



In collaboration with:



In-situ & ex-situ Conservation Plan for Brachycorythis conica subsp. transvaalensis

**A PROJECT PROPOSAL BY WILD ORCHIDS SOUTHERN AFRICA (WOSA¹) IN
COLLABORATION WITH THE WALTER SISULU NATIONAL BOTANICAL GARDEN
(WSNGB²).**



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Acronyms used:

MSB - Millenium Seed Bank
TSP - Threatened Species Program
GDARD – Gauteng Department of Agriculture and Rural Development
WOSA – Wild Orchids Southern Africa
WSNGB – Walter Sisulu National Botanical Garden
SANBI – South African National Biodiversity Institute
RBG Kew – Royal Botanic Garden - Kew United Kingdom

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INTRODUCTION:

WOSA is a sub-committee of the Witwatersrand Orchid Society concerned with the conservation of South Africa's naturally occurring diversity of orchid species. Walter Sisulu National Botanical Garden (WSNBG) is a national conservation garden under the South African National Biodiversity Institute. These two organs have come together in collaboration to promote the sustainability and conservation of the species in question and the habitat that supports it.

This specific document does not contain detailed location data of the species.



Fig. 1.1: *Brachycorythis conica* ssp. *transvaalensis*

Photos: J.K. Welwitch

Interest in the conservation of *Brachycorythis conica* subsp. *transvaalensis* (Figure 1.1) originated in 2007 when the species was re-discovered on municipal and private land adjacent to the WSNBG nature reserve (Hankey, 2013). The species was first recorded on this site in 1956 by J.P.H. Acocks during his extensive field work which covered vast areas of South Africa. Subsequently the species went largely unnoticed for many years, the rediscovery of the species at the same site in 2007 sparked alarms for conservationists as the species was slipping close to extinction with little known about its population biology. In 2010 a collaborative field excursion was conducted by several departments of SANBI (WSNBG; MSB; TSP) as well as GDARD to study historical localities, to assess whether the species was still extant at any of the historical Gauteng based localities. As a result of that field work it was concluded that the Krugersdorp population remained as the only known viable population in existence

(von Staden et.al. 2010). All of the historical sites visited where the species was recorded had subsequently been developed or altered during the rapid expansion of Johannesburg and Pretoria which had resulted in the local extirpation of the species.

The project proposal which follows is developed in an effort to address the pending threats to the species and introduce efforts to save the species from extinction.

BACKGROUND:

The species was first recorded in 1918 and named in 1955 by Summerhayes from a TYPE locality in the Pretoria district (Table 1). The species was recorded in the National Herbarium in Pretoria from 16 specimens. Until its re-discovery in 2007 at the Krugersdorp locality, the species was last recorded in Gauteng in 1956. It was subsequently recorded from solitary individuals in Limpopo province as recently as 1991. All indications are that this is the most threatened plant species in the Gauteng Province with less than 120 individuals remaining; the remaining population is faced with significant threats which are elucidated below.

THE SPECIES:

Brachycorythis conica ssp. *transvaalensis* must be the most magnificent and yet also most threatened of the *Brachycorythis* subspecies. The other two subspecies *Brachycorythis conica* ssp. *conica* and *Brachycorythis conica* ssp. *longilabris* are found in Tropical Africa.

The subspecies *Brachycorythis conica* ssp. *transvaalensis* is endemic to the Highveld with a distribution mainly in Gauteng. The species is listed as **Endangered (EN A2c)** in the Red List of South African Plants (Annexure 1). Plants have been recorded near Middelburg and Roosenekal in Mpumalanga and few in Limpopo, although most of these records are of solitary or very few individuals. This orchid is also one of the larger of its kind which makes a first view of it quite regal. Even the flowers themselves are quite grand in size. This species flowers from January to April. J.K. Welwitch recently noted the possible pollinator of the orchid, which was a medium sized, greyish coloured bee approaching the flowers (J.K. Welwitch pers. comm.). Other orchids growing in the nearby vicinity are *Disa patula* var. *transvaalensis*, *Habenaria nyikana*, *H. caffra*, *H. epipactidea*, *H. dregeana*, *H. schimperiana*, *Holothrix randii*, *Eulophia clitellifera*, *E. clavicornis*, *E. ovalis* subsp. *bainesii*, *Bonatea antennifera*, *Disperis micrantha*.

1. IMPENDING THREATS TO THE HABITAT

1.1. DEVELOPMENT

The western sub-section of the habitat of the species which was counted by Hankey & von Staden in (2010) yielded 68 individuals. This sub-population is characterised by wooded *Protea caffra* grassland, the *Brachycorythis* in these areas are typically widely scattered individuals over a large area.

This western section is currently under a development application for a 150ha housing and commercial development. This application is in the advanced stages and currently the EIA application has been submitted to the provincial authority for record of decision on environmental authorisation. This area is largely comprised of pristine *Protea caffra* wooded grassland.

The eastern sub-section of the population which was counted by (Hankey & Mills 2014) numbered 30 individuals. This area is earmarked for housing, although formal application has not yet been initiated.

The entire Roodepoort/ Krugersdorp ridge system is listed as a critically endangered ecosystem: Roodepoort Reef Mountain Bushveld (GP8) (Threatened terrestrial ecosystems for South Africa (2011)).

The vegetation type in this area is recorded as Gold Reef Mountain Bushveld (SVcb) (Mucina & Rutherford 2006).

1.2. HABITAT LOSS

Most urbanisation between Pretoria, Krugersdorp and Johannesburg has eliminated this species where it once occurred. Comments by Douglas McMurtry (orchid expert & author) states that searches for the species in historical areas over many years have failed to locate any historical populations von Staden et.al. (2010), this considered with Raimondo et. al. (2013) currently indicates that the Krugersdorp meta-population represents the last known extant and viable population of the species on earth.

1.3. DESTRUCTION OF HABITAT BY OFF-ROADERS AND EROSION:

The only plants currently in a stable population are threatened by immediate development are in an area west of Johannesburg. In addition to development, the population is in immediate danger of being detrimentally affected and possibly eliminated by uncontrolled off-road vehicles in the form of 4x4 vehicles, scramblers and quad bikes illegally accessing the area in which the plants grow. Tracks left by the illegal access and misuse of off-road vehicles quickly erode and ultimately result in gullies, dongas up to 1.8m deep, as well as surface erosion and deposition which in turn creates preferred habitat for invasive and weeds (Figure. 1.2, 1.3 & 1.4). Deep incisions into the base of the topology could potentially have an adverse effect on the soil hydrology of the valley causing rapid or altered desiccation patterns, which could potentially have a negative effect on the orchid population biology. Furthermore when a track is no longer negotiable a second track is started next to the original one.

Currently three tracks side by side with two seriously eroded pass close to the orchid colony within 2-3m (Figure 1.4.). The next track that will potentially be cut into the area is likely to traverse directly over some of the plants in the sub-population; the resulting erosion could potentially destroy entirely, or parts of, the local chain which supports the species.



Figure. 1.2: Off-road motor bikes and recreational quad bikes driving illegally in the area around the colony of *Brachycorythis conica* ssp. *transvaalensis*

Photos: K.H.K. Wodrich



Figure. 1.3: Serious erosion of ground near the population of *Brachycorythis conica* ssp. *transvaalensis* as a direct result of recreational vehicle activity in the area

Photo: P.R. Wodrich (left) K.H.K. Wodrich (right)



Fig. 1.4: Typical progression of erosion. Far left the original tracks – now eroded to a depth of up to 1.8m in places. Centre – secondary tracks – used until erosion no longer allows the tracks to be driven on. Right – current tracks

Photo: K.H.K. Wodrich

efforts to curb its spread. The above mentioned three species of alien plant invaders are of particular concern in this area.

1.4. INVASIVE ALIEN PLANTS

In addition to the other threats already imposed or potentially imposed on the habitat. The already reduced pristine natural grassland which remains is subject to colonisation by invasive alien plants. This colonisation by alien plant species is compounded by the increased soil disturbance caused by off road vehicles which is often the preferred habitat for colonisation by alien plants and acts as a conduit for invasive species to penetrate formerly un-colonised areas. Mogale City local municipality have made significant progress on the clearing of Black wattle (*Acacia mearnsii*) and Silver wattle (*Acacia dealbata*) in the immediate surrounds. However the ever increasing stands of Pompom weed (*Campilochloa macrocephala*) are rapidly increasing with no apparent



Fig. 1.5: Black Wattle (left) and Pompom weed (right).

Photo: K.H.K. Wodrich (left), SANBI (right)



Fig. 1.6: Digging activity of porcupines within the population of *Brachycorythis* should normally be sustainable under natural processes.

Photo: K.H.K. Wodrich

together with the old tuber and the roots. The replacement tuber remains in the ground and sprouts a new growth once the weather warms up in the following spring and the rains start. This mechanism of growth is an adaptation to ensure that the plants are able to survive through the harsh Highveld winters that are often associated with frost as well as fire. It is for this reason that no epiphytic or tree-growing orchids are found in Johannesburg. They would simply not survive through the winter.

As far as we are aware *Brachycorythis conica* ssp. *transvaalensis* only produces a single replacement tuber every season and does not multiply vegetatively to produce more than one plant the next season. However little is currently known about the autecology of the species and further study would be necessitated to confirm or disprove this.

Should the tuber be damaged, rot in very wet weather or be eaten by porcupines that specific plant is lost. Tubers are generally not able to re-grow once the growing point is damaged (in contrast to the potato for example that has numerous growing eyes that are able to sprout growth if the tuber is cut in half or even sectioned into pieces). This makes the orchid tuber an extremely vulnerable structure and it is crucial that the tuber is not damaged in order to ensure that the next season's growth can commence.

It should be noted that significant Porcupine activity has been observed in the area of one sub-population, where the likely target could have been the *Brachycorythis* (Pers. obs. Hankey & Wodrich

1.5. DECISIVE ACTION REQUIRED:

It is thus imperative that urgent and decisive action needs to be taken to prevent South Africa from losing another spectacular orchid species. At this stage there are steps that conservation and management authorities can implement to preserve the habitat of this orchid.

In 2010 the WSNBG collected seed from the population under the collaborative MSB agreement with RBG KEW in the UK and this seed was lodged in the MSB at Wakehurst Place in the United Kingdom.

The ultimate aim is to preserve the species from extinction. As it currently stands if no action is taken the species could be extinct in as little as 5-10 (personal estimate KW) years if not less.

2. TYPICAL ECOLOGY of ground orchids such as *Brachycorythis conica* subsp. *transvaalensis*:

Terrestrial orchids in Gauteng grow actively in summer and flower in spring, summer or autumn. During this time a replacement tuber is formed and towards the end of the growing season as the weather gets colder and the rains subside the current seasons plant dies back

2014) (Figure 1.6.). The question that would require a separate study to determine is whether the population can sustain the normal porcupine activity combined with anthropogenically induced habitat loss and destruction.

Most if not all ground growing orchids are very specialised in their method of nutrient uptake and rely on a relationship with a fungus (called a symbiotic relationship) to grow successfully. Specific types of fungi called mycorrhizal fungi grow in the ground around the orchid tuber and roots and infiltrate the cells of the newly emerging roots and the tuber in spring. It is believed that re-infection may have to take place annually. In return for a safe place to multiply the fungus supplies the orchid with vital nutrients that allow it to grow, flower and set seed.

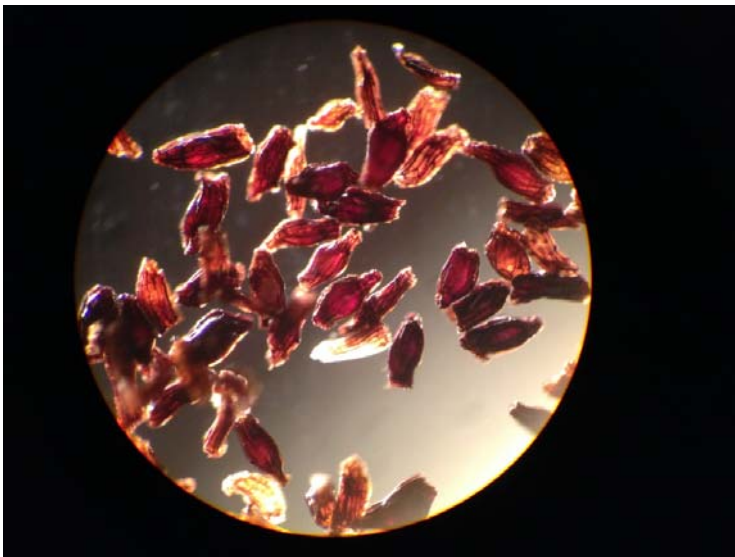


Fig. 1.7: Seed of a *Brachycorythis* species under a microscope at 10x magnification

Photo: K.H.K. Wodrich

Another specific feature of all orchids is that the seeds of an orchid are extremely small and consist of a nucleus of only a few cells surrounded by a seed coat or testa (Figure 1.7). No nutrients are stored in the seed itself making orchid seed extremely small and light and seed is normally wind dispersed. As a result of having no nutrient reserve in the seed itself the seed is unable to sustain growth after germination. Once again the mycorrhizal fungus comes into the play. In order to germinate the seed must fall onto a suitable substrate that is moist and allows the mycorrhizal fungus to infect the seed and provide the multiplying cells within the seed coat with the nutrients required to grow. In Nature the odds of a seed

germinating are very slim and it is for this reason that thousands of seed are produced in every seed capsule.

3. RELOCATION AND PROPAGATION - EXTREMELY DIFFICULT

As a result of the ecology of *Brachycorythis conica* ssp. *transvaalensis* its survival is seriously threatened and relocation, transplanting and propagation is expected to be extremely difficult. Once again due to a lack of knowledge about the species, little is known and documented about its cultivation.

Based on similar grassland ground orchid species with similar ecology, successful relocation can only be done if there is a guarantee that the soil conditions of the donor site and the recipient site are identical or very similar. In addition the correct mycorrhizal fungus must be present in the soil that the plants are being relocated to.

If those conditions are met the plants can only be transplanted in the dormant state as there is a very high risk of damage to the fragile root system and tuber during the growing season. Should the plant snap off the old tuber before the new tuber is sufficiently developed the plant is invariably lost.

Transplanting into a pot is also extremely risky as most of the times conditions in the soil of a potted plant are not ideal for the establishment of the mycorrhizal fungus. Plants with a strong mycorrhizal dependence will often grow and flower for one more season and then slowly the plants and tubers become smaller and smaller in successive seasons before finally dying.

Commercially most orchids are grown from seed using a special method outlined below. It is labour intensive, time consuming and expensive.

The only way to germinate this type of seed is to sow it onto a medium that can provide the seed with all the nutrients it needs to germinate and grow successfully. The medium that is formulated to do just that is also the ideal incubation medium for fungi and bacteria and any contamination of this medium will result in rapid and uncontrolled growth of foreign fungi and bacteria. These will quickly smother and destroy the orchid seed. In practice orchid seed must be sterilised completely before being sown onto a sterilised orchid sowing gel under aseptic conditions. This is done under laboratory conditions using a laminar flow cabinet with sowing media and tools being sterilised in autoclaves before seed sowing can take place.



Fig. 1.8: Seed being sown in a laminar flow cabinet under sterile conditions (left) with an example plants of *Bonatea antennifera* ready for removal from the sterile conditions in the flask (right).

Photo: K.H.K. Wodrich

Sterilising orchid seed is also a risk as the outer seed coat must be sterilised to a point where any bacteria or fungal spores are destroyed but the cells within the seed coat are left unharmed. Too strong a sterilant or too long a period in a sterilising solution will destroy the seed. Too weak a sterilant or too

short a time in the sterilising solution will leave viable fungal spores or bacteria behind that will rapidly multiply once set in contact with the sowing medium.

4. PROJECT PROPOSAL

4.1 Propagation

The project proposal is to obtain permission from Nature Conservation to collect a limited amount of seed from the remaining population of *Brachycorythis conica* ssp. *transvaalensis* in the identified area west of Johannesburg and sow these seed under aseptic conditions in order to establish a propagation protocol for the artificial culture of the species. It is important to have this protocol in place in the event of a catastrophic event that may threaten the viability of the population at any time in the future.

4.2 Establishment of ex-situ holdings

Once the plants have been successfully cultivated ex-situ, gene-bank and public display plantings can be established in the Walter Sisulu National Botanical Garden. An interest has also been expressed by the Suikerbosrand Nature Reserve to re-establish viable populations there. Should the need arise in the future for re-establishment of a pseudo or support sub-population in the natural habitat the technology and expertise would have already been developed.

In order to achieve the above urgent work needs to be undertaken to determine the exact sowing medium and re-flasking medium that is suitable for *Brachycorythis conica* subsp. *transvaalensis*. The exact seed sterilising method needs to be determined in order to ensure that the seed is not destroyed during the sterilisation process. At this stage the author (KW) has a sound basis of previous experience with indigenous terrestrial orchids that will prove invaluable in germinating, reflasking and finally planting out the seedlings of this species.

4.3 Awareness campaign

Together with this initiative an awareness campaign is to be run by WOSA in parallel to the propagation of the species, to raise awareness for the importance of conservation of the habitat, as well as if needed to raise funds for the conservation work to be undertaken.

4.4 On-going research

In addition to the above several smaller research projects may be initiated by WOSA dependant on securing necessary expertise in relevant fields.

4.4.1 – Entomological study

4.4.2 – Mycological study

4.4.3 – Soils study

4.4.5 – Population Biology

4.4.6 – Vegetation analysis

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Annexure 1: Red Listing of *Brachycorythis conica* subsp. *transvaalensis*

Source - <http://redlist.sanbi.org/species.php?species=2785-1>

[Home](#) >> [Genera: B](#) >> [Genus: Brachycorythis](#)

Taxonomy

Scientific Name	Brachycorythis conica (Summerh.) Summerh. subsp. transvaalensis Summerh.
Higher Classification	Monocotyledons
Family	ORCHIDACEAE
Synonyms	Brachycorythis conica (Summerh.) Summerh., Brachycorythis conica (Summerh.) Summerh., Diplacorchis tenuior sensu Pole-Evans

National Status

Status and Criteria EN A2c

Assessment Date 2010/04/12

Assessor(s) L. von Staden, A.J. Hankey & L. Mills

Justification This orchid was previously classified as Vulnerable in the Red List of South African Plants (Raimondo et al. 2009) due to a large number of historical records. However, several years of field surveys, as well as a recent survey of historical localities within Gauteng have failed to locate any surviving subpopulations except for one small subpopulation of ± 60 plants. We therefore estimate a population reduction of 55-70% in the past 60 years (generation length 20 years) due to habitat loss mainly to urban expansion.

Distribution

Endemism South African endemic

Provincial distribution Gauteng, Limpopo, Mpumalanga

Range Waterberg to Balfour.

Habitat and Ecology

Major system Terrestrial

Major habitats Grassland, Savanna

Description Short, open grassland and wooded grassland, on sandy gravel overlying dolomite, sometimes also on quartzite, 1 000-1 705 m.

Threats

This species is severely threatened by ongoing habitat loss to urban expansion in Gauteng. All known historical localities within Gauteng have been affected by extensive urban expansion in recent years, and it appears that this species is now locally extinct within Gauteng except for one remaining subpopulation. As Gauteng province is where this species has been recorded in most abundance, habitat loss within this province has caused a significant population reduction. The only known remaining subpopulation within Gauteng is currently threatened by development.

Population

A comparatively large number of herbarium specimens, together with comments by orchid experts indicate that this species was formerly common within Gauteng province. A few scattered records from adjacent provinces indicate that this species does occur outside of Gauteng, but that it is probably much rarer outside the province. Such disjunct locality records are typical of orchid distributions, and may be the result of long-distance dispersal of dust-like orchid seeds. It is not known whether such isolated subpopulations established through long-distance dispersal are viable in the long term or not. Surveys of historical localities outside Gauteng are still needed to establish whether they are still extant. At present one living population of ± 60 plants is known to survive in Gauteng. This population was rediscovered in 2007 at the same site where J.P.H. Acocks recorded the occurrence of the subspecies in 1956. Several field surveys by municipal and provincial conservation officials over the years, plus dedicated searches by orchid experts while researching a recently published book on orchids of the northern provinces of South Africa (McMurtry et al. 2009), plus a survey of all known historical localities within Gauteng during the 2010 flowering season of this orchid have failed to locate any other surviving subpopulations. As this

orchid is not closely associated with any particular vegetation type, and its habitat requirements are not well understood, it is difficult to estimate population reduction based on habitat loss. Population reduction is therefore estimated based on loss of known localities.

Population trend Decreasing

Conservation

No known living subpopulations of this orchid are currently protected in any formal conservation area. As per SANBI's recommendations for the mitigation of habitat loss to threatened species (Driver et al. 2009) we recommend no further loss of habitat until such time as another viable subpopulation of this orchid can be found. Formal protection in terms of the National Environmental Management: Protected Areas Act (Act 57 of 2003) is recommended for the only currently known extant subpopulation.

Assessment History

Date	Taxon assessed	Status and Criteria	Citation/Red List version
2009	<i>Brachycorythis conica</i> (Summerh.) Summerh. subsp. <i>transvaalensis</i> Summerh.	VU B2ab(ii,iii,iv,v)	Raimondo et al. (2009)