

Conservation status of the recently reinstated *Aloe davyana*, *A. davyana* var. *subolifera*, and *A. labiaflava* (Asphodelaceae subfam. Alooideae), three maculate aloes endemic to South Africa

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Summary: The conservation status of *Aloe davyana*, *A. davyana* var. *subolifera*, and *A. labiaflava* (Asphodelaceae subfam. Alooideae) is discussed. These three taxa were recently reinstated as accepted species (*A. davyana* and *A. labiaflava*), with *A. davyana* var. *subolifera* included as the only non-autonymic variety in *A. davyana*. Of these three aloes, the autonymic *A. davyana* and *A. davyana* var. *subolifera* are of Least Concern, while *A. labiaflava* is Endangered.

Zusammenfassung: Der Erhaltungszustand von *Aloe davyana*, *A. davyana* var. *subolifera* und *A. labiaflava* (Asphodelaceae subfam. Alooideae) wird diskutiert. Diese drei Taxa wurden kürzlich wieder als anerkannte Arten (*A. davyana* und *A. labiaflava*) eingestuft, wobei *A. davyana* var. *subolifera* neben dem Autonym *A. davyana* var. *davyana* die einzige Varietät von *A. davyana* ist. Von diesen drei Aloen sind *A. davyana* var. *davyana* und *A. davyana* var. *subolifera* nicht gefährdet, während *A. labiaflava* vom Aussterben bedroht ist.

Keywords: *Aloe davyana*; *Aloe labiaflava*; conservation status

Introduction

The maculate aloes, i.e. those species included in *Aloe* L. sect. *Pictae* Salm-Reifferscheidt-Dyck (Asphodelaceae subfam. Alooideae), form one of the largest infrageneric groups recognised in the genus in South Africa and globally. Several

species, such as *A. maculata* All., occur over vast geographical distribution ranges, while others, such as *A. lettyae* Reynolds, are localised and known from only a few locations within small ranges (see maps for these species in Van Wyk & Smith, 2014: 250, 246, respectively).

Until recently, the three *Aloe* taxa – two species and one variety included in one of them – dealt with in this study have been either not upheld at the rank of species (*A. davyana* Schönland), included in the synonymy of *A. greatheadii* Schönland var. *davyana* (Schönland) Glen & D.S.Hardy (*A. davyana* var. *subolifera* Groenew.) or regarded as a nothospecies (*A. labiaflava*). However, Smith et al. (2020) presented evidence which indicated that *A. davyana* warrants acceptance at the rank of species, and also reinstated *A. davyana* var. *subolifera* as a variety under it (Smith et al., 2021). Furthermore, Smith & Klopper (2021) showed that *A. labiaflava* is not a nothospecies and reinstated it to the rank of species.

Given the chequered taxonomic history of these three *Aloe* taxa, their conservation status has yet to be assessed at the taxonomic ranks at which they are currently accepted. Following the conservation assessment of these three aloes, it is shown that autonymic *A. davyana* is of Least Concern, for *A. davyana* var. *subolifera* a status of Least Concern is published here, while *A. labiaflava* is regarded as Endangered.

Material and methods

Hardcopy and electronic literature sources that

	Reference	Taxon (Conservation status)
1	Hall et al. (1980: 46–47)	No assessments for these taxa
2	Hall & Veldhuis (1985: 28)	No assessments for these taxa
3	Hilton-Taylor & Smith (1994: 293–295)	No assessments for these taxa
4	Hilton-Taylor (1996: 26–27)	No assessments for these taxa
5	Van Jaarsveld & Smith (1997: 10–14, 181)	No assessments for these taxa
6	Walter & Gillett (1998: 611–616)	No assessments for these taxa
6	Smith & Victor (2002: 95–96, 107, 118)	No assessments for these taxa
8	Raimondo et al. (2009: 79–84)	<i>Aloe greatheadii</i> var. <i>davyana</i> (LC)*
9	http://redlist.sanbi.org	<i>Aloe davyana</i> (LC)**

*LC (Least Concern). The concept adopted by Raimondo et al. (2009) would have included *A. labiaflava* and possibly some other taxa synonymised by Glen & Hardy (2000) under their broad definition of *A. greatheadii* var. *davyana*.

**LC (Least Concern). The concept of *A. davyana* followed under <http://redlist.sanbi.org> included *A. davyana* var. *subolifera*, *A. labiaflava*, and *A. longibracteata*. The assessment reflected in row nine was conducted on 31 October 2018.

Table 1. Conservation status of *Aloe davyana* var. *davyana*, *A. davyana* var. *subolifera*, and *A. labiaflava* given in successive, partial or complete Red Lists for South African plants. For those publications that did not include assessments of these taxa, the page numbers provided in the second column refer to treatments of representatives of the Asphodelaceae, including *Aloe*.

contain information on the conservation status of representatives of the genus *Aloe* as represented in South Africa were studied to determine whether *A. davyana* var. *davyana*, *A. davyana* var. *subolifera* and *A. labiaflava* had been historically assessed. These works are Hall et al. (1980); Hall & Veldhuis (1985), Hilton-Taylor & Smith (1994), Hilton-Taylor (1996), Van Jaarsveld & Smith (1997), Walter & Gillett (1998), Smith & Victor (2002), Raimondo et al. (2009) and the online Red List of South African Plants (<http://redlist.sanbi.org>). Where accessible, herbarium records of the taxa considered here were studied. In addition, fieldwork was conducted over much of their distribution ranges.

The recommended conservation status categories as defined in the second edition of version 3.1 of the *IUCN Red List categories and criteria* (IUCN, 2012) are used in our assessments. Two of the IUCN Red List categories are here recorded for the three aloes assessed (see Results, below). These are ‘Least Concern’ and ‘Endangered’. The categories are defined as follows.

1 – Least Concern. A species is Least Concern when it has been evaluated against the IUCN criteria, as was done here, and does not qualify for inclusion in a category of threat. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category (see <http://redlist.sanbi.org/redcat.php>).

2 – Endangered. A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction (see <http://redlist.sanbi.org/redcat.php>). One of the five IUCN criteria applies to *A. labiaflava* (further discussed below).

Results

The taxonomic concept applied to *Aloe davyana* has changed considerably since this species was first described by Schönland (1905: 288). Glen & Hardy (1987: 490) transferred *A. davyana* to varietal rank under *A. greatheadii* and expanded the concept by including in its synonymy several other maculate aloes, which have been treated as



Figure 1. The conservation status of *Aloe davyana* var. *davyana*, here growing in a dense colony near Pretoria, Gauteng province, South Africa, is Least Concern.

distinct species by Reynolds (1950) and others. Along with *A. davyana*, most of these taxa have since been reinstated (see Smith et al., 2020 for details), and the concept of *A. davyana* is once again more narrowly defined.

With the exception of Hall et al. (1980) and Hall & Veldhuis (1985), neither of which includes the three taxa considered here, all conservation assessments conducted at species rank on South African species of *Aloe* post-date the treatment of *A. davyana* as *A. greatheadii* var. *davyana* by Glen & Hardy (1987: 490). Therefore, available assessments of the conservation status of *A. davyana* do not correspond to the current concept of the species, and *A. davyana* var. *davyana*, as currently circumscribed, has not been assessed (Table 1). The first available assessment for this aloe is that of Raimondo et al. (2009), who assessed the taxon as *A. greatheadii* var. *davyana* (Least Concern), following the expanded concept of Glen & Hardy (1987, 2000). The most recent assessment for *A. davyana* (Mtshali et al. 2018; Least Concern), includes *A. davyana* var. *subolifera*, *A. labiaflava*, and *A. longibracteata* Pole-Evans in the synonymy of the species (see Table 1).



Figure 2. The conservation status of *Aloe davyana* var. *subolifera*, here growing near Pienaarsrivier, Limpopo province, South Africa, is Least Concern.



Figure 3. The conservation status of *Aloe labiaflava*, here photographed near Gemsbokspruit, Mpumalanga province, South Africa, is Endangered (D1).

Aloe davyana var. *subolifera* was described by Groenewald (1939: t.732) and treated as an accepted variety by Reynolds (1950: 235) and others, until it was included in the synonymy of *A. greatheadii* var. *davyana* by Glen & Hardy (1987: 490). This variety was only recently reinstated under *A. davyana* (Smith et al., 2021). The inclusion of *A. davyana* var. *subolifera* in the synonymy of *A. greatheadii* var. *davyana* resulted in this variety not having benefitted from any conservation assessments.

Aloe labiaflava was initially described by Groenewald (1936: 57). Reynolds (1950: 293) concluded that '*A. labiaflava* was a cross between *A. Davyana* and *A. longibracteata*', and the species was later included in the synonymy of *A. greatheadii* var. *davyana* by Glen & Hardy (1987: 490). Therefore, *A. labiaflava*, following its recent reinstatement as a species in own right, too, has not before been assessed in terms of its conservation status.

Most of the areas where the three aloes occur naturally are characterised by a rugged topography with exposed, colder hills and ridges, while the interceding valleys and slopes are more sheltered and warmer. This results in much of the area having a mosaic of grassland and savanna vegetation, with all three taxa occurring to a greater or lesser extent in both vegetation types.

Discussion

1. *Aloe davyana* var. *davyana*

Aloe davyana var. *davyana* occurs over a large area in central-northeastern South Africa, where it is a component of both grassland and bushveld

(savanna) habitats (Smith & Van Wyk, 2008: 98). The epicentre of the range of *A. davyana* var. *davyana* is the present-day province of Gauteng, the most populous province of South Africa, with the gold and platinum mining industries having resulted in a large influx of people to the region.

This aloe grows very well in disturbed areas and has been indicated as a species that can be planted on mine tailings and other disturbed areas to stabilise the soil and prevent erosion (Smith & Correia, 1988, 1992; Van Wyk & Smith, 2014). Large stands in certain areas can be indicative of habitat degradation due to severe overgrazing (Glen & Hardy, 2000).

Aloe davyana var. *davyana* is also a common species throughout Bankenveld, a vegetation type early on recognised by Acocks (1953, 1975, 1988; treated as '34. Rocky Highveld Grassland' in Low & Rebelo, 1996: 39 and as 'Gm 10 Egoli Granite Grassland' in Mucina & Rutherford, 2006: 398–399). Bankenveld has floristic affinities with grasslands and savannas, as well as with Afromontane and Kalahari vegetation (Brown & Bredenkamp, 2003). In this region, altitudinal gradients result in savanna in the warmer, low-lying areas and grassland at cooler, higher altitudes. *Aloe davyana* var. *davyana* occurs in both vegetation types. It should be noted that several human-induced threats impact on Bankenveld and today this vegetation type is highly fragmented with very few patches remaining that are not impacted by humans.

We have found *A. davyana* var. *davyana* to be common throughout its distribution range and conservation status-wise it is of Least Concern and not threatened at present.

2. *Aloe davyana* var. *subolifera*

In contrast with the autonymic variety, *A. davyana* var. *subolifera* has a more restricted distribution range in central-northeastern South Africa, overlapping in its entirety with the distribution range of that of *A. davyana* var. *davyana*. Similar to the autonymic variety, *A. davyana* var. *subolifera* can also form very dense stands.

The city of Shoshanguve, which forms part of the Tshwane metropolis, is contained entirely within the distribution range of *A. davyana* var. *subolifera*. Further north, especially adjacent to the N1 highway, several smaller settlements, such as Hammanskraal, Babelegi, Boekenhoutskloof, and Piensaarsrivier, have been established in the distribution area of this variety. Urban sprawl and human settlement have therefore impacted on the distribution range of *A. davyana* var. *subolifera*, but as pointed out by Smith et al. (2021: 210–211), the variety is included in several private

and government-managed conservation areas. However, at least some of these reserves focus on game and livestock farming, with natural fires usually being deliberately excluded. Under such conditions the integrity of ecosystems and the configuration of plant diversity can be negatively impacted, because of bush encroachment and grassland habitats becoming moribund. As with *A. davyana* var. *davyana*, disturbance by livestock and overgrazing might benefit *A. davyana* var. *subulifera* by leading to an increase of individuals at such a site, but this requires further investigation.

The distribution range of *A. davyana* var. *subulifera* borders the southeastern limits of the Waterberg Biosphere Reserve. This Reserve is of special conservation importance and harbours several endemic species (see Smith & Figueiredo 2021 on the kalanchoes in the Waterberg).

We have found *A. davyana* var. *subulifera* to be common throughout its albeit small distribution range and conservation status-wise it is of Least Concern and not threatened at present.

3. *Aloe labiaflava*

Of the three aloes here assessed in terms of their conservation status, *A. labiaflava* has the smallest natural geographical distribution range (Groenewald, 1941: Kaart no. II; Smith & Klopper, 2021). Based on recent fieldwork and herbarium records held at Herb. PRE, *A. labiaflava* is restricted to a small area in western Mpumalanga near Gemsbokspruit. Only about 200 plants are known at and near the type locality, which is in very close proximity to urban sprawl.

We have found *A. labiaflava* to be Endangered according to criterion D1, i.e. less than 250 mature individuals are known in the global population.

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