

# Review of the three species accepted in *Chortolirion* A. Berger (*Xanthorrhoeaceae*: *Asphodeloideae*)

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Figure 1. Bulbs of *C. angolense* (Fritz 1003) with inflorescences, flowers and fruit.

## Abstract

In a recent detailed study, the genus *Chortolirion* A. Berger was revised (Zonneveld & Fritz 2010). Three species were subsequently accepted, namely the spring-flowering *C. angolense* (Baker) A. Berger, the autumn-flowering *C. tenuifolium* (Engl.) A. Berger, which was reinstated, and the summer-flowering *C. latifolium* Zonn. & G.P.J. Fritz, which was described as new. A summary of this revision is provided and new information that has since become available, including several new localities, is offered.

## Introduction

In the past, *Chortolirion* has largely been studied from herbarium sheets. Limited fieldwork was conducted to investigate the inconsistent morphological characteristics observed on these herbarium records or to examine the differences between various populations seen in the field. It is noteworthy that, in the past, herbarium records of the species were not collected with a view to distinguishing between spring- and autumn-flowering populations (Craib *et al.* 2004). Failure to recognize obvious differences between various populations over the entire distribution has resulted in *Chortolirion* being considered a variable monotypic genus, with *C. angolense* the only species (Smith 1991, 1995; Craib *et al.* 2004). All species later described, namely *C. bergerianum* Dinter, *C. stenophyllum* (Baker) A. Berger, *C. subspicatum* A. Berger, *C. tenuifolium* and *C. saundersii* Baker nom. nud., were treated as synonyms.

More recently, it has become obvious that an extensive field-based study was required to account for the differences encountered in *Chortolirion* populations in the field by recognizing their distinctive autecologies, morphological differences and specific flowering times in spring, summer and autumn (Craib 2005; Fritz 2007).

## In search of *Chortolirion*

During the first week of February 2008, the late Charles Craib, who was an authority on *Chortolirion* populations in South Africa, and I travelled through Gauteng and Mpumalanga to collect living material of the autumn-flowering forms of *Chortolirion*. In 2009, we continued our field work and collected specimens of the spring- and summer-flowering forms in Gauteng, the Free

State and North West Province. From time to time, 16 live specimens from different localities were sent to Dr. Ben Zonneveld at the National Herbarium of the Netherlands, University of Leiden Branch, for measurement of the genome size (nuclear DNA content). The relevant literature and original descriptions and illustrations published on *Chortolirion* obtained from various sources, were studied and compared to all available live material (Zonneveld & Fritz 2010).

These comparisons revealed that *Chortolirion* was best circumscribed as a genus with at least three species distinguished on the basis of distinctive flowering times, morphological differences and specific habitat requirements (Table 1). Vouchers of the newly collected plants were deposited at the National Herbarium (PRE) of the South African National Biodiversity Institute in Pretoria.

**Table 1.** Comparison between the three species of *Chortolirion*

Feature	<i>C. angolense</i>	<i>C. latifolium</i>	<i>C. tenuifolium</i>
Flowering time RSA	spring (Aug.–Sept.)	summer (Nov.–Dec.)	autumn (Feb.–Mar.)
DNA in pg (1picogram =10 <sup>-12</sup> gram)	27.2	30.6	27.2
Inflorescence length	20–35 cm	30–100 cm	30–100 cm
Inflorescence diameter	2–3 mm	3–4 mm	3–4 mm
Leaf length	3–12 cm	5–12 cm	5–30 cm
Leaf width	2 mm	4–5 mm	1–3 (–5) mm
Leaf twist	2–5 times	strongly spiralling	Once
Spots on leaf base	present	present	Absent
Leaf base	tuberculate/spiny	tuberculate/spiny	Hairy
Perianth (corona) colour	whitish/greenish brown/beige	brown/beige/whitish	pale pink to coral-pink
Perianth length	10–14 mm	15 mm	14–17 mm
Pedice length	1–2 mm	1–2 mm	3–4 mm
Flower disposition	semi-erect	erect	horizontal
Number of flowers open simultaneously	2–3	3–10	3–5
Flowering	before leaves	leaves present	leaves present
Sterile bracts	2 × 9 mm	2 × 9 mm	5 × 12 mm
Floral bracts	2 × 5 mm	2 × 5 mm	4 × 7 mm
Growth form	single	often clumping	Single
Bulb diameter	15–30 mm	15–30 mm	15–33 mm
Habitat	grassy plains/various soil types	grasslands/sandy soils	rocky grasslands
Distribution	Angola/RSA	central Free State/Gauteng/ North West	Gauteng/Mpumalanga/ Namibia
Frequency	common	very rare	Rare

**1. *Chortolirion angolense* (Baker)  
A.Berger in *Das Pflanzenreich*,  
IV.38. III: 73 (1908).**

*Haworthia angolensis* Baker in *Trans. Linn. Soc.*, ser. 2, 1: 263 (1880 but pub. 1878); Baker in *Th. Dyer Fl. Trop. Afr.* 7: 469 (1897). Holotype: *Welwitsch 3756* (BM).

*Haworthia subspicata* Baker in *Bull. Herb. Boiss.* 4: 998–9 (1904). Holotype: *Conrath 645* (Z).

*Chortolirion angolense* is a common summer-rainfall grassland species in South Africa, growing singly in small colonies or scattered over a wide area. It is well adapted to various soil types and to an annual winter grass-fire cycle. These fires open up and clear the habitat, enabling an early flowering period from August, before any leaves have appeared or spring rains have fallen – this is typical of pre-rain flora (Figure 1). The inconspicuous flowers are carried on a 20–35 cm long simple inflorescence (Figure 2). By October, the plants are in fruit and the brief growing cycle is completed before the plants become smothered by taller grasses. *C. angolense* was formerly common around Heidelberg, Gauteng, but in recent times many colonies have disappeared as a result of the expansion of suburbs, as is the case in many parts of its distribution within this province.



Figure 2. Two flowering plants of *C. angolense* (Fritz 1002) growing close together in burnt grassland. It usually flowers before the first spring rains.

**2. *Chortolirion tenuifolium* (Engl.)  
A.Berger in *Das Pflanzenreich*,  
IV.38. III: 73 (1908).**

*Haworthia tenuifolia* Engl. in *Engl. Bot. Jahrb.* 10: 2. t. 1 (1889); Baker in *Th. Dyer Fl. Cap.* 6: 355 (1896); R.A.Dyer in *Flowering Plants of South Africa* 24: t. 932 (1944). Holotype: *Marloth 1049* (B).

*Chortolirion stenophyllum* (Baker) A.Berger in *Das Pflanzenreich*, IV.38. III: 72 (1908); R.A. Dyer in *Flowering Plants of South Africa* 24: t. 932 (1944). *Haworthia stenophylla* Baker in *Hook. Icon. Pl.* 10: t. 1974 (1891); Baker in *Th. Dyer Fl. Cap.* 6: 355 (1896). Holotype: *Galpin 858* (K).

*Chortolirion bergerianum* Dinter in *Neue und wenig bekannte Pflanzen Deutsch-Sudwest-Africas*: 24 (1914). Holotype: *Dinter 4295* (B).

*Chortolirion saundersiae* Baker nom. nud. in *Hook Icon. Pl.* 10: t. 1914 (1891).

In Gauteng and Mpumalanga the rare *C. tenuifolium* is found on rocky sandstone and quartzite plates and outcrops, the rocky habitats protecting these plants against bulb-eating rodents such as porcupines. *C. tenuifolium* starts its growing cycle later, in early summer, after adequate rain has fallen. The leaves are fully grown by the time flowering commences in February and March. For this species, fire does not play a significant



Figure 3. A large plant of *C. tenuifolium* (Fritz 1022) growing among clumps of *Khadia beswickii*. Note the long, narrow, immaculate leaves and peduncle 4 mm in diameter

role in clearing habitat before flowering as the plants send up 1 m high inflorescences that protrude above the surrounding vegetation, thus aiding pollination by insects in flight. Plants always grow singly in rather scattered populations of 10 to 30 plants. A distinguishing character of *C. tenuifolium* is the large (up to 17 mm long), pale pink to coral-pink flowers carried horizontally when fully open. These attractive flowers somewhat resemble those of *Aloe compressa*, and are less haworthia-like than those of *C. angolense* and *C. latifolium*. The long, narrow, greyish-green, immaculate (spotless) leaves are hairy at the base, in contrast with the tuberculate and spiny leaf bases of the other two species mentioned.

Although *C. tenuifolium* may have a wide distribution in the summer-rainfall area of South Africa, it is still not a well-known species and may as well occur in neighbouring countries such as Namibia, Botswana and Zimbabwe.

Locality at Jameson Park, Heidelberg, Gauteng.

Plants of this species were unexpectedly discovered by the author in February 2004 (Fritz 2005) while searching for new localities of *Khadia beswickii* growing at Jameson Park, Heidelberg, Gauteng (Figure 3). It was quite a surprise to



Figure 4. *C. tenuifolium*, with its raceme of pinkish horizontally disposed flowers with open mouths.

find a *Chortolirion* flowering at that time of year, carrying striking pinkish flowers (Figure 4) on a simple inflorescence 1 m tall! A peculiar phenomenon is that many plants were found on termite mounds, between and among clumps of *K. beswickii*. It seems that the well-protected, composted spaces between the leaves of these khadias offer excellent conditions for germination of the seed. Three populations of *C. tenuifolium* are known in this area, invariably growing in association with the khadias as well as with *Gladiolus permeabilis* and the small white-flowered *Nerine rehmannii*.

Locality east of Delmas, Mpumalanga.

As experienced at most localities of *C. tenuifolium*, few plants are scattered in a small area at the Delmas locality where plants are quite robust, while the flowers are pale pink to whitish.

Locality near Bronkhorstspuit, Gauteng.

At this locality *C. tenuifolium* grows scattered in flat grassland in shallow sandy soil and gravel patches at the edge of large sheets of exposed rock in association with *Frithia humilis* and a species of *Adromischus* (Figure 5).

Locality near Belfast, Mpumalanga.



Figure 5. Plants of *C. tenuifolium* (Fritz 1020) from the Bronkhorstspuit locality.

A very miniature form of *C. tenuifolium* with very small bulbs and entire leaves 1–2 mm wide (Figure 6) grows protected in quartzite cracks on hillsides of the Steenkamps Mountains (Figure 7). Here it grows in association with *Khadia al-*

*ticola*, *Agapanthus inapertus*, species of *Plectranthus* and various geophytes. The tiny leaves of this form do not die back completely in winter, but simply to the surface of the surrounding rocky cracks. The resulting short, truncate leaves are



Figure 6. Small bulbs and very narrow leaves and inflorescences of *C. tenuifolium* (Fritz 1018) plants from the Belfast locality.



Figure 7. Habitat of *C. tenuifolium* at the Belfast locality, where plants grow wedged and protected in quartzite cracks on hillsides.



Figure 8. The beautiful coral-pink flowers with wide open mouths and strongly recurved segments are a feature of *C. tenuifolium* from the eastern localities. Photograph: Judd Kirkel.

maintained through winter and the following growing season, perhaps aiding in storage of moisture during times of stress. The rather petite inflorescences and attractive, wide open, coral-pink flowers with strongly recurved segments are a feature of the plants in these eastern localities (Figure 8).

Locality at Kloof Gold Mine, Carletonville, Gauteng.

At this locality, *C. tenuifolium* grows in rocky terrain in association with *Aloe verecunda*, *Adromischus umbraticola* and species of *Brachystelma*.

**3. *Chortolirion latifolium* (Zonn. & G.P.J.Fritz) in *Bradleya* 28/2010: 27–36 (2010). Holotype: 2009, G.P.J. Fritz 1025 (PRE).**

Localities at the central Free State.

Long before the description of *C. latifolium*, Charles Craib discovered a summer-flowering form of chortolirion at the central Free State goldfields, in the vicinity of Odendaalsrus and Welkom as well as near Bloemfontein (Craib 2005). It has broad, strongly contorted leaves and is often clump-forming, a unique feature in the genus (Figure 9). Leaves of the new season have yellowish striations on the upper side but they usually fade later in the season, giving the impression that the leaves are immaculate. Plants of the species prefer sandy soil in short grassland not prone to annual grass fires. They grow socially

with various geophytes as well as with *Ruschia calcarea*, *Pterodiscus speciosus* and, more rarely, with *Cyphostemma hereroense*. Only a handful of populations are known, threatened by illegal dumping and agriculture.

Locality at Jameson Park, Heidelberg, Gauteng.

On 12 December 2009, I discovered a population of *Chortolirion* plants in full flower at Jameson Park, Heidelberg, by chance while searching for *Eulophia* species. Most inflorescences were 1 m high, carrying many whitish flowers different from those of the other two species known to occur at Heidelberg (Figure 10). The broad, strongly spiralling leaves immediately suggested it to be *C. latifolium*. Although I had visited all the known *C. latifolium* localities in the Free State, it was always late or early in the season and I had therefore never seen the species in flower. This new locality, practically on my doorstep, was indeed a blessing!

*Chortolirion latifolium* is certainly a beautiful species with characteristic yellowish bands and stations on the upper leaf surface, with spots higher up and finer striations and spiny spots on the underside over two thirds of the length of the leaf (Figures 11 & 12). The greyish green leaves grow in the form of a whirlwind or sundae glass (Figure 13). The leaves are strongly spiralling, sometimes to such extent that two or three leaves coil together. About 100 plants grow scattered over quite a large area at this locality. These plants are not clump-forming like the Free State plants. Only a couple

of suckering plants could be found. At flowering time, the surrounding grasses are short but they quickly increase in length. As a result, these chortolirions are completely covered and their inflorescences dried out by the end of January. *C. latifolium* grows socially with and sometimes even between clumps of *Vernonia oligocephala*, as well as with *Eulophia ovalis*, *Gladiolus crassifolius* and *Asclepias albens*, to name a few.

Locality at Carletonville, Gauteng.

This locality was also discovered by chance while Judd Kirkel and Andrew Hankey were on a field trip in 2007. Judd sent me a photograph he took at a site along the road en route to the Northern Cape. The plant looked like a hybrid between a *Chortolirion* and *Aloe verecunda*. I could not wait to see this strange looking plant for myself and eventually Judd and I had the opportunity to visit the locality on 17 December 2010. Fortunately the plants were in flower and could be identified as *C. latifolium*. The leaves had yellow striations, like the plants at the Heidelberg locality. However, at this locality the plants were found on exposed dolomite and associated with somewhat different species including, for example, *Brachystelma foetidum*, *Boophone disticha* as well as the crawling, dolomite-favouring, yellow-flowered *Tylosema fassoglense*, related to the well-known genus *Bauhinia*. As at the Heidelberg locality of *C. latifolium*, plants encountered here were also scarcely clump-forming (Figure 14).

Locality at Zeerust, North West Province.



Figure 9. Plants of *C. latifolium* from the type locality (Fritz 1025) near Bloemfontein Airport. Note that the bulb on the left is in the process of dividing.



Figure 10. *C. latifolium* (Fritz 1027) collected at the Heidelberg locality, the distinctive features of this species clearly shown.

Judd Kirkel discovered *C. latifolium* on 27 December 2010 near Zeerust, North West Province. According to photographs he forwarded to me, this is a quite robust form with 1 m high inflorescences, growing in semibushveld among *Acacia karroo* (sweet thorn) trees. The robust leaves show less striation than those of the plants at the Heidelberg locality and, to my mind, resemble those found in the Free State (Figure 15). This new locality is near the Botswana border, and the possibility exists that *C. latifolium* may also occur in Botswana.

## Summary

Heidelberg, Gauteng, is home to all three *Chortolirion* species, the plants growing in specific habitats in an area covering as little as 10 km<sup>2</sup>. *In situ* research and studies in the field could easily be carried out at all these localities and at all seasons of the year. Flowering times, morphological differences as well as various external factors were regularly monitored to ascertain consistency from year to year. Plants of the three species received the same annual rainfall over an extended period, proving that it did not have any influence on the different flowering times and emphasising the fact that the flowering time is a genetically defined character. The importance of flowering time in the specification of species of *Chortolirion*, as shown in this article, has been largely ignored in the past. Today, however, flowering time is considered a useful method to distin-



Figure 12. Two beautiful plants of *C. latifolium* (Fritz 1028) with yellow striation on the spiralling leaves.



Figure 11. *C. latifolium* (Fritz 1028). Note the spiniferous nature, yellow spots and striation of the leaves.



Figure 13. *C. latifolium* in flower in its habitat at the Heidelberg locality (Fritz 1028).

guish between closely related taxa in *Haworthia*.

Rainfall has nevertheless an important effect on the development and vigour of *Chortolirion* colonies in habitat. The vigour of annual growth as well as the vigour and length of the inflorescences that are produced are greatly influenced by rainfall. In times of stress, plants produce much smaller inflorescences or even fail to flower at all. In good years with adequate rainfall, mature bulbs of all three species are capable of producing two successive inflorescences at maximum height, resulting in a greater seed production and assuring continued existence.

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Figure 15. *C. latifolium* with almost immaculate leaves from the Zeerust locality (Fritz & Kirkel 1031). Photograph: Judd Kirkel.



Figure 14. A suckering plant of *C. latifolium* with various inflorescences at the Carletonville locality (Fritz 1030).

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