

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/229483336>

# The conservation status of Saintpaulia

Article in *Curtis's Botanical Magazine* · January 1998

DOI: 10.1111/1467-8748.00132

---

CITATIONS

17

READS

121

6 authors, including:



Benny Bytebier

University of KwaZulu-Natal

72 PUBLICATIONS 1,702 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Ecology of deception [View project](#)



Invasive Plant Management in the Galapagos [View project](#)

## THE CONSERVATION STATUS OF SAINTPAULIA

A. Eastwood, B. Bytebier, H. Tye, A. Tye, A. Robertson and  
M. Maunder

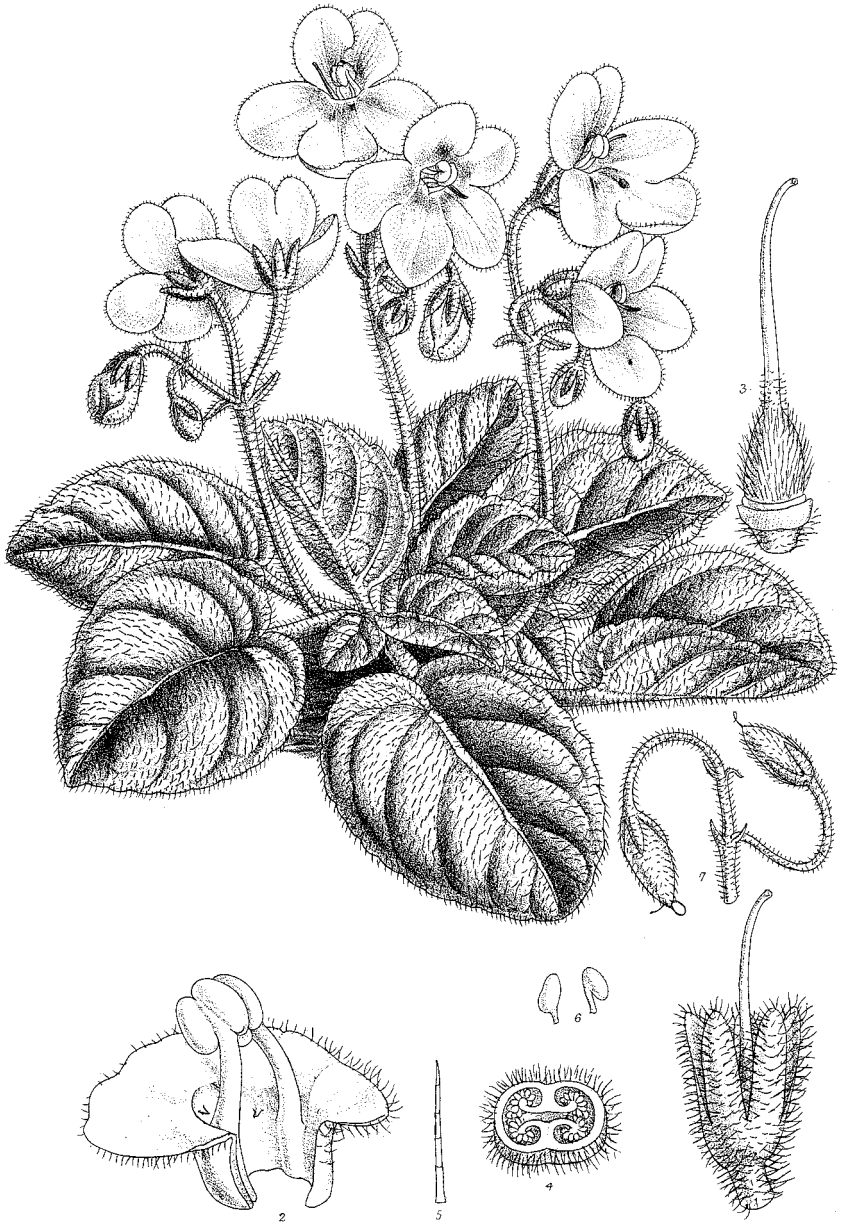
### INTRODUCTION

This paper is a preliminary assessment of the conservation status of *Saintpaulia* H. Wendl. in both the wild and in cultivation. The genus *Saintpaulia* has been promoted as a botanical 'panda' symbolizing the decline of the tropical moist forests, particularly the Eastern Arc mountains of East Africa. In spite of this and its familiarity through usage as a house plant there has been no recent review of the conservation needs of the genus. This paper represents an initial attempt to review the status of the genus and makes general recommendations on future conservation activities. The authors have collated and reviewed all the available current information on the genus *Saintpaulia* from literature, botanic garden databases, and the authors' own field experience. Using the above information they have assigned an IUCN Category of Threat (IUCN, 1994) to each *Saintpaulia* species. This initial study highlights the current threats to saintpaulias in the wild, addresses some of the taxonomic problems that are in need of further research and makes recommendations for their conservation. The authors hope that the article will instigate further research, and promote collaboration between conservation organizations, governments and the horticultural industry.

### INTRODUCTION INTO CULTIVATION AND HORTICULTURAL IMPORTANCE

It is sadly ironic that just over a century after the discovery of the AFRICAN VIOLET (*Saintpaulia*), the plant, in the form of horticultural cultivars, is spread through homes and offices all over the world, yet some of the wild species are on the brink of extinction in Tanzania and Kenya.

African violets were collected for the first time in 1884 by Sir John Kirk on the East African coast 'opposite Zanzibar' and in 1887 by the Rev W.E. Taylor in the 'Giryama and Tsimba Mountains' in Kenya. Baron Adalbert Emil Walter Radcliffe von Saint Paul-Illaire



**Saintpaulia ionantha.** Reproduced from *Curtis's Botanical Magazine* 121: t. 7408 (1895) by Matilda Smith.

(1860–1940), the then district governor of Tanga, German East Africa, found *Saintpaulia* in 1892 at two localities, one on limestone rocks near Tanga the other in forest in the Usambara mountains (Roberts, 1952). Seed was sent to his father in Germany, a keen horticulturist, who grew the plant and brought it to the attention of Hermann Wendland, the director of the Royal Botanic Garden at Herrenhausen. Wendland described the new plant as *Saintpaulia ionantha* (see p. 50), *Saintpaulia* in honour of its discoverer and *ionantha* meaning violet flowers (Wendland, 1893).

Wendland thought that the introduction consisted of one species, *S. ionantha*. However, a grower at the Ernest Benary nursery noticed that some plants produced seed capsules that were long and slender, whilst others had rounded capsules. The plants with the rounded capsules kept the name *S. ionantha*, but the ones with the long fruits were appropriately named *S. confusa*.

During that same year some of the plants were displayed at the International Horticultural Exhibition in Ghent. Within two years after the first flowering, African violets featured in no less than 5 first-class horticultural periodicals and spread rapidly through horticultural collections in Europe. The Los Angeles based nursery, Armacost and Royston, obtained seed from Europe in 1927 and established the commercial value of *Saintpaulia* as a house plant. From the seedlings they selected 10 individual cultivars. These first cultivars were released in 1936 and were named: ‘Admiral’; ‘Amethyst’; ‘Blue Boy’; ‘Commodore’; ‘Mermaid’; ‘Neptune’; ‘Norseman’; ‘Number 32’; ‘Sailor Boy’ and ‘Viking’; some of them are still popular today (Moore, 1957). While these original cultivars were only blue/purple, nowadays, as a result of intensive breeding and selection, a wide range of colours and forms are available. Some would argue that few of these cultivars represent any advance on the wild forms. Today the revenue from retail sales of *Saintpaulia* is worth millions of U.S. dollars to the horticultural industries in Europe and the USA. In 1994 alone the revenue from the sale of *Saintpaulia* by commercial growers in the USA was worth \$27,863,000 (USDA, 1995).

The role of the wild species in improving the existing cultivars should not be underestimated. For example, a whole new line of ‘trailer’ cultivars was created in the early 1950s when Frank and Anne Tinari of Philadelphia used *Saintpaulia grottei*, a caulescent species, in their hybridization programme. The taste for novelties in

horticulture will not diminish and there will always be an interest in obtaining wild breeding materials.

#### TAXONOMY

There are 20 species of *Saintpaulia* (Gesneriaceae) so far classified (Burt, 1958, 1964) although another species, *S. mafiensis*, has been recognized (Baatvik, 1993). The genus is restricted to East Africa, in Tanzania and Kenya where 19 and 2 species occur respectively. For a detailed review of *Saintpaulia* taxonomy and morphology refer to Baatvik (1993).

Following the original introduction of *S. ionantha* and *S. confusa* in 1892 by Baron Saint Paul other species were progressively introduced by plant collectors such as W. Götze and R.E. & W. Moreau. Burt (1958) published a comprehensive revision of the genus which then comprised 19 species. Six years later additional notes were added to the revision (Burt, 1964); *S. amaniensis* was reduced to a synonym of *S. magungensis* (see colour plate opposite), *S. brevipilosa* and *S. rupicola* were added to the list, as were varieties of *S. magungensis*, *S. orbicularis*, and *S. pendula*. Burt used two major characteristics to classify the species: habit (either rosulate or caulescent) and the nature, posture and distribution of leaf hairs on the leaf indumentum. A list of currently recognized species and varieties is given in Table 1.

In more recent years new populations of *Saintpaulia* showing distinct morphological features from those already described in Burt's classification have been found. There has been much discussion surrounding these new discoveries, with suggestions that they represent undescribed taxa. In Kenya two populations have been distinguished from the other two Kenyan species, *S. teitensis* and *S. rupicola*, already described by Burt. Currently these are known as *S. sp. nov.* 'Kacharoroni' and *S. sp. nov.* 'Mwachi'. In Tanzania similar discussions have arisen with the discovery of possible new taxa such as *S.* 'Sigi Falls'. Reports from Manktelow (Manktelow, 1996 pers. comm.) also indicate that there are *Saintpaulia* taxa in the Nguru Mountains that do not appear to fit into the existing classification by Burt.

The intraspecific variation present in *Saintpaulia* has not been examined in any species yet. However, a considerable amount of variation in leaf form and flower colour has been observed in the population *S. ionantha* at the Amboni caves. The revision of *Saint-*



*Saintpaulia magungensis* from Mt Mlinga, East Usumburus, Tanzania.  
Painted by Reinhild Raistrick.

*paulia* by Burtt was based on the analysis and description of only a few specimens and in some cases only one was used (Burtt, 1992 pers. comm.). Ongoing taxonomic revisions of the genus using a larger number of specimens and molecular techniques may therefore result in fewer species being recognized (Simiyu, 1996 pers. comm.); there is an urgent need for a revision of the genus.

#### DISTRIBUTION AND ECOLOGY

The majority of the taxa occur in submontane forest in the Eastern Arc mountains, a range of mountains sweeping from the Taita Hills in southern Kenya to the Udzungwa mountains in Tanzania. In addition, some species like *S. ionantha* grow at low altitudes on the coastal plains of Tanzania and Kenya. Individual species are restricted in their distribution, many endemic to one mountain or particular region. The restricted distribution of some *Saintpaulia* species may however be a reflection of the paucity of field surveys. The centre of their distribution is in the Usambara mountains (Mather, 1989) where 11 of the species occur. The *Saintpaulia* species of the Eastern Arc Mountains are usually found growing in well shaded submontane rain forest, on rocks or steep cliffs near to rivers or streams. They have also been observed growing in leaf litter and on tree trunks. Those species found on the coastal plains of Tanzania and Kenya are usually confined to limestone outcrops in remnant evergreen coastal forests or on steep limestone gorges alongside rivers, usually in the shade provided by overhanging trees.

#### STATUS IN THE WILD AND CURRENT THREATS

The greatest threat to members of the genus *Saintpaulia* is habitat loss or degradation. An inventory of the East Usambara Mts, the centre of diversity of *Saintpaulia*, revealed that 231 km<sup>2</sup> or 58% of original tropical forest remain above 600 m (Newmark, 1993). In the lowlands the story is more distressing, with only 15% of the coastal forest remaining. The remaining populations of *Saintpaulia* in the Usambara Mts are primarily restricted to areas of natural forest, mainly in forest reserves. In the Usambara Mts many of the *Saintpaulia* species are known from only a few fragmented populations which, coupled with their restricted distribution, gives them a Critically Endangered status (*sensu* IUCN, refer to Box 1 and 2, and to Table 1).

Box 1: ***Saintpaulia tongwensis*** (see colour plate opposite p. 64).

IUCN Category of Threat: Critically Endangered

Distribution: Endemic to Tanzania (Mt. Tongwe,  
Pangani Falls, and Genda-Genda forest)

Until recently herbarium specimens and field data relating to collections suggested that the distribution of this species was restricted to Mount Tongwe. Roberts (1952) noted that '*S. tongwensis* is restricted to a ledge of gneiss 50 yards long on the summit of Mt Tongwe'. A further 2 locations at Pangani Falls and the Genda-Genda Forest have been found by the Frontier-Tanzania Coastal Forest Research Programme (Clarke, 1998). In February of 1995 a translocation programme was conducted on a population of *S. tongwensis* at Pangani Falls. The population was considered threatened by the ongoing Pangani Falls hydroelectric project. Half of the population was translocated to 4 other sites whilst the other half was left within the Pangani forest (Kapuya, 1995). The IUCN/SSC Reintroduction Specialist Group have recommended that those plants translocated to sites on the Mkulumuzi and Sigi rivers are removed. This is because other populations of *Saintpaulia* are known to exist in the area and there may be a risk of hybridization between them and subsequent loss of genetic integrity. (Simiyu, 1995).

Box 2: ***Saintpaulia difficilis***

IUCN Category of Threat: Vulnerable

Distribution: Endemic to Tanzania (East Usambaras)

Four sites in the headwaters of the Sigi river, at about 900–1050 m above sea level, were described by Burt (1958). Several more sites in this area have been discovered recently, including some in the Mnyuzi and Kwamkoro Forest Reserves. The sites are in dense, humid forest. The populations are found near the tops of rocky ridges in leaf litter and on tree trunks. At another site in Amani many plants have characteristics tending towards *S. confusa*, the long hairs being more appressed than in typical *S. difficilis* populations. The similarity between these 2 species, found in the north and west of Amani, is reflected in the epithet used by Burt when naming the species.

The majority of the deforestation in the Usambara Mts and the lowlands around Tanga has occurred in this century. During the German and British colonial eras plantations of coffee and tea were planted in submontane forest areas. In the lowlands sisal and rubber



were planted extensively. Following Tanzanian independence in 1961 there was a move towards the immediate utilization of natural resources in the East Usambaras (Hamilton, 1994). This included timber extraction, cardamom cultivation and subsistence agriculture. Although areas of forest have been gazetted as forest reserves their conservation status was low and they were exploited both legally and illegally. The potential loss of biodiversity for an area renowned for its high species-richness and endemism (Rodgers & Homewood, 1982) caused national and international concern. In response, a number of collaborative projects have been initiated, especially in the East Usambara, to manage the forest reserves more sustainably (Davis *et al.*, 1994) and conduct inventories (Hamilton & Bensted-Smith, 1989). The Tanzanian government has imposed more stringent controls on forest exploitation, resulting in the cessation of mechanical logging and illegal pitsawing. In 1997 the Government of Tanzania gazetted the Amani Nature Reserve with a total area of 8,380 hectares. With this vital addition to the region's portfolio of protected areas approximately 75% of the surviving forest in the East Usambara is now legally protected. Since the 1980s the major cause of forest degradation and loss has been small scale agriculture. This still continues to be a threat outside the Forest Reserves.

Very little is currently known on the status of *Saintpaulia* in the Nguru and Uluguru mountains. According to Manktelow (pers. comm., 1996) *saintpaulias* are relatively common in the forests of the Nguru mountains. The *Saintpaulia* taxa collected during a recent collecting mission by the University of Stockholm await verification. Those species known to occur in the Nguru and Uluguru mountains have been assigned Data Deficient until more information is received (see Table 1).

Agricultural encroachment poses a severe threat to the two described Kenyan species, *S. teitensis*, and *S. rupicola* (Box 3) as well as the *Saintpaulia* population (Box 4) not yet described. Cultivation and tree felling near to Kenyan *Saintpaulia* populations reduces the tree cover and hence exposes the plants to desiccation. All the Kenyan *Saintpaulia* are Critically Endangered due to their limited distribution (see Table 1) and ongoing habitat degradation; for example there is only one population of *S. teitensis* surviving in less than 2.5 km square of forest.

The over-collection of *Saintpaulia* for the specialist horticultural

**Box 3: *Saintpaulia rupicola***

IUCN Category of Threat: Critically Endangered

Distribution: Endemic to Kenya (Cha Simba and Mwarakaya)

The distribution of *S. rupicola* is restricted to two populations, one at Cha Simba and the other at Mwarakaya. Both are growing on limestone outcrops in coastal forest. There are an estimated number of 100 individuals in each population. One of the essential habitat requirements of the species and the genus as a whole is the presence of shade. The major threat to the populations is tree felling, particularly at Mwarakaya, which exposes the plants to direct sunlight. The populations are severely fragmented and there is a continuous decline in both the area and quality of habitat. Felling and agricultural encroachment poses a serious threat to *S. rupicola* and the surrounding coastal forest in the future. The NMK/WWF Coastal Forest Survey (1993) recommended that the site should be given legal protection and would like to see the sites gazetted.

trade can have serious consequences on the status of already diminished populations. Reports by Hamilton and Mwashia (1989) suggest that some professional botanists and dealers have collected large quantities of *Saintpaulia* from the Usambaras.

**Box 4: *Saintpaulia* sp. nov. 'Kacharoroni'**

IUCN Category of Threat: Critically Endangered

Distribution: Endemic to Kenya, south coastal region

In 1987 the late Mrs Sylvia Mather, a dedicated grower and collector of *Saintpaulia* species and their hybrids, acquired a new plant from Kacharoroni in the Kilifi area in Kenya. The plant did not resemble any other species in her collection. The collection site was visited in 1988 by the NMK/WWF Coast Forest Survey. The population of this undescribed taxon is both small and severely threatened. The site has no formal protection and during a recent visit (1996) it was observed that trees in the area had been felled and burnt. This plant has generated a lot of interest due to its large stature and hence potential use as breeding material for new cultivars.

**STATUS IN CULTIVATION**

Reviewed at a taxonomic level, namely, the number of listed species cultivated *ex situ*, the genus *Saintpaulia* appears to be well represented

in botanic gardens and private collections. For example, the Royal Botanic Gardens, Kew, has 15 of the 20 known species in its collection (Eastwood & Maunder, 1995). Table 1 below gives a list of the botanic gardens and private growers that are known to have important collections of wild *Saintpaulia*. The Plant Conservation and Propagation Unit, National Museums of Kenya, cultivates a representative collection of Kenyan *Saintpaulia* as well as the extensive collection of the late Sylva Mather. With a few exceptions, notably the Plant Conservation and Propagation Unit, species in botanic gardens are often represented by a single accession, composed of clonal duplicates. The actual genetic diversity being conserved *ex situ* is narrow and not representative of the wild populations. Many botanic gardens distribute duplicates of their accessions as a security measure against accidental loss. The collection of the late Sylva Mather at the Plant Conservation and Propagation Unit, National Museums of Kenya, is duplicated at the Royal Botanic Gardens, Kew, the Royal Botanic Garden, Edinburgh and in a number of private collections. Accordingly there is a high level of clonal duplication between collections. In addition it is evident that accessions within botanic garden collections are frequently wrongly named, with vigorous taxa steadily overtaking the more delicate species. The lists of cultivated taxa provide a false indication of the actual diversity being conserved *ex situ*. The Uppsala Botanic Garden in Sweden has a good collection of primarily Tanzanian species. In recent years a collection of Tanzanian *Saintpaulia* has also been established in Tanzania with the plants currently in the care of a member of the Dar-es-Salaam Botanical Garden Committee. It is hoped that the plants will be transferred to the Dar-es-Salaam Botanic Garden when facilities become available. Duplicates of some species are also at the Amani Botanical Garden. The botanic garden in Amani is undergoing rehabilitation and it is hoped that the required horticultural facilities will be soon established.

#### RECOMMENDATIONS FOR CONSERVATION AND RESEARCH

The genus has been cited frequently as both a regional and international conservation priority, for instance in Polhill (1968), Syngé (1986), Stuart and Adams (1990), Sayer *et al.*, (1992) and Davis *et al.*, (1994). Although it is threatened directly by some illegal collecting, the fundamental priority must lie with the establishment

of viable protected areas in Kenya and Tanzania. In Kenya, only one of the *Saintpaulia* sites is in a Forest Reserve. Until recently the population in the Mwache Forest Reserve, which may represent an undescribed species, was threatened by quarrying for limestone. One of the recommendations made by the Coastal Forest Survey (NMK/WWF, 1993) was to gazette the remaining *Saintpaulia* sites as National Monuments and therefore give them legal protection; this would require support from the local communities and politicians to ensure success. The position in Tanzania is improving and the populations of a number of taxa are now included within new forest and nature reserves; for instance, *S. difficilis* within the newly established Amani Nature Reserve, *S. grandifolia* within the newly gazetted Nilo Forest Reserve and *S. grotei* within the Mlinga Mountain Forest Reserve (Johansson, 1996 pers. comm.). There is a need for field surveys in Tanzania to obtain more accurate data on the ranges and population sizes of species. A detailed review is required to ascertain the distribution of populations and the extent to which the existing protected area networks protect species.

It is likely that some of the populations have been reduced to the point where they are no longer secure or viable in the long term. In these circumstances an integrated strategy is required, linking *in situ* management of target populations with *ex situ* cultivation and storage (seed-banking). As a matter of priority the *ex situ* management should take place in the countries of origin; however, the northern botanic gardens and horticultural industry could play a very significant role in releasing both funds and technical expertise to support this urgently required work. Finances are required to upgrade the horticultural facilities at both the Amani and Dar-es-Salaam botanic gardens. It is strongly recommended that cultivated stocks from European botanic garden collections, subject to hybridization and possible pathogen accumulation, are not repatriated.

The Plant Conservation and Propagation Unit, National Museums of Kenya, has the necessary facilities and expertise in the *ex situ* conservation of *Saintpaulia*. The Unit, if supported by the proposed coastal botanic garden, could hold a duplicate collection and act as a facility for field studies and research, not only of *Saintpaulia* but of other threatened taxa found in the coastal forests (Maunder & Göhler, 1996). The Amani Botanical Garden in the Usambara Mts is the preferred locality for the establishment of *ex situ*

**Table 1:** A list of all currently known *Saintpaulia* species with details on their distribution, IUCN Category of Threat and current *ex situ* cultivation.

SPECIES	DISTRIBUTION	IUCN CAT.	EX SITU CULTIVATION
<i>S. brevopilosa</i> Burt	Nguru Mts, Tanzania	DD	UUBG, RBGE, RBGK, PCPU, BB
<i>S. confusa</i> Burt	E & W Usambara & Nguru Mts, Tanzania	VU (D: 2)	UUBG, RBGE, RBGK, PCPU, UTBG, BUBG, BB, DSBG, ABG, UBBG
<i>S. difficilis</i> Burt	E Usambara Mts, Tanzania	VU (D: 2)	UUBG, RBGE, RBGK, PCPU, BB, DSBG, ABG
<i>S. diplotricha</i> Burt	E Usambara Mt & coast plain, Tanga, Tanzania	VU (D: 2)	UUBG, RBGE, RBGK, PCPU, BB, DSBG, ABG, UBBG
<i>S. goetzeana</i> Engl.	Uluguru Mts, Tanzania	DD	
<i>S. grandifolia</i> Burt	W Usambara Mts, Tanzania	CR (B: 1 & 2)	UUBG, RBGE, RBGK, PCPU, BB, DSBG, ABG, UBBG
<i>S. grotei</i> Engl.	E Usambara Mts, Tanzania	DD	UUBG, RBGE, RBGK, PCPU, BB
<i>S. inconspicua</i> Burt	Uluguru Mts, Tanzania	DD	
<i>S. intermedia</i> Burt	E Usambara Mts, Tanzania	CR (B: 1 & 2)	UUBG, RBGE, RBGK, UBBG
<i>S. ionantha</i> H. Wendl.	Coastal plain, Tanga, Tanzania	CR (B: 1 & 2)	UUBG, RBGE, RBGK, PCPU, BB, AR, DSBG, ABG, UBBG
<i>S. magungensis</i> E. Roberts v. <i>magung.</i>	E Usambara Mts, Tanzania	CR (B: 1 & 2)	UUBG, RBGE, RBGK, PCPU, BB, DSBG, ABG
<i>S. magungensis</i> v. <i>minima</i> Burt	E Usambara Mts, Tanzania	CR (B: 1 & 2)	UUBG, RBGE, RBGK
<i>S. magungensis</i> v. <i>occidentalis</i> Burt	W Usambara Mts, Tanzania	CR (B: 1 & 2)	RBGE, RBGK, PCPU, BB
<i>S. nitida</i> Burt	Nguru Mts, Tanzania	DD	RBGE, RBGK, PCPU, BB
<i>S. orbicularis</i> Burt var. <i>orbicularis</i>	W. Usambara Mts, Tanzania	CR (B: 1 & 2)	RBGE, RBGK, PCPU, BB, UBBG
<i>S. orbicularis</i> v. <i>purpurea</i> Burt	W Usambara Mts, Tanzania	DD	UUBG, RBGE
<i>S. pendula</i> Burt v. <i>pendula</i>	E Usambara Mts, Tanzania	DD	UUBG, RBGE, UBBG
<i>S. pendula</i> v. <i>kizarae</i> Burt	E Usambara Mts, Tanzania	CR (B: 1 & 2)	UUBG, RBGE
<i>S. pusilla</i> Engl.	Uluguru Mts, Tanzania	DD	
<i>S. rupicola</i> Burt	Southern coastal plain, Kenya	CR (B: 1 & 2)	UUBG, RBGE, PCPU, BB, AR, UBBG
<i>S. shumensis</i> Burt	E & W Usambara Mts, Tanzania	DD	UUBG, RBGE, RBGK, BB, UBBG
<i>S. teitensis</i> Burt	Taita Hills, Kenya	CR (B: 1 & 2)	PCPU, BB
<i>S. tongwensis</i> Burt	Mt Tongwe, Pangani Falls, Genda-Genda forest, Tanz.	CR (B: 1 & 2)	UUBG, RBGE, RBGK, PCPU, BB, AR, DSBG, ABG, UBBG
<i>S. velutina</i> Burt	E & W Usambara Mts, Tanzania	CR (B: 1 & 2)	UUBG, RBGE, RBGK, DSBG, ABG, UBBG
<i>S. sp. nov.</i> 'Kacharoroni'	Southern coastal plain, Kenya	CR (B: 1 & 2)	RBGK, PCPU, BB, AR
<i>S. sp. nov.</i> 'Mwachi'	Southern coastal plain, Kenya	CR (B: 1 & 2)	RBGK, PCPU, BB, AR
<i>S. sp. nov.</i> 'Mafiensis'	Mafi Hill, Tanzania	CR (B: 1 & 2)	UUBG, RBGE (?)
<i>S. sp. nov.</i> 'Sigi Falls'	Sigi River, Tanzania	CR (B: 1 & 2)	RBGK, PCPU, BB, AR

DD = Data Deficient; VU = Vulnerable; CR = Critical. (sensu IUCN, 1994).

UUBG = University of Uppsala Botanic Garden; RBGE = Royal Botanic Garden, Edinburgh; RBGK = Royal Botanic Gardens, Kew; PCPU = Plant Conservation and Propagation Unit, NMK, Nairobi; BB = Private collection of Benny Bytebier; AR = Private collection of Ann Robertson; DSBG = Dar-es-Salaam Botanical Gardens; ABG = Amani Botanic Gardens; UBBG = University of Basel Botanic Garden.

conservation facilities for a *Saintpaulia* collection in Tanzania. The climatic conditions at Dar-es-Salaam Botanic Garden are not suitable for some of the montane species. An exchange of information, collections and expertise between the Plant Conservation and Propagation Unit and the Amani Botanic Garden is strongly recommended. In order to increase the genetic diversity of *ex situ* collections of Tanzanian and Kenyan taxa it is recommended that seed collections are made in a systematic manner in conjunction with field surveys.

It could be argued that the conservation of *Saintpaulia* is a low priority in two countries with considerable competition for the use of scarce conservation funds. However, populations of *Saintpaulia* occur in threatened forests of internationally significant diversity (Iversen, 1991). The genus *Saintpaulia* is a classic example of an East African natural resource that has been developed commercially in Europe and North America. No financial return from this multi-million dollar trade has been made to the countries or areas of origin. The Convention on Biological Diversity (Glowka *et al.*, 1994) places emphasis on *in situ* conservation in the countries of origin. Opportunities should be made to link the commercial African violet industry to the needs of *in situ* conservation.

The conservation of *Saintpaulia* will be fundamentally dependent on the establishment of an adequate series of reserves; a number of species will require *ex situ* support from regional plant conservation facilities. To guide this work, a thorough understanding of the taxonomy and population genetics of the genus is required, so the ongoing studies at the National Museums of Kenya and the universities of Nairobi and Copenhagen are timely in this respect. It is hoped that the *Saintpaulia* has a future as a forest plant and not only on the window shelves of Europe.

#### REFERENCES

- Baatvik, S.T. (1993). The genus *Saintpaulia* (Gesneriaceae) 100 years: History, taxonomy, ecology, distribution and conservation. *Fragmenta Floristica et Geobotanica Supplementum* 2, part 1: 97–112.
- Burt, B.L. (1958). Studies in the Gesneriaceae of the Old World. XV: The genus *Saintpaulia*. *Notes from the Royal Botanic Garden, Edinburgh*. 22. 547–568.
- Burt, B.L. (1964). Studies in the Gesneriaceae of the Old World. XXV: Additional notes on *Saintpaulia*. *Notes from the Royal Botanic Garden, Edinburgh*. 25. 191–196.

- Davis, S.D., Heywood, V.H.H. & Hamilton, A.C. (1994). *Centres of Plant Diversity*. Vol. 1. *Europe, Africa, South-west Asia and the Middle East*. WWF/IUCN, Gland.
- Clarke, G.P. (1998). Plants in Peril, 24: Notes on lowland African Violets (*Saintpaulia*) in the wild. *Curtis's Botanical Magazine* 15, 1: 00–00.
- Eastwood, A. & Maunder, M. (1995). A Conservation Assessment of *Saintpaulia* taxa cultivated within the Living Collections, Royal Botanic Gardens, Kew. *Species Assessment Report* No. 2. Unpublished RBG Kew, UK.
- Glowka, L. et al., (1994). *A Guide to the Convention on Biological Diversity*. IUCN, Gland and Cambridge.
- Hamilton, A.C. and Bensted-Smith, R. (eds.) (1989). *Forest Conservation in the East Usambara Mountains, Tanzania*. IUCN, Gland and Cambridge.
- Hamilton, A.C. and Mwashia, I. (1989). In Hamilton, A.C. & Bensted-Smith, R. (eds.). *Forest Conservation in the East Usambara Mountains, Tanzania*. IUCN, Gland and Cambridge.
- Hamilton, A.C. (1994). East Usambara Mountains, Tanzania. In Davis, S.D. et al. (eds.), *Centres of Plant Diversity; A Guide and Strategy for their Conservation* 1: 248–251. WWF/IUCN, Gland.
- IUCN (1994). *IUCN Red List Categories*. IUCN Species Survival Commission, Gland.
- Iversen, S.T. (1991). The Usambara Mountains, NE Tanzania: Phytogeography of the vascular plant flora. *Acta Universitatis Upsaliensis Symbolae Botanicae Upsaliensis* XXIX: 3.
- Kapuya, J.A. (1995). *Salvage of the African violet (Saintpaulia tongwensis) community at Pangani Falls*. Unpublished report, University of Dar-es-Salaam.
- Mather, S. (1989). *Saintpaulia*. In Hamilton, A.C. & Bensted-Smith, R. (eds.), *Forest Conservation in the East Usambara Mountains, Tanzania*: 181–184. IUCN, Gland and Cambridge.
- Maunder, M. & Göhler, C. (1996). *Feasibility study for the development of a National Plant Conservation Network*. Report produced for the National Museums of Kenya under assignment from the ODA. Unpublished document, Conservation Projects Development Unit, RBG Kew.
- Newmark, W.D. (1993). The role and design of wildlife corridors with examples from Tanzania. *Ambio* 22: 500–504.
- NMK/WWF (1993). *Report of the NMK/WWF Coast Forest Survey*. National Museums of Kenya, Nairobi.
- Moore, H.E. (1957). *African Violets, Gloxinias and their relatives*. Macmillan, New York.
- Polhill, R.M. (1968). Tanzania. In Hedberg, I. & O. (eds.), *Conservation of vegetation in Africa south of the Sahara*. *Acta Phytogeographica Suecica* 54: 166–178.
- Roberts, E.P. (1952). A key to the genus *Saintpaulia*. *African Violet Magazine*. 6(24).
- Rodgers, W.A. & Homewood, K.M. (1982). Species richness and endemism in the Usambara mountain forests, Tanzania. *Biological Journal of the Linnean Society*. 18: 197–242.

- Sayer, J.A., Harcourt, C.S. & Collins, N.M. (eds.) (1992). *The Conservation Atlas of Tropical Forests, Africa*: 153. IUCN/Macmillan, Basingstoke.
- Simiyu, S.W. (1995). When *not* to translocate: the case of the African violet, Tanzania. *Re-introduction News* 11: 13.
- Synge, H. (ed.) (1986). IUCN/WWF Plants Programme. Upland Tanzania. *Threatened Plants Newsletter* No. 16: 9. IUCN/Threatened Plant Unit, Royal Botanic Gardens, Kew.
- Stuart, S. & Adams, R.J. (1990). *Biodiversity in sub-Saharan Africa and its Islands*. IUCN, Gland.
- USDA (1995). *1994 Floriculture Crops Summary*. USDA.
- Wendland, H. (1893). *Saintpaulia ionantha*. *Gartenflora* 42(11): 321–324, t. 1391.