1		
Aloe namibensis		1	R	
Aloe nubigena		1		
Aloe pachygaster		6		Y
Aloe parvibracteata		3		
Aloe pearsonii		12	V	Y
Aloe peglerae		4	R	Y
Aloe petricola		3		
Aloe pictifolia		12	R	
Aloe pillansii		7	E	Y
Aloe plicatilis		15		Y
Aloe pluridens		7		
Aloe pratensis		3		
Aloe pretoriensis		2		Y
Aloe ramosissima		12	V	Y
Aloe reynoldsii		5	V	
Aloe rupestris		5		
Aloe saundersiae		1	V	
Aloe sessiliflora		1		
Aloe speciosa		10		
Aloe spectabilis		6		Y
Aloe spp.		9		
Aloe striata		9		Y
Aloe striata	subsp. karasbergensis	7		Y
Aloe striatula		6		
Aloe suffulta		4		
Aloe suprafoliata		3		
Aloe tenuior		1		
Aloe thompsoniae		4		
Aloe thraskii		3		
Aloe tidmarshii		1		
Aloe transvaalensis		3		
Aloe vandermerwei		2	R	
Aloe variegata		12		
Aloe verecunda		2		
Aloe viridiflora		1	R	
Aloe zebrina		1		
Aloinopsis luckhoffii		3		
Aloinopsis malherbei		4		
Aloinopsis peersii		4		
Aloinopsis rosulata		4		

Aloinopsis rubrolineata		1		
Aloinopsis setifera		1	R	
Aloinopsis spp.		3		
Anacampseros albidiflora		1		
Anacampseros albissima		5		
Anacampseros alstonii		11		Y
Anacampseros alta		1		
Anacampseros arachnoides		2		
Anacampseros buderiana		1		
Anacampseros comptonii		2	R	
Anacampseros crinita		1		
Anacampseros densifolia		2		
Anacampseros depauperata		2		
Anacampseros dielsiana		2		
Anacampseros filamentosa		11		Y
Anacampseros gracilis		1		
Anacampseros herreana		6	R	
Anacampseros karasmontana		1	R	
Anacampseros lanceolata		2		
Anacampseros lanigera		8		
Anacampseros marlothii		5		
Anacampseros meyeri		3		
Anacampseros namaquensis		2		
Anacampseros nebrownii		1		
Anacampseros nitida		1		
Anacampseros papyracea		14		Y
Anacampseros parviflora		2		
Anacampseros quinaria		1		
Anacampseros retusa		1		
Anacampseros rhodesica		2	R	
Anacampseros rufescens		5		
Anacampseros ruschii		1	R	
Anacampseros schoenlandii		1		
Anacampseros spp.		7		
Anacampseros starkiana		1		
Anacampseros subnuda		2		
Anacampseros telephiastrum		12		
Anacampseros tomentosa		1		
Anacampseros truncata		7		
Anacampseros ustulata		13		
Anacampseros variabilis		1		
Anacampseros wischkonii		2		
Apatesia helianthoides		1		
Argyroderma congregatum		1		
Argyroderma delaetii		3		
Argyroderma fissum		2		Y
Argyroderma pearsonii		2		

Aridaria noctiflora		3		
Aridaria noctiflora	var. noctiflora	1		
Aridaria spp.		1		
Aspazoma amplectens		3		
Astridia citrina		1	R	
Astridia hallii		1		
Astridia speciosa		3		
Astridia spp.		2		
Astroloba foliolosa		1		
Astroloba spp.		2		
Bijlia cana		4		
Bowiea volubilis		1		
Brachystelma barberae		3		
Brachystelma brevipedicellatum		1		
Brachystelma circinatum		1		
Brachystelma dinteri		1		
Brachystelma foetidum		3		
Brachystelma spp.		1		
Brachystelma stenophyllum		1		
Brownanthus arenosus		2		
Brownanthus ciliatus		2		
Brownanthus kuntzei		1		
Brownanthus marlothii		1		
Brownanthus pubescens		4		
Brownanthus schlichtianus		3		
Brownanthus spp.		1		
Bulbine frutescens		1		
Bulbine margarethae		4	E	
Bulbine mesembryanthemoides		1		
Bulbine sedifolia		2		
Bulbine spp.		1		
Bulbine wiesei		1	V	
Bulbinella latifolia		1		
Carpobrotus quadrifidus		1		
Cephalophyllum caespitosum		2		
Cephalophyllum ebracteatum		1		
Cephalophyllum framesii		1		Y
Cephalophyllum inaequale		1		
Cephalophyllum namaquanum		1		
Cephalophyllum regale		1		
Cephalophyllum spongiosum		3		
Cephalophyllum spp.		2		
Ceraria fruticulosa		5		
Ceraria namaquensis		3		
Ceropegia africana		10		Y
Ceropegia ampliata		3		
Ceropegia arenaria		1		

Ceropegia barklyi		3		
Ceropegia cancellata		6	R	Y
Ceropegia carnosa		1		
Ceropegia cimiciodora		4	V	
Ceropegia conrathii		5		Y
Ceropegia crassifolia		1		
Ceropegia decidua		4		
Ceropegia decidua	subsp. pretoriensis	1	R	
Ceropegia distincta		1		
Ceropegia distincta	subsp. haygarthii	3		
Ceropegia fortuita		3		
Ceropegia linearis		4		
Ceropegia meyeri		2		
Ceropegia multiflora		4		Y
Ceropegia nilotica		2		Y
Ceropegia occulta		1		
Ceropegia pachystelma		5		
Ceropegia racemosa	subsp. setifera	1		
Ceropegia radicans		2		
Ceropegia rendallii		7		
Ceropegia sandersonii		4		
Ceropegia spp.		1		
Ceropegia stapeliiformis		2		
Ceropegia stapeliiformis	subsp. stapeliiformis	4		
Ceropegia tenuis		1		
Ceropegia woodii		3		
Chasmatophyllum braunsii		1		
Chasmatophyllum musculinum		1		
Chasmatophyllum spp.		1		
Cheiridopsis candidissima		2		
Cheiridopsis cigarettifera		1		
Cheiridopsis denticulata		1		
Cheiridopsis peculiaris		3	V	
Cheiridopsis pillansii		1		
Cheiridopsis purpurea		2		
Cheiridopsis robusta		4		
Cheiridopsis spp.		2		
Cheiridopsis truncata		2		
Cheiridopsis vanzijlii		3		
Cheiridopsis verrucosa		4		
Cissus spp.		2		Y
Conicosia elongata		1		
Conicosia pugioniformis		2		
Conicosia pugioniformis	subsp. alborosea	1		
Conicosia pugioniformis	subsp. muirii	1		
Conicosia pugioniformis	subsp. pugioniformis	1		
Conicosia pugioniformis	subsp. robusta	1		

Conicosia spp.		1		
Conophytum bilobum		3		
Conophytum burgeri		1	V	
Conophytum calculus		3		
Conophytum ficiforme		1		
Conophytum flavum	subsp. novicium	1		
Conophytum gratum		2		
Conophytum meyeri		1		
Conophytum minutum		3		
Conophytum obcordellum	subsp. obcordellum	1		
Conophytum saxetanum		1		
Conophytum spp.		4		
Conophytum subfenestratum		2		
Cotyledon orbiculata		4		
Cotyledon tomentosa		1		
Crassula atropurpurea		5		
Crassula atropurpurea	var. atropurpurea	2		
Crassula atropurpurea	var. cultriformis	2		
Crassula atropurpurea	var. purcellii	2		
Crassula atropurpurea	var. watermeyeri	1		
Crassula barbata		3		
Crassula brachystachya		1		
Crassula brevifolia		3		
Crassula brevifolia	subsp. psammophila	1	R/V	
Crassula capensis		2		
Crassula clavata		3		
Crassula coccinea		2		
Crassula columella		1		
Crassula columnaris		3		
Crassula corallina		1		
Crassula cotyledonis		3		
Crassula deceptor		4		
Crassula decumbens		1		
Crassula deltoidea		1		
Crassula dichotoma		2		
Crassula elegans		3		
Crassula elegans	subsp. elegans	2		
Crassula exilis		2		
Crassula expansa		3		
Crassula fusca		1		
Crassula garibina		2		
Crassula glomerata		1		
Crassula grisea		4		
Crassula hirtipes		1		
Crassula mesembryanthoides	subsp. mesembryanthoides	1		
Crassula montana	subsp. quadrangularis	1		
Crassula multicava		1		

Crassula muscosa		4		
Crassula muscosa	var. muscosa	1		
Crassula muscosa	var. obtusifolia	1		
Crassula nudicaulis	var. nudicaulis	1		
Crassula oblanceolata		2		
Crassula orbicularis		1		
Crassula ovata		1		
Crassula pellucida		1		
Crassula pellucida	subsp. marginalis	1		
Crassula perfoliata	var. minor	3		
Crassula perforata		1		
Crassula plegmatoides		1	R/V	
Crassula pseudohemisphaerica		1		
Crassula rogersii		1		
Crassula rupestris		2		
Crassula rupestris	subsp. rupestris	1		
Crassula sericea		3		
Crassula sericea	var. sericea	1		
Crassula sericea	var. velutina	1	R	
Crassula setulosa		1		
Crassula socialis		1	R	
Crassula spp.		3		
Crassula subacaulis	subsp. erosula	1		
Crassula subaphylla		2		
Crassula subaphylla	var. subaphylla	1		
Crassula tetragona	subsp. tetragona	1		
Crassula tomentosa		2		
Crassula vestita		1	R	
Cyphostemma bainesii		1	R	
Cyphostemma currorii		2		
Cyphostemma juttae		5	R	Y
Cyphostemma oleraceum		1		
Cyphostemma spp.		3		
Cyphostemma uter		4	R	Y
Dactylopsis digitata		2		
Dactylopsis spp.		1		
Delosperma aliwalense		1		
Delosperma ashtonii		1		
Delosperma basuticum		1		
Delosperma clavipes		1		
Delosperma congestum		1		
Delosperma davyi		1		
Delosperma erectum		1		
Delosperma ficksburgense		1		
Delosperma gerstneri		1		
Delosperma hallii		1	R	
Delosperma kofleri		1		

Delosperma lineare		1		
Delosperma nelii		1		
Delosperma obtusum		1		
Delosperma peersii		1		
Delosperma pergamentaceum		2		
Delosperma reynoldsii		1		
Delosperma tradescantioides		1		
Dicrocaulon microstigma		1		
Dicrocaulon spp.		1		
Dicrocaulon trichotomum		2		
Didelta carnosa		4		
Didelta carnosa	var. tomentosa	1		
Didelta spinosa		2		
Dinteranthus inexpectatus		3		
Dinteranthus pole-evansii		4		
Dinteranthus puberulus		3		
Dinteranthus spp.		4		
Dinteranthus vanzylii		3	V	
Dinteranthus wilmotianus		3		
Dioscorea elephantipes		7	V	Y
Dioscorea hemicrypta		1		
Dioscorea sylvatica		1		
Dracophilus dealbatus		4		
Dracophilus spp.		1		
Drosanthemum acuminatum		1		
Drosanthemum albiflorum		1		
Drosanthemum bellum		1	R	
Drosanthemum bicolor		2		
Drosanthemum diversifolium		2		
Drosanthemum floribundum		1		
Drosanthemum hallii		1	R	
Drosanthemum hispidum		1		
Drosanthemum inornatum		1		
Drosanthemum leipoldtii		1		
Drosanthemum marinum		1		
Drosanthemum micans		1	R	
Drosanthemum paxianum		2		
Drosanthemum pulchellum		1		
Drosanthemum pulchrum		1		
Drosanthemum pulverulentum		1		
Drosanthemum speciosum		1		
Drosanthemum spp.		3		
Drosanthemum striatum		2		
Drosanthemum subalbum		1		
Duvalia compacta		1		
Duvalia maculata		1		
Duvalia polita		2		

Duvalia pubescens		3		
Duvalia radiata		1		
Duvalia reclinata		1		
Eberlanzia aculeata		1		
Eberlanzia armata		1		
Eberlanzia divaricata		1		
Eberlanzia spp.		1		
Eberlanzia stylosa		1		
Erepsia bracteata		1		
Euphorbia aeruginosa		5		Y
Euphorbia aggregata		2		
Euphorbia albipollinifera		3	V	
Euphorbia arida		2		Y
Euphorbia aspericaulis		1		
Euphorbia atrispina		1		
Euphorbia atrispina	var. viridis	1		
Euphorbia barnardii		2	E	
Euphorbia bayeri		3	V	
Euphorbia bothae		3		Y
Euphorbia brakdamensis		3	R	
Euphorbia braunsii		6		
Euphorbia brevirama		1	Ex	Y
Euphorbia bubalina		1		
Euphorbia bupleurifolia		15		Y
Euphorbia burmannii		2		
Euphorbia caput-medusae		10		
Euphorbia chersina		1		
Euphorbia clandestina		9		
Euphorbia clava		11		Y
Euphorbia clavarioides		5		
Euphorbia clavarioides	var. truncata	2		Y
Euphorbia clavigera		2	E	
Euphorbia coerulescens		11		
Euphorbia colliculina		2		
Euphorbia cooperi		7		Y
Euphorbia crassipes		2	Ex	Y
Euphorbia crispa		13		Y
Euphorbia cumulata		1		
Euphorbia curvirama		3		
Euphorbia cylindrica		11	V	
Euphorbia davyi		5		Y
Euphorbia decepta		4	R/V	Y
Euphorbia decidua		1		
Euphorbia decussata		1		
Euphorbia dregeana		2		
Euphorbia enopla		11		Y
Euphorbia enormis		3		

Euphorbia ephedroides		1		
Euphorbia esculenta		12		
Euphorbia eustacei		3		
Euphorbia evansii		6		
Euphorbia fasciculata		10	V	Y
Euphorbia ferox		12		Y
Euphorbia filiflora		5		Y
Euphorbia fimbriata		2		
Euphorbia flanaganii		10		Y
Euphorbia fortuita		2		
Euphorbia friedrichiae		2		
Euphorbia fusca		11		Y
Euphorbia gariepina		1		
Euphorbia gatbergensis		1		
Euphorbia gentilis		6		Y
Euphorbia globosa		11	R	Y
Euphorbia gorgonis		14		Y
Euphorbia grandialata		3	R	Y
Euphorbia grandicornis		9		Y
Euphorbia groenewaldii		6	E	Y
Euphorbia hamata		7		
Euphorbia heptagona		10		
Euphorbia herrei		1		
Euphorbia horrida		11		Y
Euphorbia horrida	var. major	1		
Euphorbia horrida	var. noorsveldensis	2		
Euphorbia horrida	var. striata	8		
Euphorbia inermis		12		Y
Euphorbia ingens		10		Y
Euphorbia inornata		2		Y
Euphorbia jansenvillensis		5	E	
Euphorbia keithii		1	E	
Euphorbia knobelii		1	R	
Euphorbia knuthii		1		
Euphorbia ledienii		1		
Euphorbia lignosa		1		
Euphorbia loricata		4		
Euphorbia louwii		5		
Euphorbia lydenburgensis		3		
Euphorbia maleolens		4		Y
Euphorbia mammillaris		7		
Euphorbia marlothiana		2	V	
Euphorbia mauritanica		3		
Euphorbia melanohydrata		3		
Euphorbia meloformis		14	V/E	Y
Euphorbia micracantha		3		
Euphorbia monteiroi		5		

Euphorbia monteiroi	subsp. monteiroi	1		
Euphorbia muirii		10		
Euphorbia multiceps		10		
Euphorbia multiramosa		3		Y
Euphorbia mundii		1		
Euphorbia namaquensis		2		
Euphorbia namibensis		5		Y
Euphorbia nesemannii		9	R	
Euphorbia obesa		12	E	Y
Euphorbia ornithopus		4		Y
Euphorbia peltigera		3		
Euphorbia pentagona		6		Y
Euphorbia pentops		1		
Euphorbia perangusta		1	E	
Euphorbia persistens		2		Y
Euphorbia pillansii		9		
Euphorbia pillansii	var. pillansii	10		
Euphorbia polycephala[1]		1	V/E	
Euphorbia polygona		8		
Euphorbia pseudocactus		8		
Euphorbia pseudoglobosa		3		
Euphorbia pseudotuberosa		11		Y
Euphorbia pubiglans		1		
Euphorbia pugniformis		3		
Euphorbia pulvinata		10		
Euphorbia ramiglans		3		
Euphorbia restituta		1	R	
Euphorbia rhombifolia		1		
Euphorbia rudis		3		Y
Euphorbia schinzii		3		
Euphorbia schoenlandii		14	V	Y
Euphorbia sekukuniensis		1	R	Y
Euphorbia silenifolia		11		Y
Euphorbia spp.		10		Y
Euphorbia squarrosa		14		Y
Euphorbia stapelioides		2		
Euphorbia stellata		14		Y
Euphorbia stellispina		9		
Euphorbia stolonifera		2		
Euphorbia striata		1		Y
Euphorbia susannae		8		
Euphorbia symmetrica		7	V	Y
Euphorbia tetragona		6		
Euphorbia tirucalli		4		
Euphorbia tortirama		4	V	
Euphorbia triangularis		6		
Euphorbia trichadenia		11		Y

Euphorbia tridentata		9		
Euphorbia tuberculata		11		Y
Euphorbia tuberculatoides		9		
Euphorbia tuberosa		7		
Euphorbia umfoloziensis		5	R	
Euphorbia valida		11	V	Y
Euphorbia venenata		1		
Euphorbia verruculosa		1		
Euphorbia virosa		9		Y
Euphorbia woodii		10	R	
Fagonia capensis		1		
Fagonia isotricha	var. spinescens	1		
Fagonia spp.		1		
Faucaria britteniae		1		
Faucaria candida		1		
Faucaria felina		1		
Faucaria paucidens		1		
Faucaria plana		1		
Faucaria spp.		1		
Faucaria tigrina		3	V	
Faucaria tuberculosa		1		
Fenestraria rhopalophylla		4		
Fenestraria rhopalophylla	subsp. aurantiaca	6	R	
Frithia pulchra		2		
Frithia spp.		1		
Gasteria batesiana		1		
Gasteria bicolor	var. bicolor	1		
Gasteria liliputana		1		
Gasteria rawlinsonii		1	R	
Gasteria spp.		2		
Gibbaeum dispar		1		
Gibbaeum gibbosum		1		
Gibbaeum haagei		1		
Gibbaeum heathii		2		
Gibbaeum petrense		1		
Gibbaeum pilosulum		1		
Gibbaeum pubescens		1		
Gibbaeum velutinum		1		
Glottiphyllum carnosum		1		
Glottiphyllum linguiforme		1		
Glottiphyllum nelii		1		
Glottiphyllum regium		1		
Haworthia arachnoidea		2		
Haworthia aranea		1		
Haworthia archeri		1	V	
Haworthia atro-fusca		1		
Haworthia blackbeardiana		1		

Haworthia comptoniana		2	E	
Haworthia cymbiformis		2		
Haworthia emelyae		3		
Haworthia emelyae	var. multifolia	1	E	
Haworthia fasciata		1	R	
Haworthia globosiflora		1		
Haworthia habdomadis		1		
Haworthia herbacea		1		
Haworthia limifolia		4		Y
Haworthia maculata		1		
Haworthia marumiana		1		
Haworthia maughanii		5	V	Y
Haworthia mirabilis		2		
Haworthia nigra		1		
Haworthia parksiana		1	E	
Haworthia pumila		2		
Haworthia reinwardtii		1		
Haworthia reticulata		1		
Haworthia retusa		4		
Haworthia rycroftiana		1		
Haworthia scabra		1		
Haworthia sordida		1	V	
Haworthia spp.		8		Y
Haworthia springbokvlakensis		3	V	
Haworthia starkiana		2		
Haworthia tessellata		1		
Haworthia truncata		4	V	Y
Haworthia venosa		2		
Heliophila amplexicaulis		1		
Heliophila coronopifolia		1		
Heliophila deserticola		1		
Heliophila lactea		1		
Heliophila spp.		1		
Hereroa spp.		2		
Herrea spp.		1		
Herreanthus spp.		1		
Herreroa spp.		1		
Hoodia bainii		1		
Hoodia gordonii		3		
Hoodia juttae		1	R	
Hoodia langii		2		
Hoodia macrantha		2		
Hoodia spp.		2		
Huernia brevirostris		1		
Huernia hystrix		1		
Huernia kennedyana		1	V	
Huernia kirkii		1		

Huernia loeseneriana		1		
Huernia longii		1	R	
Huernia longituba		1		
Huernia namaquensis		2		
Huernia nouhuysii		1	E	
Huernia oculata		1		
Huernia pillansii		1		
Huernia transvaalensis		3		Y
Huernia verekeri		1		
Huernia zebrina		2		
Huernia zebrina	var. magniflora	2		
Huerniopsis atrosanguinea		3		
Huerniopsis decipiens		2		
Jordaaniella cuprea		3		
Juttadinteria albata		1		
Kalanchoe spp.		1		
Kalanchoe thyrsiflora		1		
Khadia acutipetala		2		
Lachenalia anguinea		1		
Lachenalia carnosa		1		
Lachenalia namaquensis		1		
Lachenalia splendida		1		
Lachenalia spp.		2		
Lampranthus deltoides		1		
Lampranthus maximiliani		1		
Lampranthus spp.		3		
Lampranthus suavissimus		2		
Lampranthus tenuifolius		1		
Lampranthus watermeyeri		1		
Lapidaria margaretae		7		
Lavrania cactiformis		1		
Leipoldtia compacta		1		
Leipoldtia laxa		1		
Leipoldtia pauciflora		1		
Leipoldtia schultzei		1		
Leipoldtia spp.		2		
Leipoldtia uniflora		1		
Lithops aucampiae		6		
Lithops aucampiae	subsp. aucampiae var. aucampiae	2		
Lithops aucampiae	subsp. aucampiae var. euniceae	4		
Lithops aucampiae	subsp. aucampiae var. koelemanii	4		
Lithops aucampiae	subsp. euniceae var. fluminalis	5	R	
Lithops bromfieldii		5		
Lithops bromfieldii	var. bromfieldii	1		
Lithops bromfieldii	var. glaudinae	4		
Lithops bromfieldii	var. insularis	4		
Lithops bromfieldii	var. mennellii	4		Y

Lithops comptonii		5		
Lithops comptonii	var. comptonii	1	E	
Lithops comptonii	var. weberi	4	R	
Lithops dinteri		4		
Lithops dinteri	subsp. dinteri var. brevis	5		
Lithops dinteri	subsp. dinteri var. dinteri	1		
Lithops dinteri	subsp. frederici	4		
Lithops dinteri	subsp. multipunctata	4		
Lithops divergens		5		
Lithops divergens	var. amethystina	4		
Lithops divergens	var. divergens	1	V	
Lithops dorotheae		6	V	Y
Lithops francisci		5	R	Y
Lithops fulviceps		5		
Lithops fulviceps	var. fulviceps	2		
Lithops fulviceps	var. fulviceps cv. aurea	2		
Lithops fulviceps	var. lactinea	4	R	
Lithops gesinae		5		
Lithops gesinae	var. annae	4		
Lithops gesinae	var. gesinae	2	E	
Lithops geyeri		4	R	Y
Lithops gracilidelineata		4		
Lithops gracilidelineata	subsp. gracilidelineata var. gracilidelineata	1		
Lithops gracilidelineata	subsp. gracilidelineata var. waldroniae	4		
Lithops hallii		4		
Lithops hallii	var. hallii	1		
Lithops hallii	var. ochracea	4		Y
Lithops helmutii		4	R	Y
Lithops herrei		6		Y
Lithops hookeri		5		
Lithops hookeri	var. dabneri	4		
Lithops hookeri	var. elephina	4		
Lithops hookeri	var. hookeri	1		
Lithops hookeri	var. lutea	4		
Lithops hookeri	var. marginata	4		
Lithops hookeri	var. subfenestrata	5		
Lithops hookeri	var. susannae	4	R	
Lithops julii		4		
Lithops julii	subsp. fulleri	3		
Lithops julii	subsp. fulleri var. brunnea	4		
Lithops julii	subsp. fulleri var. fulleri	2		
Lithops julii	subsp. fulleri var. rouxii	4		Y
Lithops karasmontana		4		
Lithops karasmontana	subsp. bella	5		
Lithops karasmontana	subsp. eberlanzii	5		
Lithops karasmontana	subsp. karasmontana var. aiaisensis	4		
Lithops karasmontana	subsp. karasmontana var. karasmontana	1		

Lithops karasmontana	subsp. karasmontana var. lericheana	4		
Lithops karasmontana	subsp. karasmontana var. tischeri	4		Y
Lithops lesliei		12		Y
Lithops lesliei	subsp. burchellii	1		
Lithops lesliei	subsp. lesliei var. hornii	4		
Lithops lesliei	subsp. lesliei var. lesliei	1		
Lithops lesliei	subsp. lesliei var. lesliei cv. albiflora	3		
Lithops lesliei	subsp. lesliei var. lesliei cv. albinica	3		
Lithops lesliei	subsp. lesliei var. mariae	4		
Lithops lesliei	subsp. lesliei var. minor	4		
Lithops lesliei	subsp. lesliei var. rubrobrunnea	4		
Lithops lesliei	subsp. lesliei var. venteri	4		Y
Lithops marmorata		5		
Lithops marmorata	var. elisae	5		Y
Lithops marmorata	var. marmorata	1		
Lithops meyeri		6	R	Y
Lithops naureeniae		5	R	Y
Lithops olivacea		5		Y
Lithops olivacea	var. nebrownii	2		
Lithops optica		5		
Lithops optica	cv. rubra	3		
Lithops otzeniana		6	R	Y
Lithops pseudotruncatella		5		
Lithops pseudotruncatella	subsp. archerae	4		
Lithops pseudotruncatella	subsp. dendritica	4		
Lithops pseudotruncatella	subsp. groendrayensis	3		
Lithops pseudotruncatella	subsp. pseudotruncatella var. elisabethiae	4	R	
Lithops pseudotruncatella	subsp. pseudotruncatella var. pseudotruncatella	1		
Lithops pseudotruncatella	subsp. pseudotruncatella var. riehmerae	4	R	
Lithops pseudotruncatella	subsp. volkii	4	R	Y
Lithops ruschiorum		5		
Lithops ruschiorum	var. lineata	3		
Lithops ruschiorum	var. ruschiorum	1		
Lithops salicola		5	V	Y
Lithops schwantesii		4		
Lithops schwantesii	subsp. gebseri	3		
Lithops schwantesii	subsp. schwantesii var. marthae	5		
Lithops schwantesii	subsp. schwantesii var. rugosa	3	R	
Lithops schwantesii	subsp. schwantesii var. schwantesii	1		
Lithops schwantesii	subsp. schwantesii var. urikosensis	4		Y
Lithops spp.		7		Y
Lithops terricolor		6		Y
Lithops vallis-mariae		4		Y
Lithops verruculosa		5		
Lithops verruculosa	var. glabra	5		
Lithops verruculosa	var. verruculosa	1		
Lithops villetii		4		

Lithops villetii	subsp. deboeri	4		
Lithops villetii	subsp. kennedyi	4		
Lithops villetii	subsp. villetii	1		
Lithops viridis		5	R	Y
Lithops werneri		5	R	Y
Machairophyllum albidum		1		
Machairophyllum cookii		1		
Machairophyllum latifolium		1		
Malephora crocea		1		
Malephora framesii		1		
Malephora lutea		1		
Malephora purpureo-crocea		2		
Maughaniella luckhoffii		1		
Mesembryanthemaceae spp.		2		
Mesembryanthemum guerichianum		1		
Mesembryanthemum hypertrophicum		1		
Mesembryanthemum karrooense		1		
Mesembryanthemum nodiflorum		1		
Mesembryanthemum pellitum		2		
Mesembryanthemum spp.		2		
Mesembryanthemum squamulosum		3		
Mestoklema tuberosum		1		
Meyerophytum meyeri		1		
Mitrophyllum abbreviatum		1	R	
Mitrophyllum clivorum		1		
Mitrophyllum dissitum		1		
Mitrophyllum spp.		2		
Monilaria moniliformis		1		
Monilaria obconica		1		
Monilaria pisiformis		1		
Monilaria scutata		1		
Mossia intervallaris		1	R	
Mossia spp.		1		
Muiria hortenseae		1	E	
Muiria spp.		1	E	
Namibia pomonae		2		
Nananthus aloides		4		
Nananthus transvaalensis		3		Y
Nelia meyeri		1		
Neohenricia sibbettii		3	V	
Neohenricia spp.		1		
Notechidnopsis columnaris		2	R	
Octopoma connatum		1		
Octopoma inclusum		1		
Odontophorus nanus		1		
Oophytum nanum		2		
Oophytum oviforme		1		

Ophthalmophyllum spp.		4		
Opophytum aquosum		1		
Orbea cooperi		1		
Orbea macloughlinii		1		
Orbea namaquensis		2		
Orbea paradoxa		1	V	
Orbea pulchella		2		
Orbea tapscottii		2		
Orbea variegata		2		
Orbea woodii		1	R	
Orbeanthus hardyi		1	V	
Orbeopsis lutea		2		
Orbeopsis melanantha		1		
Ornithogalum dubium		1		
Ornithogalum prasinum		1		
Ornithogalum saundersiae		1		
Ornithogalum seineri		1		
Ornithogalum suaveolens		1		
Ornithogalum tenuifolium	subsp. tenuifolium	1		
Ornithogalum thyrsoides		1		
Ornithogalum xanthochlorum		1		
Orthopterum spp.		1		
Osteospermum amplectens		1		
Osteospermum armatum		1		
Osteospermum clandestinum		2		
Osteospermum grandiflorum		1		
Osteospermum hyoseroides		1		
Osteospermum microcarpum		1		
Osteospermum oppositifolium		4		
Osteospermum pinnatum		1		
Osteospermum sinuatum		2		
Osteospermum spp.		1		
Othonna arbuscula		4		
Othonna cacalioides		2		
Othonna clavifolia		2		
Othonna cylindrica		4		
Othonna furcata		2		
Othonna herrei		1		
Othonna humilis		1		
Othonna intermedia		2		
Othonna lyrata		1		
Othonna opima		3		
Othonna perfoliata		1		
Othonna retrofracta		1		
Othonna sedifolia		2		
Othonna spp.		3		
Pachycymbium keithii		2		

Pachycymbium lugardii		3		
Pachypodium bispinosum		14		Y
Pachypodium lealii		7		Y
Pachypodium namaquanum		15	V	Y
Pachypodium saundersii		14		Y
Pachypodium spp.		3		
Pachypodium succulentum		14		Y
Pectinaria articulata		1		
Pectinaria exasperata		1		
Pectinaria pillansii		1		
Pectinaria saxatilis		2		
Pelargonium carnosum		4		
Pelargonium caroli-henrici		1		
Pelargonium crithmifolium		5		
Pelargonium echinatum		1		
Pelargonium fulgidum		3		
Pelargonium lobatum		2		
Pelargonium spp.		2		
Pelargonium triste		3		
Piaranthus comptus		1		
Piaranthus cornutus		2		
Piaranthus punctatus		1		
Plectranthus ambiguus		1		
Plectranthus fruticosus		1		
Plectranthus saccatus	var. longitubus	1		
Plectranthus strigosus		1		
Pleiospilos bolusii		2		
Pleiospilos compactus		1		
Pleiospilos nelii		2	R/V	
Pleiospilos spp.		3		
Polymita albiflora		1		
Polymita spp.		1		
Portulaca collina		1		
Portulaca grandiflora		1		
Portulaca hereroensis		1		
Portulaca oleracea		1		
Portulaca pilosa		1		
Portulaca quadrifida		1		
Portulacaria afra		4		
Portulacaria pygmaea		2		
Prenia pallens		2		
Prenia sladeniana		2		
Psammophora longifolia		3		
Psammophora modesta		7		
Psammophora spp.		2		
Pseudobrownanthus nucifer		3		
Psilocaulon dinteri		2		

Psilocaulon fimbriatum		2		
Psilocaulon pageae		1		
Psilocaulon rapaceum		1		
Psilocaulon spp.		3		
Psilocaulon subnodosum		3		
Pterodiscus aurantiacus		4		Y
Pterodiscus luridus		2		Y
Pterodiscus ngamicus		2		Y
Pterodiscus speciosus		6		Y
Pterodiscus spp.		2		Y
Quaqua acutiloba		1		
Quaqua incarnata	subsp. incarnata var. incarnata	2		
Quaqua mammillaris		3		
Quaqua marlothii		1		
Quaqua pillansii		2		
Quaqua pruinosa		1	R	
Rabiea albinota		1		
Rabiea albipuncta		1		
Rabiea difformis		1		
Rabiea spp.		4		
Rhinephyllum frithii		1		
Rhinephyllum spp.		1		
Rhombophyllum dolabriforme		1		
Rhombophyllum rhomboideum		1		
Ruschia acuminata		1		
Ruschia aristata		1		
Ruschia biformis		1		
Ruschia bina		1		
Ruschia caroli		1		
Ruschia compacta		1		
Ruschia congesta		1		
Ruschia cymbifolia		2		
Ruschia cymosa		1		
Ruschia densiflora		1		
Ruschia distans		1		
Ruschia elineata		1		
Ruschia erecta		1		
Ruschia gracilis		1		
Ruschia hamata		1		
Ruschia maxima		1		
Ruschia muricata		1		
Ruschia mutica		1		
Ruschia namaquana		2		
Ruschia robusta		3		
Ruschia salteri		1		
Ruschia sarmentosa		2		
Ruschia sedoides		1		

Ruschia spp.		3		
Ruschia stricta		1		
Ruschia subaphylla		1		
Ruschia tecta		1		
Ruschia tumidula		2		
Ruschia utilis		2		
Ruschia vaginata		2		
Ruschia verruculosa		1		
Ruschia viridifolia		2		
Ruschianthemum gigas		2		
Ruschianthemum spp.		1		
Sansevieria spp.		1		
Sarcocaulon crassicaule		8		Y
Sarcocaulon multifidum		1		
Sarcocaulon spp.		4		
Sarcocaulon vanderietiae		1		Y
Sarcocornia xerophila		1		
Sarcostemma viminale		2		
Sceletium albanense		1		
Sceletium compactum		1		
Sceletium gracile		1		
Sceletium ovatum		1		
Sceletium tortuosum		1		
Sceletium varians		1		
Schlechteranthus hallii		1		
Schwantesia acutipetala		1	R/V	
Schwantesia australis		2		
Schwantesia borcherdsii		1	V	
Schwantesia herrei		2		
Schwantesia marlothii		1		
Schwantesia pillansii		1		
Schwantesia ruedebuschii		1		
Schwantesia speciosa		1		
Schwantesia triebneri		1		
Senecio aloides		1		
Senecio citriformis		1		
Senecio corymbiferus		3		
Senecio haworthii		1		
Senecio herreianus		1		
Senecio macroglossus		1		
Senecio radicans		3		Y
Senecio rowleyanus		1		
Sphalmanthus abbreviatus		1		
Sphalmanthus deciduus		3		
Sphalmanthus decurvatus		4		
Sphalmanthus scintillans		2		
Sphalmanthus spp.		2		

Sphalmanthus tetragonus		2		
Sphalmanthus viridiflorus		1		
Stapelia arenosa		1		
Stapelia cedrimontana		2		
Stapelia flavopurpurea		2		
Stapelia gariepensis		4		
Stapelia gettliffei		2		
Stapelia grandiflora		1		
Stapelia hirsuta		1		
Stapelia kwebensis		2		
Stapelia leendertziae		2		
Stapelia olivacea		1		
Stapelia rubiginosa		1	R/V	
Stapelia schinzii		1		
Stapelia spp.		3		
Stapeliopsis neronis		2	E	
Stapeliopsis urniflora		2	R	
Stoeberia beetzii		5		
Stoeberia carpii		2		
Stoeberia spp.		2		
Stomatium pyrodorum		1		
Stomatium spp.		3		
Stomatium suaveolens		1		
Talinum arnotii		1		
Talinum caffrum		3		Y
Talinum crispatulum		1		
Talinum spp.		2		
Talinum tenuissimum		1		
Tanquana hilmarii		3	R	
Tanquana prismatica		1		
Tavaresia barklyi		1		
Tavaresia grandiflora		1		
Tavaresia meintjesii		2		
Titanopsis calcarea		7		
Titanopsis hugo-schlechteri		1		Y
Trichocaulon alstonii		5		Y
Trichocaulon annulatum		2		Y
Trichocaulon cactiforme		6		
Trichocaulon delaetianum		2		
Trichocaulon dinteri		3		Y
Trichocaulon felinum		1		
Trichocaulon flavum		2		
Trichocaulon grande		1		
Trichocaulon kubusense		3		Y
Trichocaulon marlothii		5		
Trichocaulon meloforme		2		Y
Trichocaulon officinale		3		

Trichocaulon pedicellatum		1		
Trichocaulon perlatum		5		
Trichocaulon pictum		1		
Trichocaulon piliferum		5		
Trichocaulon pillansii		2		
Trichocaulon simile		1		
Trichocaulon spp.		1		
Trichocaulon triebneri		2		
Trichodiadema attonsum		1		
Trichodiadema aureum		1		
Trichodiadema barbatum		1		
Trichodiadema bulbosum		1		
Trichodiadema burgeri		1	R	
Trichodiadema calvatum		1		
Trichodiadema concinnum		1		
Trichodiadema decorum		1		
Trichodiadema densum		1		
Trichodiadema emarginatum		1		
Trichodiadema fergusoniae		1		
Trichodiadema fourcadei		1		
Trichodiadema gracile		1		
Trichodiadema hallii		1	R	
Trichodiadema hirsutum		1		
Trichodiadema imitans		1		
Trichodiadema intonsum		1		
Trichodiadema littlewoodii		1		
Trichodiadema marlothii		1		
Trichodiadema mirabile		1		
Trichodiadema obliquum		1		
Trichodiadema occidentalis		1		
Trichodiadema olivaceum		1		
Trichodiadema orientale		1		
Trichodiadema peersii		1		
Trichodiadema pomeridianum		1		
Trichodiadema pygmaeum		1	R	
Trichodiadema rogersiae		1		
Trichodiadema rupicolum		1		
Trichodiadema ryderae		1		
Trichodiadema schimperi		1		
Trichodiadema setuliferum		1		
Trichodiadema stayneri		1		
Trichodiadema stellatum		1		
Trichodiadema stelligerum		1		
Trichodiadema strumosum		1		
Tridentea aperta		2		
Tridentea choanantha		1		
Tridentea herrei		3		

Tridentea juncunda	var. cincta	1		
Tridentea longipes		3		
Tridentea marientalensis		1		
Tridentea pachyrrhiza		1	R/V	
Tridentea pendunculata		1		
Tridentea ruschiana		2		
Tridentea spp.		1		
Tridentea umdausensis		3		
Tridentea virescens		1	R	
Tromotriche engleriana		3		
Tromotriche revoluta		2		
Tylecodon buchholzianus		2		
Tylecodon decipiens		1	R	
Tylecodon faucium		1		
Tylecodon hallii		1		
Tylecodon luteosquamata		2		
Tylecodon paniculatus		10		Y
Tylecodon pearsonii		5		Y
Tylecodon pygmaeus		1		
Tylecodon racemosus		1		
Tylecodon reticulatus		3		
Tylecodon reticulatus	subsp. reticulatus	5		Y
Tylecodon schaeferianus		4		
Tylecodon similis		1		
Tylecodon spp.		4		
Tylecodon striatus		1		
Tylecodon viridiflorus		1		
Tylecodon wallichii		7		
Tylecodon wallichii	subsp. wallichii	5		
Vanheerdea divergens		1		
Vanzijlia annulata		1		
Zygophyllum cordifolium		2		
Zygophyllum cylindrifolium		1		
Zygophyllum dregeanum		1		
Zygophyllum foetidum		1		
Zygophyllum longicapsulare		2		
Zygophyllum maculatum		1		
Zygophyllum meyeri		2		
Zygophyllum morgsana		2		
Zygophyllum prismatocarpum		4		
Zygophyllum spp.		2		
Zygophyllum stapfii		1		
Zygophyllum teretifolium		1	R	

Source: South African CITES permits, non-CITES permits and Exemption certificates.

Appendix 2: List of succulent plant species and subspecies (with synonyms) advertised for sale in catalogues but without records of export from South Africa, 1991 to 1994.

Scientific Name	Subspecies	Synonyms	RDB Status
Acrodon bellidiflorus		Acrodon subulatus	
Acrodon spp.			
Adenia digitata			
Adenia fruticosa	subsp. trifoliata		
Adromischus caryophyllaceus		Adromischus bolusii	
Adromischus cooperi		Adromischus festivus	
Adromischus cristatus			
Adromischus cristatus	var. clavifolius	Adromischus poellnitzianus	
Adromischus cristatus	var. zeyheri		
Adromischus fallax			
Adromischus filicaulis			
Adromischus filicaulis	subsp. filicaulis		
Adromischus filicaulis	subsp. marlothii		
Adromischus humilis			
Adromischus leucophyllus			R
Adromischus liebenbergii			R
Adromischus mammillaris			
Adromischus marianiae	var. immaculatus		
Adromischus marianiae	var. kubusensis		
Adromischus marianiae	var. marianiae		
Adromischus montium-klinghardtii			
Adromischus phillipsiae			
Adromischus roaneanus			
Adromischus schuldtianus			
Adromischus sphenophyllus			
Adromischus triflorus			
Adromischus trigynus			
Adromischus umbraticola			
Adromischus umbraticola	subsp. ramosus		
Adromischus umbraticola	subsp. umbraticola	Adromischus saxicola	V
Aloe albida			
Aloe alooides			
Aloe ammophila			
Aloe angelica			
Aloe brevifolia	var. depressa		
Aloe broomii	var. tarkaensis		
Aloe burgersfortensis			
Aloe christianii			
Aloe dewetii			
Aloe dyeri			
Aloe ferox			R
Aloe gerstneri			
Aloe grandidentata			

Aloe greenii			
Aloe hardyi			
Aloe immaculata			
Aloe integra			
Aloe keithii			R
Aloe lineata	var. lineata		
Aloe lineata	var. muirii		
Aloe massawana			
Aloe polyphylla			E
Aloe prinslooi			R
Aloe pruinosa			R
Aloe reitzii			
Aloe simii			V
Aloe sladeniana			R
Aloe soutpansbergensis			R
Aloe spicata			
Aloe striata	subsp. striata		
Aloe succotrina			
Aloe swynnertonii			
Aloe umfoloziensis			
Aloe vanbalenii			
Aloe vogtsii			R
Aloinopsis hilmarii			
Aloinopsis jamesii			R
Aloinopsis lodewykii			
Aloinopsis orpenii			
Aloinopsis schooneesii			
Aloinopsis spathulata			
Aloinopsis thudichumii			
Aloinopsis villetii			R
Anacampseros affinis			
Anacampseros lubbersii			
Anacampseros recurvata			
Antegibbaeum fissoides			
Aptenia cordifolia			
Aptenia lancifolia			
Arenifera pillansii			
Argyroderma framesii	subsp. framesii	Argyroderma framesii var. minus	
Argyroderma framesii	subsp. hallii		
Argyroderma patens			
Argyroderma ringens			
Argyroderma spp.			
Argyroderma subalbum			
Argyroderma testiculare			
Aridaria brevifolia			
Astridia herrei			
Astridia longifolia		Astridia alba	

Astridia velutina			
Astroloba herrei			R
Bergeranthus artus			
Bergeranthus glenensis			
Bergeranthus jamesii			
Bergeranthus katbergensis			
Bergeranthus multiceps			
Bergeranthus spp.			
Bowiea gariepensis			R
Brachystelma australe			
Brachystelma bruceae			
Brachystelma bruceae	subsp. bruceae		
Brachystelma bruceae	subsp. hirsutum		
Brachystelma caffrum			
Brachystelma cathcartense			
Brachystelma chlorozonum			
Brachystelma coddii			
Brachystelma decipiens			
Brachystelma discoideum			R
Brachystelma gracile			
Brachystelma huttonii			
Brachystelma incanum			
Brachystelma minor			R
Brachystelma modestum			
Brachystelma nanum			
Brachystelma ngomense			E
Brachystelma perditum			R
Brachystelma petraeum			R
Brachystelma pulchellum			
Brachystelma pygmaeum	subsp. flavidum		
Brachystelma pygmaeum	subsp. pygmaeum		
Brachystelma remotum			
Brachystelma stellatum			
Brachystelma swazicum			
Brachystelma tenellum			V
Brachystelma tenue			
Brachystelma vahrmeijeri			R
Braunsia apiculata			
Braunsia geminata			
Bryophyllum delagoense		Bryophyllum tubiflorum	
Bulbine alooides			
Bulbine haworthioides			V
Caralluma schweinfurthii		Caralluma piaranthoides	
Carpobrotus acinaciformis			
Carpobrotus deliciosus			
Carpobrotus edulis			
Carruanthus peersii			

Carruanthus ringens			
Cephalophyllum alstonii			
Cephalophyllum aureorubrum			
Cephalophyllum bredasdorpsense			
Cephalophyllum compactum			
Cephalophyllum confusum			R
Cephalophyllum corniculatum			
Cephalophyllum curtophyllum			
Cephalophyllum diversiphyllum			
Cephalophyllum franciscii			
Cephalophyllum fulleri			V
Cephalophyllum gracile			
Cephalophyllum herrei			
Cephalophyllum loreum			
Cephalophyllum parvibracteatum			
Cephalophyllum pillansii			
Cephalophyllum pulchrum			R/V
Cephalophyllum purpureo-album			
Cephalophyllum rostellum			
Cephalophyllum spissum			
Cephalophyllum staminodiosum			R
Cephalophyllum subulatoides			
Cephalophyllum tetrastichum			V
Cephalophyllum tricolorum			
Cerochlamys pachyphylla			
Ceropegia connivens			
Ceropegia fimbriata			
Ceropegia lugardae			
Ceropegia multiflora	subsp. multiflora		
Ceropegia multiflora	subsp. tentaculata		
Ceropegia occidentalis			V
Ceropegia radicans	subsp. radicans		R
Ceropegia radicans	subsp. smithii		
Ceropegia stapeliiformis	subsp. serpentina		
Ceropegia stenantha			
Ceropegia stentiae			R
Ceropegia turricula			
Chamaesyce mossambicensis		Euphorbia mossambicensis	
Cheiridopsis acuminata			
Cheiridopsis aspera			
Cheiridopsis aurea			
Cheiridopsis borealis			
Cheiridopsis brownii			
Cheiridopsis carinata			
Cheiridopsis carnea			
Cheiridopsis caroli-schmidtii			
Cheiridopsis citrina			

Cheiridopsis derenbergiana			
Cheiridopsis dilatata			
Cheiridopsis duplessii			
Cheiridopsis excavata			
Cheiridopsis framesii			
Cheiridopsis herrei			
Cheiridopsis imitans			
Cheiridopsis inconspicua			
Cheiridopsis inspersa			
Cheiridopsis macrophylla			
Cheiridopsis marlothii			
Cheiridopsis meyeri			
Cheiridopsis meyeri	var. minor		
Cheiridopsis pearsonii			V
Cheiridopsis pillansii	var. crassa		
Cheiridopsis pulverulenta			
Cheiridopsis purpurescens			
Cheiridopsis purpurescens	var. purpurescens		
Cheiridopsis quadrifolia			
Cheiridopsis rostrata			
Cheiridopsis schlechteri			
Cheiridopsis tuberculata			
Cheiridopsis turbinata			
Cheiridopsis umdausensis			V
Cheiridopsis vanbredai			
Cheiridopsis vanheerdei			
Conophytum albiflorum			
Conophytum angelicae			
Conophytum auriflorum			
Conophytum auriflorum	subsp. turbiniforme	Conophytum turbiniforme	
Conophytum bicarinatum			R
Conophytum bilobum	subsp. altum	Conophytum luisae	
Conophytum bilobum	subsp. bilobum	Conophytum ampliatum	
Conophytum bilobum	subsp. gracilistylum	Conophytum gracilistylum	
Conophytum blandum			R
Conophytum bolusiae			
Conophytum bolusiae	subsp. bolusiae	Conophytum intrepidum	
Conophytum breve			
Conophytum calculus	subsp. vanzylii	Conophytum vanzylii	
Conophytum caroli		Ophthalmophyllum caroli	
Conophytum carpianum			R
Conophytum chauviniae			
Conophytum comptonii			
Conophytum concavum			R
Conophytum cylindratum			
Conophytum devium		Ophthalmophyllum littlewoodii	
Conophytum ectypum			

Conophytum ectypum	subsp. ectypum	Conophytum ectypum var. tischleri	
Conophytum ectypum brownii	subsp. ectypum var. brownii	Conophytum ectypum	var.
Conophytum ectypum	subsp. sulcatum	Conophytum sulcatum	
Conophytum ernstii			
Conophytum fibuliforme			
Conophytum flavum			
Conophytum flavum	subsp. flavum	Conophytum ornatum	
Conophytum fraternum		Conophytum praecox	
Conophytum friedrichiae		Ophthalmophyllum friedrichiae	
Conophytum frutescens			R
Conophytum fulleri			
Conophytum globosum			
Conophytum gratum	subsp. gratum	Conophytum jacobsenianum	
Conophytum gratum	subsp. marlothii	Conophytum marlothii	
Conophytum halenbergense			R
Conophytum hians			
Conophytum inornatum			
Conophytum joubertii		Conophytum viride	
Conophytum khamiesbergense			R
Conophytum klinghardtense			
Conophytum limpidum		Ophthalmophyllum subfenestratum	
Conophytum lithopsoides			
Conophytum lithopsoides	subsp. koubergense	Conophytum koubergense	
Conophytum lithopsoides	subsp. lithopsoides	Conophytum kennedyi	
Conophytum loeschianum			R
Conophytum longibracteatum			
Conophytum longum		Ophthalmophyllum longum	
Conophytum luckhoffii			
Conophytum marginatum			
Conophytum marginatum	var. karamoepense	Conophytum triebneri	
Conophytum marginatum	var. marginatum		
Conophytum maughanii			
Conophytum minimum		Conophytum pictum	
Conophytum minusculum			
Conophytum minusculum	subsp. leipoldtii	Conophytum leipoldtii	
Conophytum minusculum	subsp. minusculum	Conophytum herrei	
Conophytum minutum	var. minutum	Conophytum sellatum, Conophytum minutum forma sellatum	
Conophytum minutum	var. nudum	Conophytum nudum	
Conophytum minutum	var. pearsonii	Conophytum pearsonii	
Conophytum obcordellum			
Conophytum obcordellum	subsp. obcordellum var. ceresianum	Conophytum ceresianum	
Conophytum obcordellum	subsp. rolfii	Conophytum rolfii	
Conophytum obcordellum	subsp. stenandrum	Conophytum stenandrum	
Conophytum obcordellum	var. mundum		
Conophytum obscurum			

Conophytum obscurum	subsp. obscurum	Conophytum barbatum	
Conophytum obscurum	subsp. vitreopapillum	Conophytum vitreopapillum	
Conophytum pageae		Conophytum subrisum	
Conophytum pellucidum			
Conophytum pellucidum	subsp. cupreatum	Conophytum cupreatum	
Conophytum pellucidum	subsp. cupreatum var. terrestre	Conophytum terrestre	
Conophytum pellucidum	subsp. pellucidum	Conophytum terricolor	
Conophytum pellucidum	var. lilianum	Conophytum lilianum	
Conophytum petraeum			
Conophytum piluliforme			
Conophytum piluliforme	subsp. edwardii	Conophytum edwardii	
Conophytum piluliforme	subsp. piluliforme	Conophytum advenum	
Conophytum praesectum		Ophthalmophyllum praesectum	
Conophytum pubescens		Ophthalmophyllum pubescens	
Conophytum pubicalyx			
Conophytum quaesitum			
Conophytum quaesitum	subsp. densipunctatum	Conophytum densipunctatum	
Conophytum quaesitum	subsp. quaesitum var. rostratum	Conophytum rostratum	
Conophytum ratum			
Conophytum reconditum			
Conophytum regale			R
Conophytum ricardianum			
Conophytum roodiae			
Conophytum rubrolineatum			
Conophytum rugosum			
Conophytum schlechteri			R
Conophytum smorenskaduense			
Conophytum stephanii			
Conophytum swanepoelianum			
Conophytum tantillum			
Conophytum tantillum	subsp. helenae	Conophytum helenae	
Conophytum tantillum	subsp. lindenianum	Conophytum lindenianum	
Conophytum tantillum	subsp. tantillum	Conophytum eenkokerense	
Conophytum taylorianum			
Conophytum taylorianum	subsp. ernianum	Conophytum taylorianum var. ernianum	
Conophytum truncatum			
Conophytum truncatum	subsp. truncatum	Conophytum peersii	
Conophytum truncatum	subsp. truncatum var. wiggettiae	Conophytum wiggettae, Conophytum truncatum var. wiggettae	
Conophytum truncatum	subsp. viridcatum viridicatum var.	Conophytum pisinnum, Conophytum pisinnum	
Conophytum truncatum	subsp. viridicatum	Conophytum catervum	
Conophytum turrigerum			
Conophytum uviforme			
Conophytum uviforme	subsp. decoratum	Conophytum decoratum	
Conophytum uviforme	subsp. rauhii	Conophytum rauhii	
Conophytum uviforme	subsp. subincanum uviforme var.	Conophytum subincanum, Conophytum subincanum	V

Conophytum uviforme	subsp. uviforme	Conophytum stipitatum	
Conophytum vanheerdei			R
Conophytum velutinum			
Conophytum velutinum	subsp. polyandrum	Conophytum polyandrum	
Conophytum velutinum	subsp. velutinum	Conophytum tischeri, C. velutinum var. velutinum	R
Conophytum verrucosum			
Conophytum violaciflorum			
Conophytum wettsteinii			
Conophytum wettsteinii	subsp. fragile	Conophytum avenantii	
Conophytum wettsteinii	subsp. ruschii	Conophytum wettsteinii var. speciosum	
Cotyledon campanulata			
Cotyledon cuneata		Cotyledon pillansii	
Cotyledon orbiculata	var. dactylopsis		
Cotyledon orbiculata	var. oblonga	Cotyledon undulata	
Cotyledon papillaris			
Cotyledon spp.			
Cotyledon tomentosa	subsp. ladismithiensis	Cotyledon ladismithensis	R
Cotyledon tomentosa	subsp. tomentosa		
Cotyledon woodii		Cotyledon salmiana var. woodii	
Crassula alba			
Crassula alstonii			
Crassula arborescens			
Crassula arborescens	subsp. undulatifolia		R
Crassula ausensis			
Crassula ausensis	subsp. ausensis	Crassula karasana	
Crassula barklyi		Crassula teres	
Crassula capitella			
Crassula capitella	subsp. capitella	Crassula turrita	
Crassula capitella	subsp. nodulosa	Crassula nodulosa	
Crassula capitella	subsp. thyrsiflora	Crassula corymbosula	
Crassula ciliata			
Crassula columnaris	subsp. prolifera		
Crassula compacta			
Crassula congesta	subsp. laticephala		
Crassula corallina	subsp. corallina	Crassula dasyphylla	
Crassula corallina	subsp. macrorrhiza		
Crassula cordata			
Crassula crenulata			
Crassula cultrata			
Crassula dejecta			
Crassula elegans	subsp. namibensis		
Crassula ericoides			
Crassula ericoides	subsp. tortuosa		
Crassula exilis	subsp. cooperi	Crassula cooperi	
Crassula exilis	subsp. sedifolia	Crassula picturata	
Crassula fascicularis			

Crassula flava			
Crassula garibina	subsp. garibina		
Crassula hemisphaerica			
Crassula hirsuta			
Crassula lactea			
Crassula lanuginosa			
Crassula macowaniana			
Crassula mesembrianthemopsis			
Crassula mesembryanthoides			
Crassula namaquensis			
Crassula namaquensis	subsp. comptonii	Crassula comptonii	R
Crassula nemorosa			
Crassula nudicaulis			
Crassula nudicaulis	var. herrei		
Crassula peploides			
Crassula perfoliata			
Crassula pruinosa			
Crassula pubescens			
Crassula pubescens	subsp. radicans	Crassula radicans	
Crassula pyramidalis		Crassula archeri	
Crassula sarcocaulis			
Crassula sarcocaulis	subsp. sarcocaulis	Crassula parvisepala	
Crassula sarmentosa			
Crassula sediflora	var. sediflora		
Crassula sericea	var. hottentotta	Crassula hottentotta	
Crassula streyi			R
Crassula susannae			
Crassula tecta			
Crassula tetragona			
Crassula tomentosa	var. glabrifolia		
Cylindrophyllum calamiforme			
Cylindrophyllum comptonii			
Cylindrophyllum dyeri			
Cylindrophyllum spp.			
Cylindrophyllum tugwelliae			
Cyphostemma humile			
Delosperma aberdeenense			
Delosperma acuminatum			
Delosperma brevisepalum			
Delosperma britteniae			
Delosperma brunnthaleri			
Delosperma carolinense			
Delosperma cooperi			
Delosperma echinatum			
Delosperma ecklonis			
Delosperma harasianum			
Delosperma hirtum			

Delosperma lehmannii			
Delosperma lydenburgense			
Delosperma macellum			
Delosperma nubigenum			
Delosperma pageanum			
Delosperma spp.			
Delosperma steytlerae			
Delosperma sutherlandii			
Delosperma vinaceum			
Didymaotus lapidiformis			V
Dinteranthus microspermus			
Dinteranthus microspermus	subsp. puberulus		
Dinteranthus wilmotianus	subsp. impunctatus		R
Dinteranthus wilmotianus	subsp. wilmotianus		
Dioscorea sylvatica	var. paniculata		
Disphyma crassifolium			
Disphyma dunsdonii			
Dracophilus delaetianus			
Dracophilus montis-draconis			
Dracophilus proximus			
Drosanthemum cymiferum			
Drosanthemum eburneum			
Drosanthemum schoenlandianum			
Drosanthemum tuberculiferum			
Duvalia angustiloba			
Duvalia caespitosa			
Duvalia corderoyi			
Duvalia elegans			
Duvalia immaculata			
Duvalia modesta			
Duvalia namaquensis	var. elegans		
Duvalia parviflora			R
Duvalia polita	var. parviflora		
Duvalia polita	var. polita		
Duvalia spp.			
Eberlanzia disarticulata			
Eberlanzia persistens			
Eberlanzia spinosa			
Ebracteola candida			
Ebracteola derenbergiana			
Ebracteola fulleri			
Ebracteola montis-moltkei			
Ebracteola spp.			
Erepsia hallii			
Erepsia pentagona			V
Erepsia steytlerae			
Euphorbia albertensis			R/V

Euphorbia amygdaloides			
Euphorbia angularis			
Euphorbia anoplia			
Euphorbia avasmontana			
Euphorbia bergeri			
Euphorbia cereiformis			
Euphorbia clivicola			V
Euphorbia complexa			
Euphorbia confinalis			
Euphorbia confinalis	subsp. confinalis		
Euphorbia damarana			
Euphorbia ernestii			
Euphorbia excelsa			
Euphorbia franckiana			
Euphorbia franksiae			
Euphorbia grandidens			
Euphorbia graniticola			
Euphorbia griseola			
Euphorbia guerichiana			
Euphorbia halipedicola			
Euphorbia hallii			R
Euphorbia heterophylla			
Euphorbia hottentota			R
Euphorbia hypogaea			
Euphorbia inconstantia			
Euphorbia inermis	var. huttonae		
Euphorbia juttae			
Euphorbia knuthii	subsp. knuthii		
Euphorbia lathyris			
Euphorbia lavrani			R
Euphorbia ledienii	var. ledienii		
Euphorbia malevola			
Euphorbia memoralis			
Euphorbia namuskluftensis			R
Euphorbia pedemontana			
Euphorbia persistentifolia			
Euphorbia restricta			R
Euphorbia rowlandii			R
Euphorbia splendens			
Euphorbia submammillaris			
Euphorbia subsalsa			
Euphorbia transvaalensis			
Euphorbia tubiglans			
Euphorbia valaris			
Euphorbia vandermerwei			
Euphorbia waterbergensis			V
Euphorbia wildii			

Euphorbia zoutpansbergensis			R
Faucaria albidens			
Faucaria bosscheana			
Faucaria bosscheana	var. haagei		
Faucaria duncanii			
Faucaria felina	var. jamesii		
Faucaria hooleae			
Faucaria kingiae			
Faucaria longidens			
Faucaria lupina			
Faucaria peersii			
Faucaria ryneveldiae			
Faucaria smithii			
Faucaria speciosa			
Faucaria subintegra			
Fenestraria spp.			
Fockea multiflora			
Frithia pulchra	var. minor		
Gasteria acinacifolia			
Gasteria baylissiana			E
Gasteria bicolor			
Gasteria brachyphylla	var. bayeri		
Gasteria brachyphylla	var. brachyphylla	Conophytum angustiarum	
Gasteria carinata			
Gasteria carinata	var. carinata	Gasteria schweickerdtiana	
Gasteria carinata	var. verrucosa	Gasteria verrucosa	
Gasteria croucheri			V
Gasteria dicta			
Gasteria disticha		Gasteria obtusifolia	
Gasteria ellaphieae			R
Gasteria excelsa			
Gasteria glomerata			R
Gasteria maculata			
Gasteria minima			
Gasteria nitida			
Gasteria nitida	var. armstrongii	Gasteria armstrongii	
Gasteria nitida	var. nitida	Gasteria obtusa	
Gasteria pillansii			
Gasteria pillansii	var. ernesti-ruschii	Gasteria ernesti-ruschii	
Gasteria pulchra			
Gasteria vlokii			R
Gibbaeum album			
Gibbaeum angulipes			
Gibbaeum comptonii			
Gibbaeum cryptopodium			
Gibbaeum esterhuyseniae			Ex
Gibbaeum geminum			

Gibbaeum pachypodium			
Gibbaeum pubescens	subsp. shandii		
Gibbaeum schwantesii			R/V
Gibbaeum spp.			
Glottiphyllum compressum			
Glottiphyllum depressum			
Glottiphyllum fragrans			
Glottiphyllum grandiflorum			
Glottiphyllum herrei			
Glottiphyllum longum			
Glottiphyllum marlothii			
Glottiphyllum muirii			
Glottiphyllum oligocarpum			
Glottiphyllum parvifolium			
Glottiphyllum peersii			
Glottiphyllum pygmaeum			
Glottiphyllum semicylindricum			
Glottiphyllum spp.			
Glottiphyllum surrectum			
Hallianthus planus			
Haworthia altilinea			
Haworthia angolensis		Chortolirion angolense	
Haworthia angustifolia			
Haworthia aristata			
Haworthia armstrongii			
Haworthia asperula			
Haworthia attenuata			
Haworthia baccata			
Haworthia badia			
Haworthia batesiana			
Haworthia bilineata			
Haworthia blackburniae			R
Haworthia bolusii			
Haworthia cassytha			
Haworthia chloracantha			
Haworthia coarctata			
Haworthia congesta			
Haworthia cooperi			
Haworthia cuspidata			
Haworthia decipiens			
Haworthia dekenahii			
Haworthia divergens			
Haworthia eilyae			
Haworthia emelyae	var. emelyae	Haworthia picta	V
Haworthia floribunda			V
Haworthia foliosa			
Haworthia fouchei			

Haworthia geraldii			
Haworthia glabrata			
Haworthia glauca			
Haworthia gracilis			
Haworthia graminifolia			R
Haworthia granulata			
Haworthia greenii			
Haworthia heidelbergensis			V
Haworthia helmae			
Haworthia herrei			
Haworthia hurlingii			
Haworthia hybrida			
Haworthia icosiphylla			
Haworthia incurvula			
Haworthia integra			
Haworthia jacobseniana			
Haworthia janseneana			
Haworthia jonesiae			
Haworthia kewensis			
Haworthia kingiana			V
Haworthia koelmaniorum		Haworthia mcmurtryi	V
Haworthia leightonii			
Haworthia limifolia	var. limifolia		V
Haworthia limifolia	var. ubomboensis	Haworthia ubomboensis	
Haworthia lockwoodii			V
Haworthia longebracteata			
Haworthia longiana			
Haworthia magnifica			
Haworthia maraisii			
Haworthia marginata			E
Haworthia minima			
Haworthia mirabilis	subsp. mirabilis	Haworthia nitida	
Haworthia mucronata			
Haworthia mundula			
Haworthia mutica			V
Haworthia nitidula			
Haworthia nortieri			
Haworthia pallida			
Haworthia paradoxa			
Haworthia parva			
Haworthia pearsonii			
Haworthia pehlemanniae			E
Haworthia poellnitziana			E
Haworthia pubescens			V
Haworthia pulchella			
Haworthia pygmaea			E
Haworthia radula			

Haworthia rugosa			
Haworthia ryderiana			
Haworthia schuldtiana			
Haworthia semiviva			E
Haworthia serrata			
Haworthia sessiliflora			
Haworthia stiemiei			
Haworthia subattenuata			
Haworthia subfasciata			
Haworthia subulata			
Haworthia tenera			
Haworthia tisleyi			
Haworthia tortuosa			
Haworthia translucens			
Haworthia triebnerana			
Haworthia turgida			
Haworthia umbraticola			
Haworthia unicolor			
Haworthia variegata			
Haworthia venosa	subsp. tessellata	Haworthia minuta	
Haworthia viscosa			
Haworthia wittebergensis			R
Haworthia woolleyi			V
Haworthia xiphiophylla			
Haworthia zantnerana			
Hereroa calycina			
Hereroa dyeri			
Hereroa incurva			
Hereroa joubertii			
Hereroa muirii			
Hereroa nelii			
Hereroa puttkameriana			
Herreanthus meyeri			
Hoodia currori			R
Hoodia dregei			R
Hoodia pilifera	subsp. pilifera	Trichocaulon piliferum	R
Hoodia triebneri			
Huernia barbata			
Huernia brevirostris	var. immaculata		
Huernia brevirostris	var. pallida		
Huernia brevirostris	var. parvipuncta		
Huernia campanulata			
Huernia clavigera			
Huernia confusa			
Huernia distincta			
Huernia guttata			
Huernia hystrix	var. hystrix	Huernia hystrix var. appendiculata	

Huernia hystrix	var. parvula		V
Huernia insigniflora			
Huernia levyi			
Huernia ocellata			
Huernia pendula			
Huernia piersii			
Huernia praestans			R
Huernia primulina			
Huernia procumbens			
Huernia quinta			
Huernia reticulata			
Huernia schneiderana			
Huernia spp.			
Huernia stapelioides			
Huernia thureti			
Huernia venusta			
Huernia volkartii			
Huernia whitesloaneana			
Jacobsenia kolbei			
Jensenobotrya lossowiana			R
Jordaaniella dubia		Cephalophyllum procumbens	
Juttadinteria ausensis			
Juttadinteria decumbens			
Juttadinteria deserticola			
Juttadinteria insolita			
Juttadinteria kovisimontana			
Juttadinteria sauvissima			
Juttadinteria simpsonii			
Juttadinteria spp.			
Kalanchoe crenata			
Kalanchoe crundalli			R
Kalanchoe longiflora			
Kalanchoe paniculata			
Khadia carolinensis			
Khadia spp.			
Kleinia fulgens		Senecio fulgens	
Lachenalia aloides			
Lachenalia aloides	var. aurea		
Lachenalia contaminata			
Lachenalia pallida			
Lachenalia rubrida			
Lachenalia viridiflora			E
Lampranthus amoenus			
Lampranthus aurantiacus			
Lampranthus aureus			
Lampranthus brownii			
Lampranthus comptonii			

Lampranthus copiosus			
Lampranthus curvifolius			
Lampranthus dependens			
Lampranthus explanatus			
Lampranthus falcatus			
Lampranthus glaucus			
Lampranthus godmaniae			
Lampranthus godmaniae	var. grandiflorus		
Lampranthus haworthii			
Lampranthus primiversus			
Lampranthus productus			
Lampranthus purpureus			
Lampranthus roseus			
Lampranthus spectabilis			
Lampranthus stayneri			
Lampranthus vredenburgensis			
Lavrania marlothii		Trichocaulon marlothii	
Leipoldtia britteniae			
Leipoldtia frutescens		Cephalophyllum frutescens	
Leipoldtia weigangiana			
Lithops gracilidelineata	subsp. brandbergensis	Lithops pseudotruncatella var. brandbergensis	R
Lithops steineckeana			
Luckhoffia beukmanii			
Machairophyllum acuminatum			
Machairophyllum baxteri			
Machairophyllum spp.			
Machairophyllum stayneri			
Malephora crassa			
Malephora crocea	var. purpureo-crocea		
Malephora spp.			
Malephora uitenhagensis			
Mestoklema arboriforme			
Mestoklema spp.			
Mestoklema tuberosum	var. macrorrhizum	Mestoklema macrorrhizum	
Mitrophyllum grande			
Monadenium lugardiae			
Monilaria chrysoleuca			
Monilaria chrysoleuca	var. polita		
Monilaria globosa			
Namaquanthus vanheerdii			
Nananthus broomii			
Nananthus spp.			
Nananthus vittatus			
Nananthus wilmaniae			
Nelia pillansii			
Notechidnopsis tessellata			
Odontophorus angustifolius			

Odontophorus marlothii			
Odontophorus spp.			
Ophthalmophyllum dinteri			
Ophthalmophyllum haramoepense			
Ophthalmophyllum latum			
Ophthalmophyllum lydiae			
Ophthalmophyllum maughanii			
Ophthalmophyllum schlechteri			
Ophthalmophyllum schuldtii			
Ophthalmophyllum spathulatum			
Ophthalmophyllum triebneri			
Ophthalmophyllum vanheerdei			
Orbea lepida		Stapelia lepida	
Orbea speciosa			V
Orbea verrucosa			
Orbea verrucosa	var. fucosa		
Orbea verrucosa	var. verrucosa	Stapelia verrucosa	
Orbeanthus conjunctus		Stultitia conjunctus	V
Orbeopsis caudata			
Orbeopsis gerstneri	subsp. elongata		R
Orbeopsis lutea	subsp. lutea	Caralluma lutea	
Orbeopsis lutea	subsp. vaga	Caralluma nebrownii	
Ornithogalum graminifolium			
Ornithogalum hispidum			
Ornithogalum longibracteatum		Ornithogalum caudatum	
Ornithogalum multifolium			
Ornithogalum spp.			
Orthopterum coegana			E
Orthopterum waltoniae			
Osteospermum barberae			
Osteospermum ecklonis			
Osteospermum jucundum			
Othonna armiana			R
Othonna capensis			
Othonna cuneata			
Othonna euphorbioides			
Othonna hallii			R
Othonna lasiocarpa			
Othonna lepidocaulis			
Othonna lobata			
Othonna retrorsa			
Othonna triplinervia			
Pachycymbium carnosum		Caralluma carnosa	
Pachycymbium miscellum		Caralluma bredae	
Pachycymbium rogersii		Caralluma rogersii	
Pachycymbium ubomboense		Caralluma ubomboensis	V
Pectinaria longipes			R

Pectinaria maughanii			
Pectinaria stayneri			
Pelargonium acetosum			
Pelargonium alternans			
Pelargonium anethifolium			
Pelargonium antidysentericum			
Pelargonium antidysentericum	subsp. zonale		
Pelargonium appendiculatum			R
Pelargonium articulatum			
Pelargonium barklyi			
Pelargonium bowkeri			
Pelargonium ceratophyllum			
Pelargonium cortusifolium			
Pelargonium crassicaule			
Pelargonium crassipes			
Pelargonium dasyphyllum			
Pelargonium gibbosum			
Pelargonium hirtum			
Pelargonium hystrix			R
Pelargonium incrassatum			
Pelargonium karooicum			
Pelargonium klinghardtense			
Pelargonium laxum			
Pelargonium longifolium			
Pelargonium luridum			
Pelargonium luteolum			
Pelargonium oblongatum			
Pelargonium paniculatum			
Pelargonium peltatum			
Pelargonium pulchellum			
Pelargonium pulverulentum			
Pelargonium punctatum			
Pelargonium rapaceum			
Pelargonium reniforme			
Pelargonium sibthorpiifolium			
Pelargonium sidoides			
Pelargonium stipulaceum			
Pelargonium tetragonum			
Pelargonium xerophyton			
Peperomia rotundifolia			
Piaranthus disparilis			
Piaranthus foetidus			
Piaranthus foetidus	var. diversus		
Piaranthus foetidus	var. purpureus		
Piaranthus framesii			
Piaranthus globosus			
Piaranthus pallidus			

Piaranthus parvulus			
Piaranthus pillansii			
Piaranthus pillansii	var. inconstans		
Piaranthus pulcher	var. nebrownii		
Piaranthus ruschii			
Piaranthus spp.			
Platythyra haeckeliana			
Plectranthus amboinicus			
Plectranthus ciliatus			
Plectranthus cylindraceus			
Plectranthus ecklonii			
Plectranthus ernstii			R
Plectranthus grandidentatus			
Plectranthus hadiensis	var. tomentosus	Plectranthus tomentosus	
Plectranthus madagascariensis			
Plectranthus oertendahlii			R
Plectranthus spicatus			
Plectranthus spp.			
Plectranthus verticillatus			
Plectranthus xerophilus			
Plectranthus zuluensis			
Pleiospilos compactus	subsp. canus		
Pleiospilos compactus	subsp. fergusoniae	Pleiospilos fergusoniae	
Pleiospilos compactus	subsp. minor	Pleiospilos minor	R
Pleiospilos compactus	subsp. sororius	Pleiospilos dimidiatus	
Pleiospilos simulans			E
Poellnitzia rubriflora			R
Psammophora nissenii			
Quaqua incarnata			
Quaqua parviflora	subsp. gracilis	Caralluma gracilis	
Rabiea albinota	var. albinota		
Rabiea comptonii			
Rhinephyllum broomii			
Rhinephyllum luteum			
Rhinephyllum muirii			
Rhinephyllum schonlandii			
Rhombophyllum nelii			
Rhombophyllum rhomboideum	var. rhomboideum		
Rhombophyllum spp.			
Ruschia crassa			
Ruschia crassifolia			
Ruschia dichroa			
Ruschia dualis			
Ruschia elevata			
Ruschia evoluta			
Ruschia fenestrata			
Ruschia frutescens			

Ruschia gemina			
Ruschia herrei			
Ruschia inclusa			
Ruschia indurata			
Ruschia intrusa			
Ruschia karrooica			
Ruschia macowanii			
Ruschia multiflora			
Ruschia pulvinaris			
Ruschia pungens			
Ruschia pygmaea			
Ruschia rubricaulis			
Ruschia strubeniae			
Ruschia turneriana			
Ruschia uncinata			
Ruschia valida			
Ruschianthus falcatus			
Sarcocaulon camdeboense			
Sarcocaulon ciliatum			
Sarcocaulon herrei			
Sarcocaulon inerme			
Sarcocaulon patersonii			
Sarcocaulon peniculinum			R
Sarcostemma spp.			
Sceletium anatomicum			
Sceletium joubertii			
Sceletium spp.			
Sceletium subvelutinum			
Schwantesia spp.			
Scopologena gracilis			
Scopologena vereculata			R
Semnanthe lacera			
Senecio acaulis			
Senecio articulatus			
Senecio ficoides			
Senecio hallianus			
Senecio medley-woodii			
Senecio pyramidatus			
Senecio scaposus			
Senecio serpens			
Senecio vitalis			
Sesamothamnus guerichii			
Sesamothamnus lugardii			
Smicrostigma viride			
Stapelia asterias			
Stapelia concinna			
Stapelia divaricata			V

Stapelia gigantea			
Stapelia glabricaulis			
Stapelia glanduliflora			
Stapelia incomparabilis			
Stapelia longipedicellata			
Stapelia macowanii	var. conformis	Stapelia conformis	
Stapelia paniculata		Stapelia nouhuysii	R
Stapelia pillansii			
Stapelia praetermissa			
Stapelia pulvinata		Stapelia margarita	
Stapelia rufa			
Stapelia similis			
Stapelia tsomoensis			R
Stapelia unicornis			
Stapelia villetiae			
Stapeliopsis pillansii			R
Stapeliopsis saxatilis			
Stomatium agninum			
Stomatium beaufortense			
Stomatium difforme			
Stomatium fulleri			
Stomatium loganii			
Stomatium meyeri			
Stomatium niveum			
Stomatium peersii			
Stomatium resedolens			
Stomatium suricatinum			
Stomatium trifarium			
Synadenium cupulare			
Talinum paniculatum			
Talinum portulacifolium			
Tanquana archeri			R
Titanopsis fulleri			
Titanopsis hugo-schlechteri	var. alboviridis		
Titanopsis luederitzii			
Titanopsis primosii			
Titanopsis schwantesii			
Trichodiadema spp.			
Tridentea baylissii			
Tridentea baylissii	var. baylissii	Stapelianthus baylissii	
Tridentea gemmiflora			
Tridentea longii		Stapelia longii	
Tridentea parvipuncta			
Tromotriche spp.			
Tylecodon bayeri			R
Tylecodon boddleyae			R
Tylecodon cacaliodes			

Tylecodon fragilis			V
Tylecodon hirtifolius			R
Tylecodon leucothrix			
Tylecodon reticulatus	subsp. phyllopodium		
Tylecodon rubrovenosus			
Tylecodon suffultus			R
Tylecodon sulphureus			R
Tylecodon sulphureus	var. armianus		
Tylecodon torulosus			R
Tylecodon ventricosus			
Tylecodon wallichii	subsp. ecklonianus	Cotyledon dinteri	
Vanheerdea angusta			
Vanheerdea primosii			
Vanheerdea roodiae			

Source: South African CITES permits, non-CITES permits, Exemption certificates and succulent plant nursery catalogues.

Appendix 3: Potentially Threatened Species list

Scientific Name	Sub species	Status	Synonyms	Threatened by trade according to experts	Species in the the Top 50% price category	Species exported in quantity of 100 or greater units per year	Species with no export permits or exemption certificates
Adenia digitata				✗	Y		Y
Adenia fruticosa				✗	Y	Y	
Adenia fruticosa	*subsp. trifoliata*			✗	Y		Y
Adenia pechuelii		R		✓	Y	Y	
Adenia spinosa				✗	Y	Y	
Adenium boehmianum				✗	Y	Y	
Adenium swazicum				✗	Y	Y	
Adromischus caryophyllaceus			*Adromischus bolusii*	✗	Y		Y
Adromischus cooperi				✗	Y		Y
Adromischus cristatus	*var. clavifolius*		*Adromischus clavifolius*	✗	Y		Y
Adromischus fallax				✗	Y		Y
Adromischus humilis				✗	Y		Y
Adromischus marianiae	*var. immaculatus*		*Adromischus alveolatus*	✗	Y		Y
Adromischus marianiae	*var. kubusensis*			✗	Y		Y
Adromischus marianiae	*var. marianiae*			✗	Y		Y
Adromischus phillipsiae				✗	Y		Y
Adromischus triflorus			*Adromischus procurvus*	✗	Y		Y
Adromischus trigynus			*Adromischus rupicola*	✗	Y		Y
Aloe albida		V		✓	Y		Y
Aloe alooides				✗	Y		Y
Aloe bowiea		E		✓	Y	Y	
Aloe brevifolia	*var. depressa*			✓	Y		Y

Aloe broomii	*var. tarkaensis*			✗	Y		Y
Aloe buhrii		R		✓	Y	Y	
Aloe cryptopoda				?	Y	Y	
Aloe dewetii				✗	Y		Y
Aloe hardyi				✓	Y		Y
Aloe integra				?	Y		Y
Aloe keithii		R		?	Y		Y
Aloe krapohliana		V	*Aloe krapohliana var. dumoulinii*	?	Y	Y	
Aloe pachygaster				?	Y	Y	
Aloe pearsonii		V		✗	Y	Y	
Aloe pillansii		E		✓	Y	Y	
Aloe soutpansbergensis		R		✓	Y		Y
Aloe spicata				✗	Y		Y
Aloe umfoloziensis				✗	Y		Y
Bowiea gariepensis		R		✗	Y		Y
Brachystelma australe				✓	Y		Y
Brachystelma bruceae				✓	Y		Y
Brachystelma bruceae	*subsp. bruceae*			✓	Y		Y
Brachystelma bruceae	*subsp. hirsutum*			✓	Y		Y
Brachystelma caffrum				✓	Y		Y
Brachystelma cathcartense				✓	Y		Y
Brachystelma chlorozonum				✓	Y		Y
Brachystelma coddii				✗	Y		Y
Brachystelma decipiens				?	Y		Y
Brachystelma discoideum		R		✓	Y		Y
Brachystelma gracile				✗	Y		Y
Brachystelma huttonii				✗	Y		Y

Brachystelma incanum				✗	Y		Y
Brachystelma minor		R		✓	Y		Y
Brachystelma modestum				✓	Y		Y
Brachystelma ngomense		E		✓	Y		Y
Brachystelma perditum		R		✓	Y		Y
Brachystelma petraeum		R		✓	Y		Y
Brachystelma pulchellum				✓	Y		Y
Brachystelma pygmaeum	*subsp. flavidum*		*Brachystelma flavidum*	✗	Y		Y
Brachystelma pygmaeum	*subsp. pygmaeum*		*Brachystelma pygmaeum*	✗	Y		Y
Brachystelma remotum				✓	Y		Y
Brachystelma stellatum				✓	Y		Y
Brachystelma swazicum				✓	Y		Y
Brachystelma tenellum		V		✓	Y		Y
Brachystelma tenue				✓	Y		Y
Brachystelma vahrmeijeri		R		✓	Y		Y
Bryophyllum delagoense				?	Y		Y
Caralluma schweinfurthii			*Caralluma piaranthoides*	✗	Y		Y
Ceropegia cancellata		R	*Ceropegia assimilis*	?	Y	Y	
Ceropegia connivens				✗	Y		Y
Ceropegia conrathii				✗	Y	Y	
Ceropegia fimbriata			*Ceropegia estelleana*	✗	Y		Y
Ceropegia lugardae			*Ceropegia apiculata*	✗	Y		Y
Ceropegia multiflora				✗	Y	Y	
Ceropegia multiflora	*subsp. multiflora*			✗	Y		Y
Ceropegia multiflora	*subsp. tentaculata*			✗	Y		Y
Ceropegia nilotica			*Ceropegia boussingaultiflora*	✗	Y	Y	
Ceropegia stenantha				✗	Y		Y

Ceropegia turricula				✗	Y		Y
Chamaesyce mossambicensis			*Euphorbia mossambicensis*	✗	Y		Y
Cheiridopsis tuberculata				✗	Y		Y
Cheiridopsis umdausensis		V		✗	Y		Y
Conophytum auriflorum				✗	Y		Y
Conophytum bilobum	*subsp. altum*		*Conophytum altum*	✗	Y		Y
Conophytum bilobum	*subsp. bilobum*		*Conophytum absimile var. absimile*	✗	Y		Y
Conophytum bolusiae				✗	Y		Y
Conophytum breve				✗	Y		Y
Conophytum comptonii				✓	Y		Y
Conophytum concavum		R		✗	Y		Y
Conophytum flavum	*subsp. flavum*		*Conophytum flavum var. flavum*	✗	Y		Y
Conophytum fraternum				✗	Y		Y
Conophytum frutescens		R		✗	Y		Y
Conophytum globosum				✗	Y		Y
Conophytum gratum	*subsp. gratum*		*Conophytum admiralii*	✗	Y		Y
Conophytum hians				✗	Y		Y
Conophytum inornatum				?	Y		Y
Conophytum limpidum			*Ophthalmophyllum subfenestratum*	✗	Y		Y
Conophytum loeschianum		R	*Conophytum intermedium*	✗	Y		Y
Conophytum longibracteatum				?	Y		Y
Conophytum marginatum	*var. karamoepense*		*Conophytum karamoepense*	✗	Y		Y
Conophytum minimum			*Conophytum albifissum*	✗	Y		Y
Conophytum minusculum	*subsp. leipoldtii*		*Conophytum leipoldtii*	✗	Y		Y
Conophytum minusculum	*subsp. minusculum*		*Conophytum herrei*	✗	Y		Y
Conophytum minutum	*var. minutum*		*Conophytum minutum forma minutum*	✗	Y		Y
Conophytum minutum	*var. pearsonii*		*Conophytum glabrum*	✗	Y		Y

Conophytum obcordellum	*subsp. obcordellum var. ceresianum*		*Conophytum ceresianum*		Y		Y
Conophytum obscurum	*subsp. obscurum*		*Conophytum barbatum*	✗	Y		Y
Conophytum pageae			*Conophytum breve var. minutiflorum*	✗	Y		Y
Conophytum pellucidum	*subsp. pellucidum*		*Conophytum areolatum*	✗	Y		Y
Conophytum piluliforme	*subsp. edwardii*		*Conophytum edwardii*	✗	Y		Y
Conophytum piluliforme	*subsp. piluliforme*		*Conophytum advenum*	✗	Y		Y
Conophytum rubrolineatum				✗	Y		Y
Conophytum stephanii				?	Y		Y
Conophytum swanepoelianum				?	Y		Y
Conophytum tantillum				✗	Y		Y
Conophytum tantillum	*subsp. tantillum*		*Conophytum eenkokerense*	✗	Y		Y
Conophytum taylorianum	*subsp. ernianum*		*Conophytum ernianum*	✗	Y		Y
Conophytum truncatum	*subsp. truncatum*		*Conophytum morganii, Conophytum peersii*	✗	Y		Y
Conophytum truncatum	*subsp. truncatum var. peersii var. wiggettiae*		*Conophytum calitzdorpense*	✗	Y		Y
Conophytum truncatum	*subsp. viridicatum*		*Conophytum archeri var. stayneri*	✗	Y		Y
Conophytum turrigerum				✗	Y		Y
Conophytum uviforme	*subsp. decoratum*		*Conophytum decoratum*	✗	Y		Y
Conophytum uviforme	*subsp. rauhii*		*Conophytum rauhii*	✗	Y		Y
Conophytum uviforme	*subsp. uviforme*		*Conophytum clarum, Conophytum uviforme var. clarum*	✗	Y		Y
Conophytum velutinum	*subsp. velutinum*	R	*Conophytum cinereo-viride*	✗	Y		Y
Conophytum verrucosum				✗	Y		Y
Conophytum violaciflorum			*Conophytum anjametae*	✗	Y		Y
Conophytum wettsteinii	*subsp. fragile*		*Conophytum avenantii*	✗	Y		Y
Cotyledon orbiculata	*var. dactylopsis*			✗	Y		Y
Cotyledon orbiculata	*var. oblonga*		*Cotyledon coruscans*	✗	Y		Y

Cotyledon tomentosa	*subsp. ladismithiensis*	R	*Cotyledon ladismithensis*	✗	Y		Y
Crassula alstonii				✗	Y		Y
Crassula arborescens	*subsp. undulatifolia*	R		✗	Y		Y
Crassula compacta				✗	Y		Y
Crassula pubescens				✗	Y		Y
Crassula pyramidalis			*Crassula archeri*	✗	Y		Y
Crassula sarcocaulis				✗	Y		Y
Crassula sarcocaulis	*subsp. sarcocaulis*		*Crassula parvisepala*	✗	Y		Y
Crassula streyi		R		✗	Y		Y
Crassula tecta				✗	Y		Y
Cyphostemma humile				✓	Y		Y
Cyphostemma uter		R		✓	Y	Y	
Delosperma nubigenum				✗	Y		Y
Duvalia angustiloba				✗	Y		Y
Duvalia modesta				✗	Y		Y
Euphorbia amygdaloides				✗	Y		Y
Euphorbia anoplia				✗	Y		Y
Euphorbia arida				✓	Y	Y	
Euphorbia avasmontana				✗	Y		Y
Euphorbia bergeri				✗	Y		Y
Euphorbia cereiformis				✗	Y		Y
Euphorbia clivicola		V		✗	Y		Y
Euphorbia confinalis	*subsp. confinalis*			✗	Y		Y
Euphorbia crassipes		Ex		✗	Y	Y	
Euphorbia crispa				✗	Y	Y	
Euphorbia damarana				✗	Y		Y
Euphorbia davyi				✗	Y	Y	

Euphorbia decepta		R/V		✗	Y	Y	
Euphorbia ernestii				✗	Y		Y
Euphorbia fasciculata		V		✗	Y	Y	
Euphorbia flanaganii				✗	Y	Y	
Euphorbia franckiana				✗	Y		Y
Euphorbia franksiae				✗	Y		Y
Euphorbia fusca			*Euphorbia eendornensis*	✗	Y	Y	
Euphorbia gentilis				?	Y	Y	
Euphorbia globosa		R		✗	Y	Y	
Euphorbia groenewaldii		E		✓	Y	Y	
Euphorbia guerichiana			*Euphorbia*				
			commiphoroides	✗	Y		Y
Euphorbia halipedicola				?	Y		Y
Euphorbia hallii		R		✗	Y		Y
Euphorbia heterophylla			*Euphorbia geniculata*	✗	Y		Y
Euphorbia hottentota		R		✗	Y		Y
Euphorbia hypogaea				✓	Y		Y
Euphorbia inconstantia				✗	Y		Y
Euphorbia inermis	*var. huttonae*		*Euphorbia huttonae*	✗	Y		Y
Euphorbia inornata			*Euphorbia inelegans*	✗	Y	Y	
Euphorbia juttae				✗	Y		Y
Euphorbia knuthii	*subsp. knuthii*			✗	Y		Y
Euphorbia lavrani		R		✗	Y		Y
Euphorbia maleolens				✗	Y	Y	
Euphorbia malevola				✗	Y		Y
Euphorbia multiramosa				✗	Y	Y	
Euphorbia namibensis			*Euphorbia argillicola*	✗	Y	Y	

Euphorbia namuskluftensis		R		?	Y		Y
Euphorbia ornithopus				?	Y	Y	
Euphorbia pedemontana				?	Y		Y
Euphorbia persistens				?	Y	Y	
Euphorbia persistentifolia				?	Y		Y
Euphorbia pseudotuberosa				?	Y	Y	
Euphorbia restricta		R		✗	Y		Y
Euphorbia rowlandii		R		✓	Y		Y
Euphorbia rudis				✗	Y	Y	
Euphorbia splendens				?	Y		Y
Euphorbia squarrosa				✗	Y	Y	
Euphorbia submammillaris				?	Y		Y
Euphorbia subsalsa				?	Y		Y
Euphorbia trichadenia				✗	Y	Y	
Euphorbia tubiglans				?	Y		Y
Euphorbia valaris				?	Y		Y
Euphorbia vandermerwei				✗	Y		Y
Euphorbia virosa			*Euphorbia dinteri*	✗	Y	Y	
Euphorbia waterbergensis		V		?	Y		Y
Euphorbia wildii				✓	Y		Y
Euphorbia zoutpansbergensis		R		✓	Y		Y
Faucaria smithii				?	Y		Y
Fockea multiflora				✗	Y		Y
Gasteria acinacifolia				✗	Y		Y
Gasteria brachyphylla	*var. brachyphylla*		*Conophytum angustiarum*	✗	Y		Y
Gasteria carinata	*var. carinata*		*Gasteria angulata*	✗	Y		Y
Gasteria carinata	*var. verrucosa*		*Gasteria radulosa*	✗	Y		Y

Gasteria disticha			*Gasteria angustifolia,*				
			Gasteria nigricans	✗	Y		Y
Gasteria minima				✗	Y		Y
Gasteria nitida	*var. armstrongii*		*Gasteria armstrongii*	✓	Y		Y
Gasteria nitida	*var. nitida*		*Gasteria beckeri*	✗	Y		Y
Gasteria pillansii	*var. ernesti-ruschii*		*Gasteria ernesti-ruschii*	✗	Y		Y
Gibbaeum spp.				✓	Y		Y
Glottiphyllum compressum				✗	Y		Y
Glottiphyllum grandiflorum				✗	Y		Y
Glottiphyllum herrei				✗	Y		Y
Glottiphyllum muirii				✗	Y		Y
Haworthia altilinea				✗	Y		Y
Haworthia angolensis			*Chortolirion angolense*	✗	Y		Y
Haworthia angustifolia				✗	Y		Y
Haworthia aristata				✓	Y		Y
Haworthia armstrongii				✗	Y		Y
Haworthia asperula				?	Y		Y
Haworthia baccata				?	Y		Y
Haworthia badia				✓	Y		Y
Haworthia batesiana				✗	Y		Y
Haworthia blackburniae		R		✗	Y		Y
Haworthia chloracantha				✗	Y		Y
Haworthia coarctata				✗	Y		Y
Haworthia congesta				?	Y		Y
Haworthia cooperi				✓	Y		Y
Haworthia cuspidata				?	Y		Y
Haworthia eilyae				✓	Y		Y

Haworthia floribunda		V		✓	Y		Y
Haworthia foliosa				✗	Y		Y
Haworthia glabrata				✗	Y		Y
Haworthia gracilis				✗	Y		Y
Haworthia graminifolia		R		✓	Y		Y
Haworthia granulata				✓	Y		Y
Haworthia greenii				✓	Y		Y
Haworthia heidelbergensis		V		✓	Y		Y
Haworthia helmae				✗	Y		Y
Haworthia herrei				✗	Y		Y
Haworthia hurlingii				✗	Y		Y
Haworthia hybrida				✗	Y		Y
Haworthia incurvula				✗	Y		Y
Haworthia jacobseniana				✗	Y		Y
Haworthia janseneana				✗	Y		Y
Haworthia jonesiae				✗	Y		Y
Haworthia kewensis				✗	Y		Y
Haworthia kingiana		V		✓	Y		Y
Haworthia koelmaniorum		V		✓	Y		Y
Haworthia limifolia	*var. ubomboensis*			✓	Y		Y
Haworthia magnifica				✓	Y		Y
Haworthia maraisii				✓	Y		Y
Haworthia mucronata				✓	Y		Y
Haworthia mundula				✓	Y		Y
Haworthia mutica		V		✓	Y		Y
Haworthia nitidula				✗	Y		Y
Haworthia paradoxa				✓	Y		Y

Haworthia pearsonii				✗	Y		Y
Haworthia pehlemanniae		E		✓	Y		Y
Haworthia poellnitziana		E		✓	Y		Y
Haworthia pubescens		V		✓	Y		Y
Haworthia pulchella				✓	Y		Y
Haworthia radula				✗	Y		Y
Haworthia ryderiana				?	Y		Y
Haworthia schuldtiana				?	Y		Y
Haworthia serrata		E		✓	Y		Y
Haworthia sessiliflora				?	Y		Y
Haworthia spp.				?	Y	Y	
Haworthia subattenuata				✗	Y		Y
Haworthia subfasciata				✗	Y		Y
Haworthia tenera				✗	Y		Y
Haworthia tisleyi				?	Y		Y
Haworthia tortuosa				?	Y		Y
Haworthia triebnerana				?	Y		Y
Haworthia umbraticola				?	Y		Y
Haworthia wittebergensis		R		✓	Y		Y
Haworthia xiphiophylla				✓	Y		Y
Haworthia zantnerana				✗	Y		Y
Hoodia currori				✗	Y		Y
Hoodia dregei		R		✗	Y		Y
Hoodia pilifera	*subsp. pilifera*	R	*Trichocaulon piliferum*	✗	Y		Y
Hoodia triebneri		R		✗	Y		Y
Huernia barbata				✗	Y		Y
Huernia clavigera				✗	Y		Y

Huernia confusa				✗	Y		Y
Huernia levyi				✗	Y		Y
Huernia praestans		R		✗	Y		Y
Huernia primulina				✗	Y		Y
Huernia reticulata				✗	Y		Y
Huernia schneiderana				✗	Y		Y
Huernia stapelioides				✗	Y		Y
Huernia whitesloaneana				✗	Y		Y
Khadia spp.				?	Y		Y
Lampranthus brownii				?	Y		Y
Lampranthus glaucus				?	Y		Y
Lampranthus purpureus				?	Y		Y
Lavrania marlothii			*Trichocaulon dinteri*	✗	Y		Y
Lithops gracilidelineata	*subsp. brandbergensis*	R	*Lithops pseudotruncatella var. brandbergensis*	?	Y		Y
Luckhoffia beukmanii				✗	Y		Y
Monadenium lugardiae				✗	Y		Y
Monilaria globosa				✗	Y		Y
Ophthalmophyllum spathulatum				✗	Y		Y
Orbeopsis caudata				✗	Y		Y
Orbeopsis lutea	*subsp. lutea*		*Caralluma lateritia*	✗	Y		Y
Orbeopsis lutea	*subsp. vaga*		*Caralluma hahnii*	✗	Y		Y
Ornithogalum spp.				?	Y		Y
Osteospermum barberae				?	Y		Y
Osteospermum jucundum				?	Y		Y
Othonna armiana		R		✓	Y		Y
Othonna euphorbioides				✗	Y		Y
Othonna hallii		R		✓	Y		Y

Othonna lasiocarpa			*Othonna lamulosa*	✗	Y		Y
Othonna lepidocaulis				✗	Y		Y
Othonna retrorsa				✓	Y		Y
Othonna triplinervia				✗	Y		Y
Pachycymbium miscellum			*Caralluma bredae*	✗	Y		Y
Pachypodium lealii			*Pachypodium giganteum*	✗	Y	Y	
Pachypodium succulentum			*Pachypodium griquense*	✗	Y	Y	
Pectinaria longipes		R		✗	Y		Y
Pectinaria maughanii				✗	Y		Y
Pelargonium antidysentericum				✗	Y		Y
Pelargonium antidysentericum	*subsp. zonale*			✗	Y		Y
Pelargonium articulatum				✓	Y		Y
Pelargonium bowkeri				✓	Y		Y
Pelargonium crassicaule				✓	Y		Y
Pelargonium crassipes				✓	Y		Y
Pelargonium karooicum				✓	Y		Y
Pelargonium luridum				✗	Y		Y
Pelargonium pulchellum				✓	Y		Y
Pelargonium punctatum				✓	Y		Y
Pelargonium sibthorpiifolium				✓	Y		Y
Pelargonium sidoides				✓	Y		Y
Pelargonium xerophyton				✓	Y		Y
Piaranthus foetidus	*var. purpureus*			✗	Y		Y
Piaranthus globosus				✗	Y		Y
Piaranthus ruschii				✗	Y		Y
Piaranthus spp.				?	Y		Y
Plectranthus ernstii		R		✗	Y		Y

Plectranthus xerophilus				✗	Y		Y
Poellnitzia rubriflora		R		✓	Y		Y
Pterodiscus ngamicus				✓	Y	Y	
Pterodiscus speciosus				✓	Y	Y	
Pterodiscus spp.				?	Y	Y	
Quaqua incarnata				✗	Y		Y
Quaqua parviflora	*subsp. gracilis*		*Caralluma ericeta*	✗	Y		Y
Sarcocaulon camdeboense				✗	Y		Y
Sarcocaulon ciliatum				✗	Y		Y
Sarcocaulon inerme				✗	Y		Y
Sarcocaulon patersonii				✗	Y		Y
Sarcocaulon peniculinum		R		✗	Y		Y
Senecio hallianus				✗	Y		Y
Senecio medley-woodii				✗	Y		Y
Senecio scaposus				✗	Y		Y
Senecio vitalis				✗	Y		Y
Sesamothamnus guerichii				✗	Y		Y
Stapelia gigantea			*Stapelia cyclista*	✗	Y		Y
Stapelia glanduliflora				✗	Y		Y
Stapelia longipedicellata				?	Y		Y
Stapelia unicornis				✗	Y		Y
Synadenium cupulare			*Synadenium arborescens*	?	Y		Y
Tridentea parvipuncta				✗	Y		Y
Tylecodon bayeri		R		✗	Y		Y
Tylecodon boddleyae		R		✗	Y		Y
Tylecodon fragilis		V	*Cotyledon fragilis*	✗	Y		Y
Tylecodon hirtifolius		R	*Cotyledon hirtifolia*	✗	Y		Y

Tylecodon leucothrix			*Cotyledon leucothrix*	✗	Y		Y
Tylecodon reticulatus	*subsp. reticulatus*		*Cotyledon parvula*	✗	Y	Y	
Tylecodon rubrovenosus			*Cotyledon rubrovenosa*	✗	Y		Y
Tylecodon suffultus		R		✗	Y		Y
Tylecodon sulphureus		R		✗	Y		Y
Tylecodon sulphureus	*var. armianus*			✗	Y		Y
Tylecodon torulosus		R		✗	Y		Y
Tylecodon ventricosus			*Cotyledon ventricosa*	✗	Y		Y
Tylecodon wallichii	*subsp. ecklonianus*		*Cotyledon dinteri*	✗	Y		Y

Appendix 4: Final Priority Species list.

Number	Species	Subspecies/Variety	Reason for listing
1	*Adenia pechuelii*		Confirmed from App.3
2	*Adenium multiflorum*		Expert listing
3	*Adromischus marianiae (=A. herrei)*	*var. immaculatus*	Expert listing
4	*Aloe albida*		Confirmed from App.3
5	*Aloe bowiea*		Confirmed from App.3
6	*Aloe brevifolia*	*var. depressa*	Confirmed from App.3
7	*Aloe buhrii*		Confirmed from App.3
8	*Aloe erinacea*		Expert listing
9	*Aloe haemanthifolia*		Expert listing
10	*Aloe hardyi*		Confirmed from App.3
11	*Aloe kniphofioides*		Expert listing
12	*Aloe meyeri*		Expert listing
13	*Aloe nubigena*		Expert listing
14	*Aloe peglerae*		Expert listing
15	*Aloe pillansii*		Confirmed from App.3
16	*Aloe polyphylla*		Expert listing
17	*Aloe soutpansbergensis*		Confirmed from App.3
18	*Brachystelma australe*		Confirmed from App.3
19	*Brachystelma bruceae*	*subsp. bruceae*	Confirmed from App.3
20	*Brachystelma bruceae*	*subsp. hirsutum*	Confirmed from App.3
21	*Brachystelma caffrum*		Confirmed from App.3
22	*Brachystelma cathcartense*		Confirmed from App.3
23	*Brachystelma chlorozonum*		Confirmed from App.3
24	*Brachystelma discoideum*		Confirmed from App.3
25	*Brachystelma minor*		Confirmed from App.3
26	*Brachystelma modestum*		Confirmed from App.3
27	*Brachystelma ngomense*		Confirmed from App.3
28	*Brachystelma perditum*		Confirmed from App.3
29	*Brachystelma petraeum*		Confirmed from App.3
30	*Brachystelma pulchellum*		Confirmed from App.3
31	*Brachystelma remotum*		Confirmed from App.3
32	*Brachystelma stellatum*		Confirmed from App.3
33	*Brachystelma swazicum*		Confirmed from App.3
34	*Brachystelma tenellum*		Confirmed from App.3
35	*Brachystelma tenue*		Confirmed from App.3
36	*Brachystelma vahrmeijeri*		Confirmed from App.3
37	*Ceropegia cimiciodora*		Expert listing
38	*Ceropegia insignis*		Expert listing
39	*Cheiridopsis pecularis*		Expert listing
40	*Conophytum burgeri*		Expert listing
41	*Conophytum comptonii*		Confirmed from App.3
42	*Conophytum phoeniceum*		Expert listing
43	*Conophytum ratum*		Expert listing
44	*Crassula mesembryanthoides*		Expert listing

45	*Crassula susannae*		Expert listing
46	*Cyphostemma humile*		Confirmed from App.3
47	*Cyphostemma uter*		Confirmed from App.3
48	*Dioscorea elephantipes*		Expert listing
49	*Diplosoma spp.*		Expert listing
50	*Euphorbia arida*		Confirmed from App.3
51	*Euphorbia groenewaldii*		Confirmed from App.3
52	*Euphorbia hypogaea*		Confirmed from App.3
53	*Euphorbia obesa*		Expert listing
54	*Euphorbia rowlandii*		Confirmed from App.3
55	*Euphorbia susannae*		Expert listing
56	*Euphorbia symmetri5ca*		Expert listing
57	*Euphorbia valida*		Expert listing
58	*Euphorbia wildii*		Confirmed from App.3
59	*Euphorbia woodii*		Expert listing
60	*Euphorbia zoutpansbergensis*		Confirmed from App.3
61	*Gasteria nitida*	*var. armstrongii*	Confirmed from App.3
62	*Gibbaeum esterhuyseniae*		Expert listing
63	*Haworthia unicolor (=H. aristata)*		Confirmed from App.3
64	*Haworthia mirabilis (=H. badia)*	*subsp. badia*	Confirmed from App.3
65	*Haworthia bayeri*		Expert listing
66	*Haworthia bruynsii*		Expert listing
67	*Haworthia emelyae (=H. comptoniana)*	*var. comptoniana*	Expert listing
68	*Haworthia cooperi*		Confirmed from App.3
69	*Haworthia glauca (=H. eilyae)*	*var. herrei*	Confirmed from App.3
70	*Haworthia emelyae*	*var. multifolia*	Expert listing
71	*Haworthia floribunda*		Confirmed from App.3
72	*Haworthia graminifolia*		Confirmed from App.3
73	*Haworthia venosa (=H. granulata)*		Confirmed from App.3
74	*Haworthia coarctata (=H. greenii)*		Confirmed from App.3
75	*Haworthia heidelbergensis*		Confirmed from App.3
76	*Haworthia kingiana*		Confirmed from App.3
77	*Haworthia koelmaniorum*		Confirmed from App.3
78	*Haworthia limifolia*	*var. gigantea*	Expert listing
79	*Haworthia limifolia*	*var. limifolia*	Expert listing
80	*Haworthia limifolia*	*var. ubomboensis*	Confirmed from App.3
81	*Haworthia magnifica*	*var. atrofusca*	Expert listing
82	*Haworthia magnifica*		Confirmed from App.3
83	*Haworthia maraisii*		Confirmed from App.3
84	*Haworthia marginata*		Expert listing
85	*Haworthia maughanii*		Expert listing
86	*Haworthia mirabilis*	*subsp. badia*	Expert listing
87	*Haworthia mirabilis*	*subsp. mundula*	Expert listing
88	*Haworthia mucronata (invalid species)*		Confirmed from App.3
89	*Haworthia mirabilis (=H. mundula)*		Confirmed from App.3
90	*Haworthia mutica*		Confirmed from App.3
91	*Haworthia paradoxa*		Confirmed from App.3

92	*Haworthia parksiana*		Expert listing
93	*Haworthia pehlemanniae*		Confirmed from App.3
94	*Haworthia poellnitziana*		Confirmed from App.3
95	*Haworthia pubescens*		Confirmed from App.3
96	*Haworthia pulchella*		Confirmed from App.3
97	*Haworthia serrata*		Confirmed from App.3
98	*Haworthia sordida*		Expert listing
99	*Haworthia springbokvlakensis*		Expert listing
100	*Haworthia truncata*		Expert listing
101	*Haworthia venosa (=H. granulata)*	*subsp. granulata*	Expert listing
102	*Haworthia wittebergensis*		Confirmed from App.3
103	*Haworthia woolleyi*		Expert listing
104	*Haworthia xiphiophylla*		Confirmed from App.3
105	*Muiria hortenseae*		Expert listing
106	*Othonna armiana*		Confirmed from App.3
107	*Othonna cacalioides*		Expert listing
108	*Othonna hallii*		Confirmed from App.3
109	*Othonna herrei*		Expert listing
110	*Othonna retrorsa*		Confirmed from App.3
111	*Pachypodium namaquanum*		Expert listing
112	*Pelargonium articulatum*		Confirmed from App.3
113	*Pelargonium bowkeri*		Confirmed from App.3
114	*Pelargonium crassicaule*		Confirmed from App.3
115	*Pelargonium crassipes*		Confirmed from App.3
116	*Pelargonium karooicum*		Confirmed from App.3
117	*Pelargonium pulchellum*		Confirmed from App.3
118	*Pelargonium punctatum*		Confirmed from App.3
119	*Pelargonium sibthorpiifolium*		Confirmed from App.3
120	*Pelargonium sidoides*		Confirmed from App.3
121	*Pelargonium xerophyton*		Confirmed from App.3
122	*Poellnitzia rubriflora*		Confirmed from App.3
123	*Pterodiscus ngamicus*		Confirmed from App.3
124	*Pterodiscus speciosus*		Confirmed from App.3
125	*Quaqua spp.*		Expert listing
126	*Sarcocaulon multifidum*		Expert listing
127	*Sarcocaulon vanderietiae*		Expert listing
128	*Senecio laticipes*		Expert listing

Endangered Wildlife Trust

The TRAFFIC Network is the world's largest wildlife trade monitoring programme with offices covering most parts of the world. TRAFFIC is supported by WWF (World Wide Fund For Nature) and IUCN (the World Conservation Union) to monitor trade in and utilisation of wild plants and animals. TRAFFIC in South Africa is supported by WWF South Africa, Endangered Wildlife Trust, The Green Trust, Mazda Wildlife Fund and the Tony and Lisette Lewis Foundation. It works in close co-operation with the Secretariat of the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES). As the majority of its funding is provided by WWF, the Network is administered by the WWF Programme Committee on behalf of WWF and IUCN.

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