

Aloe in Angola (Asphodelaceae: Aloioideae)

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ABSTRACT

Botanical exploration of Angola was virtually impossible during the almost three-decade-long civil war. With more areas becoming accessible, there is, however, a revived interest in the flora of this country. A total of 27 members of the genus *Aloe* L. have been recorded for Angola. It is not unlikely that new taxa will be discovered, and that the distribution ranges of others will be expanded now that botanical exploration in Angola has resumed. This manuscript provides a complete taxonomic treatment of the known *Aloe* taxa in Angola. It includes, amongst other information, identification keys, descriptions and distribution maps.

INTRODUCTION

The Republic of Angola covers an area of ± 1 246 700 km² in southwest-central Africa. Its western boundary is 1 650 km along the Atlantic Ocean and it is bordered by Namibia in the south, the Democratic Republic of Congo in the north and northeast, and Zambia in the east. The detached province of Cabinda has a border with the Republic of Congo in the north and the Democratic Republic of the Congo in the southeast (<http://www.angola.org>) (Figure 1).

The geography of Angola is extremely varied. The flat coastal part has a few shallow bays and is bordered by a sparsely vegetated coastal plain that extends inland for 48–165 km. This coastal belt is separated from the central plateau by an intermediate mountain belt of irregular terraces, running mostly parallel to the coast. Water is more abundant in these mountain chains and the vegetation is therefore lush. The central plateau has an altitude of 1 200–1 800 m and consists of rolling plains and low hills with scanty vegetation. The plateau falls away in the east to the basins of the Congo and Zambezi Rivers and merges with the barren, sandy Namib Desert in the south. Several small rivers arise in the mountain belt and drain westward to the sea. The largest of these are the Cuanza and Cunene Rivers. From the plateau, the Cuango and other rivers flow northwards to join the Casai River, one of the largest tributaries of the Congo River. Rivers in the south of the country either belong to the Zambezi River system or, like the Okavango, drain to Lake Ngami in Botswana (http://www.biocrawler.com/encyclopedia/Geography_of_Angola).

Angola is situated in a subtropical zone, but owing to several factors, the climate of the country is not typical of such areas. Angola's climate is influenced by the cold Benguela Current along the southern part of the coast, the highlands in the interior and the Namib Desert in the southwest.

The country has two distinct seasons: the rainy season from October to May, with average coastal temperatures of around 21°C and the dryer season with lower average coastal temperatures of around 16°C and mist or *Cacimbo* from June to September. The heaviest rains occur in April and are accompanied by violent storms. Rainfall along the coast is high and gradually decreases from 800 mm in the north to 50 mm in the south. The interior can be divided into three zones: the North, with very heavy rains and high temperatures; the Central Plateau, a dry area with average temperatures; and the South with temperature fluctuations due to the proximity of the Kalahari Desert and the influence of tropical air currents (http://www.biocrawler.com/encyclopedia/Geography_of_Angola).

The vegetation of Angola is predominantly Zambebian and falls mainly within the Tropical Grassland (Savanna) zone. Six of White's phytochoria are represented in the country (White 1983). Humid tropical rainforest occurs in the north of the country and the arid Namib Desert and Karoo-Namib shrubland occur in a narrow coastal strip in the southwest. Elsewhere the vegetation consists mostly of miombo woodland, dry evergreen forest, dry deciduous forest, grassland and savanna with Afro-montane formations in the highlands (Airy Shaw 1947; Costa *et al.* 2004). In a recent classification of terrestrial ecoregions based on ecological features, climate, and plant and animal communities, 15 regions are represented in Angola (World Wildlife Fund 2001).

The geography and unique climatic characteristics of the area provide Angola with a rich biodiversity. However, the flora of the country remains poorly known, a situation recently addressed by Figueiredo & Smith (2008). Although the first botanical specimens from Angola were collected towards the end of the 18th century and various explorations were carried out during the 18th, 19th and 20th centuries, the Angolan Civil War (1975–2002) prevented the country from being properly surveyed for almost three decades. After the end of the civil war, some areas are still inaccessible owing to the threat of landmines (Costa *et al.* 2004). Even before the war, the poor condition of some roads prevented explorers from reaching many isolated habitats in this country. This situation still prevails to some extent today. With certain areas of the country becoming increasingly accessible, a new interest in the botanical wealth of Angola is surfacing.

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FIGURE 1.—Map of Angola showing the provinces.

In 2006, a project on the flora of Angola, Flora of Angola Online (FLAN) was initiated in the South African National Biodiversity Institute (SANBI), with the collaboration of the Instituto de Investigação Científica Tropical in Lisbon, Portugal, and the Instituto de Investigação Agronómica in Angola. The project had the objective of producing a compilation of plant names with associated specimen data, with the collaboration of 32 botanists. As a result of this joint effort, a comprehensive list of the vascular plants of Angola was compiled (Figueiredo & Smith 2008).

The results of that project (Figueiredo & Smith 2008; Figueiredo *et al.* in press) provide the following data for the plant diversity of the country: a total vascular flora of 7 296 taxa, consisting of 6 961 species (of which 6 735 are indigenous) and 335 infraspecific taxa (of which 331 are indigenous), belonging to 250 families; 997 species and 72 infraspecific taxa are endemic.

This manuscript provides a complete treatment of the known *Aloe* L. taxa in Angola. It is the culmination of research done for the Angolan Flora Project and also forms part of the Aloes of the World Project, which is funded by the Andrew W. Mellon Foundation. Its objectives are to compile as much information as possible on representatives of the genus *Aloe* and to make this data available to a broad range of stakeholders through the internet as part of the African Plants Initiative of Aluka (Smith *et al.* 2008a, b).

MATERIALS AND METHODS

Geo-referencing of specimens was undertaken for all the specimens examined. The co-ordinates of the collecting locality of each specimen were determined using the Angolan map collection kept at the Instituto de Investigação Científica Tropical. Distribution maps are based on the type specimens and those cited under *Additional specimens examined*. These specimens are mainly housed in LISC and PRE, but also in BM, BR, E, G, K, LISU, M and MO (acronyms as in Holmgren *et*

al. 1990). Specimens not housed at LISC, LISU or PRE were viewed on the Aluka website (<http://www.aluka.org>) of the African Plants Initiative. Specimens housed at B were viewed on the virtual herbarium website of the Herbarium Barolinense (Röpert 2000). Further distribution records for taxa with a distribution range extending outside Angola, were obtained from specimens cited in treatments of the genus in *Flora zambesiaca* (Carter 2001) and *Flora of tropical East Africa* (Carter 1994), as well as specimens housed at PRE.

This treatment includes a summary of the discovery of aloes in Angola, as well as identification keys to the taxa using either field or herbarium characters. For each taxon a description, based on the abbreviated description template of the Aloes of the World Project (Smith *et al.* 2008a, b), is provided. Other information that is supplied for each taxon includes the protologue citation, type specimen information, diagnostic characters and specimens investigated, as well as notes on habitat, flowering time, distribution and endemism (indicated by ^E in front of the taxon name). Each taxon is further accompanied by a distribution map.

HISTORY OF *ALOE* DISCOVERY IN ANGOLA

The known *Aloe* taxa in Angola currently number 27, of which at least 16 (59 %) are endemic to the country. Only five of the 27 Angolan aloes (*A. bulbicaulis* Christian, *A. christianii* Reynolds, *A. dinteri* A. Berger, *A. hereroensis* Engl. and *A. nuttii* Baker) do not have their type localities within Angola. The other 22 *Aloe* taxa occurring in the country were described from material collected during plant collecting surveys or expeditions to Angola from the mid-1800s up to as recently as 1973. Important collectors of *Aloe* in Angola were Dr Friedrich Welwitsch (1853–1861), Lieut. Wissmann & P. Pogge during their expedition through Angola and the Democratic Republic of Congo (1881–1882), Hugo Baum during the Kunene-Zambezi Expedition (1899–1900), John Gossweiler (1903–1944), Edgar Milne-Redhead (1938), Eduardo J. Mendes (1955–1956 and 1959–1960), Gilbert W. Reynolds (1959), Larry C. Leach & I. C. Cannell during the early 1970s and Baptista de Sousa (1973). Botanical exploration and the possible discovery of new *Aloe* taxa ceased with the advent of the 27-year-long Angolan Civil War. As a result of vast areas of the country remaining unexplored, it is likely that more taxa will be found once detailed botanical surveys of these areas are resumed.

The first *Aloe* specimens from Angola were collected by Welwitsch during 1853–1861. From these collections Baker (1878) described six new species, of which only *A. platyphylla* Baker was later reduced to synonymy under *A. zebrina* Baker, and *A. angolensis* Baker is sometimes considered to be either a hybrid between *A. zebrina* and *A. littoralis* Baker or to be a synonym of the latter species (Glen & Hardy 2000; Carter 2001). A further species, *A. venenosa* Engl., was described by Engler (1893) from material collected by Wissmann & Pogge during their expedition through Angola and the Democratic Republic of Congo in 1881–1882. This species has not been collected since and remains insufficiently known. During the Kunene-Zambezi Expedition

of 1899 to 1900, Baum collected *Aloe* specimens from which three new species were described by Engler & Gilg (1903). However, only *A. metallica* Engl. & Gilg is still regarded as a valid species, whereas *A. brunneo-punctata* Engl. & Gilg and *A. baumii* Engl. & Gilg have been reduced to synonymy under *A. nuttii* Baker and *A. zebrina*, respectively.

In 1903, Gossweiler collected material that was later described by Berger (1906) as *Aloe paedogona* A.Berger. Christian (1936) described *A. bulbicaulis* Christian from material collected by Porter in Zambia, but Reynolds (1966) later established that it is a later synonym of *A. paedogona*. The latter species is, furthermore, considered by some (Reynolds 1966; Keay 1968) as a synonym of *A. buettneri* A.Berger, although more recent views (Carter 1994) consider the three as separate taxa. Milne-Redhead collected a further *Aloe* in 1938 that was subsequently described by Christian (1940a) as *A. milne-redheadii* Christian.

Reynolds visited Angola during June and July of 1959, but could not reach certain areas in the northeast and southeast of the country due to the inaccessibility of these areas. During his journey he established that *A. hereroensis* Engl., from Namibia and the Northern

Cape Province of South Africa, also occurs in Angola. An additional six species were described by Reynolds (1960, 1961, 1962, 1964) after his Angolan travels, all of which are still upheld.

During the early 1970s, Leach & Cannell collected *Aloe* material in Angola from which Leach (1971, 1974) described five new species and a new variety of *A. andongensis* Baker. At the same time Leach (1974) also described a further species of which the material was collected and given to him by Baptista de Sousa in 1973. All seven of these taxa are still considered current, although *A. esculenta* L.C.Leach is sometimes considered to be synonymous with *A. angolensis* (Glen & Hardy 2000).

IDENTIFICATION KEYS

Two identification keys are presented below. The first uses field characters for the identification of living plants, whereas the second uses mostly leaf and inflorescence characters (flowers, pedicels and floral bracts) and is aimed at identifying herbarium specimens. *Aloe venenosa* is not included in the identification keys owing to lack of information for this insufficiently known species.

Key using field characters

1a Acaulescent or with very short stem:

2a Leaf bases markedly enlarged below ground to form bulb-like swelling:

3a Leaves with marginal teeth ± 1 mm long, densely crowded; floral bracts ovate-acuminate *A. bulbicaulis*

3b Leaves with marginal teeth $\pm 3-4$ mm long, 5-40 mm apart; floral bracts linear-lanceolate *A. paedogona*

2b Leaf bases not markedly enlarged to form bulb-like swelling:

4a Flowers vertically disposed (secund) when open:

5a Inflorescence up to 1 m high; racemes subdense; flowers scarlet with a bloom, ± 40 mm long *A. guerrae*

5b Inflorescence 2.20-2.75 m high; racemes lax; flowers dull reddish purple, 28-33 mm long *A. procera*

4b Flowers horizontally or pendulously disposed when open:

6a Racemes capitate:

7a Leaves with copious small, white, circular spots near base on lower surface; leaf margin with small crowded teeth that are sometimes almost serrate *A. grata*

7b Leaves obscurely lineate, with few to many whitish spots scattered or arranged in transverse bands on lower surface; leaf margin with pungent, red-brown teeth *A. hereroensis* var. *hereroensis*

6b Racemes acuminate:

8a Leaves not marked with whitish spots on either surface:

9a Inflorescence ± 0.9 m long; flowers yellow, 20-25 mm long *A. angolensis*

9b Inflorescence longer than 1 m; flowers reddish pink, longer than 30 mm:

10a Flower buds at first covered by densely imbricate, long, white, prominently nerved bracts *A. metallica*

10b Flower buds not covered by dense floral bracts *A. christianii*

8b Leaves marked with whitish spots on one or both surfaces:

11a Leaves trifarious *A. dinteri*

11b Leaves not trifarious:

12a Leaves with prickles along median line of lower leaf surface *A. esculenta*

12b Leaves without prickles along median line of lower leaf surface:

13a Leaves copiously white-spotted on upper surface, usually obscurely spotted on lower surface; marginal teeth 4-7 mm long *A. zebrina*

13b Leaves densely white-spotted on both surfaces, especially on lower surface; marginal teeth 2-3 mm long ... *A. milne-redheadii*

1b Stems erect, procumbent, ascending or pendent:

14a Stems erect:

15a Leaves grass-like *A. nuttii*

15b Leaves not grass-like:

16a Stem usually shorter than 1 m:

17a Stem 0.5-1 m long; leaves obscurely lineate, rarely with few spots near base *A. scorpioides*

17b Stem up to 0.3 m long; leaves with spots arranged in wavy transverse bands *A. lepida*

16b Stem usually longer than 1.5 m:

18a Stems without persistent dried leaves *A. rupicola*

18b Stems with persistent dried leaves:

19a Stem unbranched *A. littoralis*

19b Stem branched *A. palmiformis*

14b Stems procumbent, ascending or pendent:

20a Stems pendent:

21a Stems without persistent dried leaves; leaves obscurely lineate, without spots *A. mendesii*

21b Stems with persistent dried leaves; leaves obscurely lineate with few small, whitish, H-shaped spots; spots more numerous and in transverse bands on lower surface *ZA. inamara*

- 20b Stems procumbent, ascending:
 22a Stems slender, branched, forming thickets:
 23a Stems without persistent dried leaves *A. catengiana*
 23b Stems with persistent dried leaves *A. gossweileri*
 22b Stems branched, but not slender, not forming thickets:
 24a Inflorescence 0.5–0.9 m high, unbranched or branched once, with lax racemes *A. vallis*
 24b Inflorescence 0.3–0.4 m high, branched, with dense racemes:
 25a Leaves sometimes sparsely spotted on lower surface, with many crowded spots near base, 200–250 × 60–70 mm, with marginal teeth 2–3 mm long, 5–7 mm apart; ovary pale green *A. andongensis* var. *andongensis*
 25b Leaves more copiously white-spotted with spots tending to be arranged in wavy transverse bands, smaller and narrower than above, with marginal teeth smaller and more crowded; ovary brownish orange *A. andongensis* var. *repens*

Key using herbarium characters

- 1a Floral bracts longer than pedicels at anthesis:
 2a Flowers 20–24 mm long; outer perianth segments free for < 10 mm; leaves 40–50 mm wide *A. angolensis*
 2b Flowers longer than 25 mm; outer perianth segments free for > 10 mm; leaves wider than 60 mm:
 3a Floral buds and open flowers secund:
 4a Racemes ± 200 mm long; flowers ± 40 mm long, ± 8 mm across ovary; floral bracts 6–8 mm long; leaves 60–70 mm wide, with marginal teeth 4–5 mm long *A. guerae*
 4b Racemes 250–400 mm long; flowers 28–33 mm long, 5–6 mm across ovary; floral bracts 5–6 mm long; leaves 80–95 mm wide, with marginal teeth 1.5–3.5 mm long *A. procera*
 3b Floral buds and open flowers not secund:
 5a Leaves with blackish brown marginal teeth and similar spines along median line of lower leaf surface; pedicels 5–6 mm long; floral bracts 20–27 mm long *A. esculenta*
 5b Leaves with reddish brown marginal teeth and no spines along median line of lower leaf surface; pedicels longer than 6 mm; floral bracts shorter than 20 mm:
 6a Leaves up to 600 × 100–130 mm, with marginal teeth 3–4 mm long; inflorescence much-branched and rebranched; floral bracts 12–18 mm long *A. littoralis*
 6b Leaves 250–400 × 70–90 mm, with marginal teeth 2–3 mm long; inflorescence sparsely branched; floral bracts 18–20 mm long *A. metallica*
 1b Floral bracts shorter than or equal to pedicels at anthesis:
 7a Floral bracts about as long as pedicels at anthesis:
 8a Floral bracts almost equal to or slightly shorter than pedicels at anthesis; leaves < 50 mm wide:
 9a Inflorescence up to 0.15 m long, simple or 1- or 2-branched, descending at base and then curving upwards; racemes rather dense; flowers 21–28 mm long, well constricted above ovary; outer perianth segments free for 8.5–10.0 mm *A. scorpioides*
 9b Inflorescence 0.5–0.6 m long, simple or 1-branched, oblique or suberect; flowers 20–25 mm long, only slightly constricted above ovary; outer perianth segments free for 4.5–6.0 mm *A. vallis*
 8b Floral bracts almost equal to pedicels at anthesis; leaves > 50 mm wide, usually > 60 mm wide:
 10a Leaves 100–120 mm wide, unspotted; flowers 35–45 mm long, not constricted above ovary *A. christianii*
 10b Leaves < 80 mm wide, spotted on both surfaces; flowers up to 35 mm long, abruptly constricted above ovary:
 11a Leaf margin narrow, white, with minute white teeth, ± 0.5 mm long, 1–2 mm apart, edge of keel white cartilaginous with similar teeth *A. dinteri*
 11b Leaf margin cartilaginous, with stout, pungent, red-brown teeth, 4–7 mm long, 10–15 mm apart, no spines on median line ... *A. zebrina*
 7b Floral bracts markedly shorter than pedicels at anthesis:
 12a Outer perianth segments free for ± ½ or > ½ its length:
 13a Pedicel > 25 mm long at anthesis:
 14a Flowers 25–33 mm long; outer perianth segments free for 14–16 mm *A. hereroensis* var. *hereroensis*
 14b Flowers 35–42 mm long; outer perianth segments free almost to base, or for ¼ of its length *A. nuttii*
 13b Pedicel < 20 mm long at anthesis:
 15a Flowers ± 42 mm long *A. rupicola*
 15b Flowers ± 25 mm long:
 16a Pedicels 18–20 mm long; floral bracts ± 12 mm long *A. mendesii*
 16b Pedicels 14–18 mm long; floral bracts 5–8 mm long:
 17a Leaves 200–250 × 60–70 mm, with marginal teeth 2–3 mm long, 5–7 mm apart *A. andongensis* var. *andongensis*
 17b Leaves smaller and narrower than above, with marginal teeth smaller and more crowded *A. andongensis* var. *repens*
 12b Outer perianth segments free for < ½ its length:
 18a Leaves with marginal teeth up to 1 mm long:
 19a Flowers 35–40 mm long; pedicels ± 20 mm long; leaves ± 150 mm wide; acaulescent plant with leaf bases enlarging below ground to form bulb-like swelling *A. bulbicaulis*
 19b Flowers 26–29 mm long; pedicels 22–27 mm long; leaves 40–50 mm wide; plants with branched stem, growing pendent on cliff faces *A. inamara*
 18b Leaves with marginal teeth > 2 mm long:
 20a Floral bracts 15–25 mm long; pedicels 25–30 mm long; acaulescent plants with leaf bases enlarging below ground to form bulb-like swelling *A. paedogona*
 20b Floral bracts < 7 mm; pedicels usually < 20 mm; shrubs or if acaulescent, then leaf bases not enlarging below ground to form bulb-like swelling:
 21a Floral bracts up to 3 mm long:
 22a Leaves 70–80 mm wide; flowers 25–28 mm long *A. grata*
 22b Leaves ± 50 mm wide; flowers ± 30 mm long:
 23a Flowers subsecund when open; pedicels ± 10 mm long; leaves with marginal teeth spaced ± 15 mm apart *A. gossweileri*
 23b Flowers nodding to pendulous, not subsecund when open; pedicels 13–15 mm long; leaves with marginal teeth spaced ± 10 mm apart *A. palmiformis*
 21b Floral bracts 5 mm or longer:
 24a Leaves ± 35 mm wide; racemes up to 160 mm long; pedicels ± 10 mm long *A. catengiana*
 24b Leaves > 60 mm wide; racemes 200 mm or longer; pedicels longer than 13 mm:
 25a Leaves with marginal teeth 3–7 mm long; flowers 25–29 mm long, ± 5.5 mm across ovary; outer perianth segments free for 5–6 mm *A. lepida*
 25b Leaves with marginal teeth 2–3 mm long; flowers 28–35 mm long, ± 8 mm across ovary; outer perianth segments free for ± 10 mm *A. milne-redheadii*

TAXONOMY

A. andongensis* Baker var. *andongensis in Transactions of the Linnean Society of London 1: 263 (1878). Type: Angola, Pungo Andongo, *Welwitsch 3729* (BM, holo.!; K!, LISC!, LISU!, iso.).

Branched shrub. *Stem* short or 0.3–0.6 m high, branched, ascending, sometimes becoming decumbent, with persistent dried leaves. *Leaves* rosulate at branch apices, varying from spreading and slightly recurved to suberectly spreading and compact, dull grey-green, upper surface mostly without spots, sometimes sparsely spotted, lower surface usually with many crowded spots near base, lanceolate-attenuate, 200–250 × 60–70 mm; margin slightly cartilaginous, with brownish teeth 2–3 mm long, 5–7 mm apart; leaf exudate crusty when dry. *Inflorescence* 0.3–0.4 m high, erect, 2- or 3-branched. *Raceme* subcapitate to cylindrical-acuminate, 60–120 mm long, dense. *Floral bracts* 5–8 × 3 mm. *Pedicels* 14–18 mm long. *Flowers*: perianth pale orange-scarlet, paler at tips, 25 mm long, 5–6 mm across ovary, narrowed above ovary, widening towards mouth giving a clavate appearance, cylindric and very slightly decurved; outer segments free for 17 mm. *Stamens* exerted up to 1 mm. *Style* exerted up to 1–2 mm. *Flowering time*: January to April.

Diagnostic characters: upper leaf surface mostly without spots, sometimes sparsely spotted, lower surface usually with many crowded spots near the base. Buds all spread somewhat horizontally or slightly deflexed. Inflorescence subdense, subcapitate, with flowers lacking a basal swelling.

Relationships with other species: Reynolds (1966) placed *Aloe andongensis* in his Group 19: Plants of shrubby growth. It seems to be closely related to *A. lepida* L.C. Leach and also shows a strong link in vegetative characters with *A. squarrosa* Baker from Socotra (Leach 1974).

Habitat: exposed rocky places.

Distribution: endemic to Angola (Cuanza Sul, Huambo, Malange) (Figure 2).

Illustrations: Reynolds: 347 (1966).

Additional specimens examined

ANGOLA.—0915: Pungo Andongo, (–DA), 22 March 1973, *Bamps, Martins & Silva 4246* (LISC, PRE), 31 March 1967, *Barbosa 11332* (LISC), 29 December 1911, *Gossweiler 5445* (LISC), 14 May 1960, *Reynolds 9385* (BM, PRE). 1014: Cuanza Sul, Gabela, rocha Chitandero, na Roça Africana de CADA, (–CD), 16 March 1967, *Teixeira 11203* (LISC). 1015: Benguela Province, 14 miles [22.5 km] S of Quibala, (–CC), 18 June 1960, *Reynolds 9366* (BM). 1115: Cuanza Sul, 4 miles [6.5 km] NW of Cassongue, (–CC), 26 May 1960, *Reynolds 9335* (BM, PRE). 1215: Huambo, Alto Hama, Iumbo, Rio Queve, (–BA), 6 April 1966, *Correia 3638* (LISC).

***A. andongensis* Baker var. *repens* L.C. Leach** in Journal of South African Botany 40: 115 (1974). Type: Angola, Cuanza Sul, 11 km E of Gabela, 8 June 1973, *Leach & Cannell 13950* (LISC, holo.!; BM!, BR!, K!, PRE!, SRGH, iso.).

Branched shrub, forming large spreading clumps. *Stem* up to 0.6 m high, branched freely from base and above, prostrate, with persistent dried leaves. *Leaves* rosulate at branch apices, widely spreading, dull grey-green, upper surface mostly without spots, sometimes sparsely spotted, lower surface usually with copious

crowded spots near base, spots tend to be arranged in wavy transverse bands, lanceolate-attenuate, smaller and narrower than typical variety; margin slightly cartilaginous, with brownish teeth smaller and more crowded than typical variety; exudate crusty when dry. *Inflorescence* 0.3–0.4 m high, erect, 2- or 3-branched. *Raceme* subcapitate to cylindrical-acuminate, 60–120 mm long, dense. *Floral bracts* 5–8 × 3 mm. *Pedicels* 14–18 mm long. *Flowers*: perianth pale orange-scarlet, paler at tips, 25 mm long, 5–6 mm across ovary, narrowed above ovary, widening towards mouth giving a clavate appearance, cylindric and very slightly decurved; outer segments free for 17 mm. *Stamens* exerted up to 1 mm. *Style* exerted up to 1–2 mm. *Flowering time*: February to April.

Diagnostic characters: prostrate habit. Stems up to 0.6 m long, branching freely from the base and above, thus forming large spreading clumps. Stems foliate for greatest part of their length. Leaves much smaller, narrower, and more widely spreading than typical variety of species, also more copiously white-spotted with spots tending to be arranged in wavy transverse bands, with smaller, more crowded marginal teeth. Buds all spread somewhat horizontally or slightly deflexed. Inflorescence subdense, subcapitate, with flowers lacking a basal swelling. Ovary brownish orange.

Relationships with other species: see comments under *Aloe andongensis* subsp. *andongensis*.

Habitat: slopes of rounded granite hills.

Distribution: endemic to Angola (Cuanza Sul) (Figure 3).

Illustrations: Leach: 116 (1974).

Additional specimens examined

ANGOLA.—1114: Cuanza Sul, Santa Comba-Amboiva, bac du Queve, (–DB), 28 March 1973, *Bamps & Martins 4301* (LISC). 1115: Cuanza Sul, Santa Comba, próximo de Santa Comba, (–AC), 10 March 1965, *Santos 1412* (LISC).

***A. angolensis* Baker** in Transactions of the Linnean Society of London 1: 263 (1878). Type: Angola, Barra do Bengo, between Quisoma and Cacuaco at Mutolo in District Quicuxe, 1858, *Welwitsch 3728* (BM, holo.!; G!, K!, LISC!, LISU!, iso.).

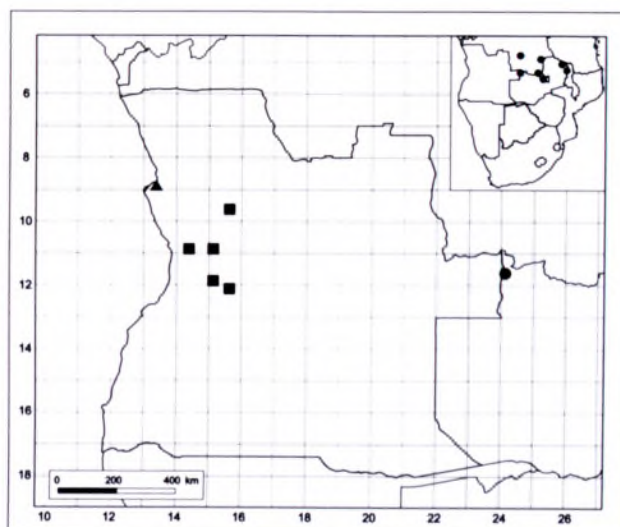


FIGURE 2.—Distribution of *Aloe andongensis* var. *andongensis*, ■; *A. angolensis*, ▲; and *A. bulbicaulis*, ●.

Stem very short or up to 0.7 m high. *Leaves* densely rosulate, suberect, glaucous, not spotted below, very fleshy, lanceolate-ensiform, 600 × 40–50 mm; margin with teeth, 2 mm long, 15–20 mm apart. *Inflorescence* 0.9 m high, erect, simple or up to 3-branched. *Raceme* cylindrical, slightly acuminate, 100 mm long, dense. *Floral bracts* 10 mm long. *Pedicels* 3–6 mm long. *Flowers*: perianth sulphur-yellow, 20–24 mm long; outer segments fused to beyond middle (free for less than 10 mm). *Stamens* and *style* scarcely exerted. *Flowering time*: unknown.

Diagnostic characters: thick leaves and branched inflorescence with dense racemes of sulphur-yellow flowers.

Relationships with other species: Reynolds (1966) stated that the affinities of this species are uncertain, but noted that the thick leaves and type of inflorescence suggest a link with the *Aloe littoralis*-complex. Reynolds (unpublished notes at PRE) further speculated that *A. angolensis* might be a natural hybrid between *A. littoralis* and *A. zebrina* Baker. This view is upheld by Glen & Hardy (2000), although they regarded it as conspecific with *A. esculenta* L.C. Leach. Carter (2001) considered it as a synonym of *A. littoralis*.

Habitat: low hills facing the Bengo River valley, not far from the sea.

Distribution: endemic to Angola (Bengo) (Figure 2).

Notes: this species has not been found again since Welwitsch collected the type specimen. A specimen collected on steep limestone slopes facing the sea between the Dande River Mouth and the road to Caxito, north of Luanda [Barbosa & Santos 10833 (LISC)] is considered to possibly be *Aloe angolensis*. However, this specimen was not in flower and had dry, dehiscent capsules. Until such time as flowering plants are found at this locality, it is not possible to say if this specimen belongs to *A. angolensis* or not (Reynolds 1966; Reynolds, unpublished notes at LISC).

A. bulbicaulis Christian in The Flowering Plants of South Africa 16: t. 630 (1936). Type: Zambia, West-

ern Province, Misundu Siding, Porter cult. Christian PRE20587 (PRE, holo.!).

A. buettneri auct., sensu Reynolds (1966), p.p. ref. loc. in DRC, Malawi & Zambia.

Acaulescent, up to 0.5 m high, with leaf bases enlarged below ground to form bulb-like swelling; rosettes solitary. *Leaves* rosulate, deciduous, spreading, bright green, longitudinally striate, slightly fleshy, surface smooth, ovate-lanceolate, up to 500 mm long, 150 mm wide at middle; margin white, cartilaginous, with densely crowded, fairly evenly-spaced, whitish teeth, 1 mm long, 1–5 mm apart. *Inflorescence* up to 0.6 m high, erect, 3- or 4-branched. *Raceme* cylindrical, 100–200 mm long, lax below, more dense above. *Floral bracts* 8–15 × 5–8 mm. *Pedicels* ± 20 mm long. *Flowers*: perianth pale yellow to pinkish or brownish yellow with darker nerves, 35–40 mm long, 8–10 mm across ovary, slightly constricted above ovary, widening towards wide-open mouth, cylindrical; outer segments free for one-third (12–13 mm). *Stamens* scarcely exerted. *Style* slightly exerted. *Flowering time*: February.

Diagnostic characters: underground bulb. Leaves up to 500 mm long, 150 mm wide in middle, with densely crowded teeth of 1 mm long. Floral bracts ovate-acuminate, 8–15 mm long.

Relationships with other species: Reynolds (1966) considered *Aloe bulbicaulis* to be conspecific with *A. buettneri* together with *A. paedogona*. Carter (1994) stated that the three taxa are morphologically clearly distinct and also separated geographically and therefore does not agree with Reynold's opinion that the three taxa are conspecific.

Habitat: seasonally wet grassland in open woodland.

Distribution: Eastern Angola (Moxico), southeastern Democratic Republic of the Congo (Katanga), northern Malawi, northwestern Mozambique, southwestern Tanzania, northern Zambia (Figure 2).

Illustration: Lane: 17 (2004).

Notes: cited in Carter (1994) to occur in western Angola. This is clearly a mistake and should be eastern Angola. It has been collected in western Zambia, at Matonchi Farm [Milne-Redhead 2903A (K–PRE, photo.); Christian 868 (PRE)] very close to the Angolan border.

A. catengiana Reynolds in Kirkia 1: 160 (1961). Type: Angola, Benguela District, at Catengue, 60 miles [96 km] SE of Benguela, 2 August 1960, Reynolds 9307 (PRE, holo.!.; K, iso.!).

Shrub, forming dense, tangled thickets of 1–2 m across. *Stem* 1.5–2.0 m long, simple or branching low down, slender, ascending, divergent or sprawling, dried leaves not persistent. *Leaves* rather laxly rosulate on apical 0.3 m of stem, spreading to deflexed near base, pale yellowish grey-green, with copious, very pale green lenticular spots on both surfaces, more numerous towards base, narrowly lanceolate-attenuate, ± 300 × ± 35 mm; sheath lineate, 15–20 mm long; margin with firm, pale, reddish brown-tipped teeth, 3 mm long, 8–10 mm apart. *Inflorescence* 0.4 m high, erect or suberect, slender, divaricately about 6-branched. *Raceme* cylindrical-acuminate, terminal raceme longest, 160 mm long, erect, lateral racemes shorter, oblique, rather lax, flowers sub-

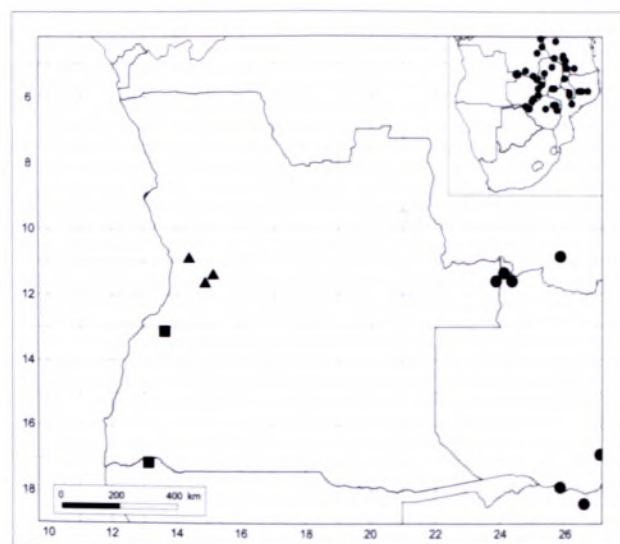


FIGURE 3.— Distribution of *Aloe andongensis* var. *repens*, ▲; *A. catengiana*, ■; and *A. christianii*, ●.

secund on lateral racemes. *Floral bracts* 5 × 3 mm. *Pedicels* 10 mm long. *Flowers*: perianth dull scarlet, 28 mm long, 7 mm across ovary, slightly narrowed above ovary, slightly enlarging towards mouth, cylindric, slightly decurved; outer segments free for 10 mm. *Stamens* exerted 1–2 mm. *Style* exerted up to 2 mm. *Flowering time*: March to July.

Diagnostic characters: forms dense, tangled thickets. Stems slender. Leaves peculiar pale yellowish grey-green, usually copiously spotted on both surfaces. Inflorescence slender and divaricately branched. Racemes vary from terminal erect with flowers evenly distributed around axis, to oblique with flowers somewhat secund.

Relationships with other species: its closest ally is *Aloe palmiformis* (Reynolds 1961).

Habitat: hot, arid bush country and quartzitic sandstone cliffs.

Distribution: western Angola (Benguela, Namibe), northern Namibia (Figure 3).

Illustration: Reynolds: 373 (1966).

Notes: this species was previously only known from the type locality and considered to be endemic to Angola. However, it has recently been discovered in the Kaokoveld in Northern Namibia [*E. van Jaarsveld* 18805 (WIND)].

A. christianii Reynolds in Journal of South African Botany 2: 171 (1936a). Type: Zimbabwe, Ewanrigg, E of Harare, Acturus, May–June 1936, Reynolds 1885 (PRE, holo.!, K!, SAM!, SRGH, iso.).

Acaulescent; rosettes usually solitary, up to 1 m across, or in small groups, rarely suckering. *Stem* develops in older plants, up to 1 m long, erect or decumbent, with persistent dried leaf bases. *Leaves* densely rosulate, erectly spreading, dull green above, dull bluish green below, tinged pinkish in dry conditions, unspotted but often obscurely lineate, lanceolate-attenuate, 300–600 mm long, 100–120 mm wide at base; margin cartilaginous, with pungent, pinkish to pale brown, brown-tipped teeth, 2–5 mm long, 10–20 mm apart. *Inflorescence* 2–3 m high, erect, compactly 6–10-branched, lower branches sometimes 1- or 2-rebranched. *Raceme* cylindric-acuminate, 150–300 mm long, terminal raceme longest, lateral racemes shorter, dense. *Floral bracts* 8–18 × 3–4 mm. *Pedicels* 8–20 mm long. *Flowers*: perianth bright coral-pink with a bloom and obscure nerves, lighter and brownish at tips, 35–45 mm long, 8–10 mm across ovary, not narrowed above ovary, cylindric-trigynous, straight; outer segments free for 15 mm. *Stamens* exerted 3–4 mm. *Style* exerted 4–5 mm. *Flowering time*: April to July.

Diagnostic characters: rosette large. Inflorescence tall and branched. Floral bracts small, up to 18 mm long, pedicels short, 8–20 mm long. Flowers cylindric-trigynous, with thick, fleshy perianth and outer segments free for only 15 mm.

Relationships with other species: *Aloe christianii* is closely related to *A. pretoriensis* Pole Evans from northern South Africa and Zimbabwe (Reynolds 1966).

Habitat: usually in shade in woodland, sometimes in tall grassland, never on rocks.

Distribution: eastern Angola (Moxico), southern and eastern Democratic Republic of the Congo, Malawi,

northern Mozambique, eastern Tanzania, Zambia, northern Zimbabwe (Figure 3).

Illustrations: Reynolds: 187, 188 (1966); Lane: 32 (2004).

Notes: this species has not yet been collected in Angola, but it was reportedly seen in Angola near the Zambian border west of Matonchi by Mr Edgar Milne-Redhead (Reynolds 1966; Carter 2001).

A. dinteri A. Berger in Dinter, Neue und wenig bekannte Pflanzen Deutsch-Südwest-Afrikas: 14 (1814). Type: Namibia, Outjo, Dinter 2791a (SAM, holo.!).

Acaulescent, 0.26 m high; rosettes solitary. *Leaves* trifarious, spreading to almost horizontal, chocolate-brown or deep brownish green, copiously spotted with crowded narrowly elongated white spots arranged ± in broken transverse bands, with small white teeth on white cartilaginous edge of keel, narrowly lanceolate-acuminate, plicate-carinate, 200–300 mm long, 50–80 mm wide at base; margin narrow, white, with minute white teeth, ± 0.5 mm long, 1–2 mm apart. *Inflorescence* 0.5–0.85 m high, erect, 3–8-branched. *Raceme* cylindric-acuminate, 150–200 mm long, terminal raceme the longest, lax. *Floral bracts* 7–12 × ± 2 mm. *Pedicels* 10–15 mm long. *Flowers*: perianth pale rose-pink with bluish bloom, pale to almost white at mouth, 28–30 mm long, ± 6.5 mm across ovary, abruptly narrowed above ovary, enlarging towards mouth, slightly decurved; outer segments free for 5–10 mm. *Stamens* included or exerted up to 1 mm. *Style* exerted up to 1 mm. *Flowering time*: January to March.

Diagnostic characters: acutely folded, trifarious, chocolate-brown leaves of up to 300 mm long, with margins finely toothed. Inflorescence 3–8-branched and up to 0.85 m high. Floral bracts 3-nerved.

Relationships with other species: *Aloe dinteri*, together with its close relatives, *A. sladeniana* Pole Evans from central Namibia and *A. variegata* L. from southern, western and central South Africa and southern Namibia, forms the Section *Serrulatae* Salm-Dyck (Glen & Hardy 2000).

Habitat: usually wedged firmly in cracks in limestone in areas of very low summer rainfall. Sometimes on granite, in bushveld near edge of Namib Desert.

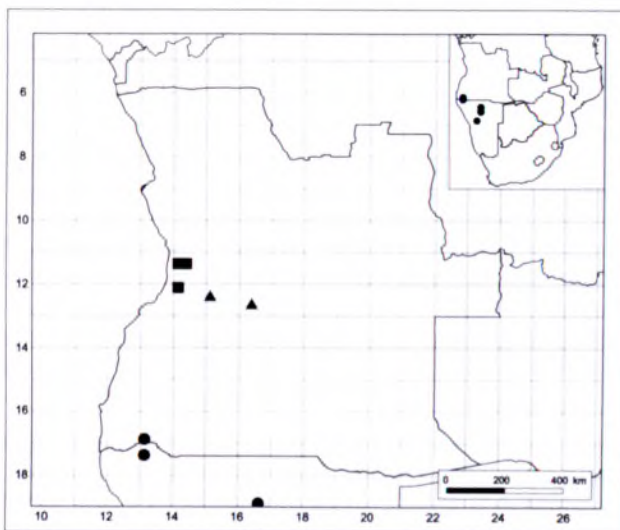


FIGURE 4.— Distribution of *Aloe dinteri*, ●; *A. gossweileri*, ■; and *A. grata*, ▲.

Distribution: southwestern Angola (Namibe, Cunene), northern Namibia (Figure 4).

Illustrations: Reynolds: t. 637 (1936b); Reynolds: 211 (1950); Rothmann: 58, 59 (2004).

Note: this species was previously considered to be endemic to northern Namibia and occurs near the Cunene River west of Ruacaná. Due to its frequent proximity to the river, it was believed likely to occur north of the Cunene River in Angola (Hardy 1992). In fact, a few plants were reportedly seen near Namibe (Moçâmedes) on low stony ridges and in stony desert areas (Downs 1970). However, no herbarium specimens could be found to confirm this distribution. Clair Bell (pers. comm.) saw this species north of the Cunene River in Angola in 1996. A plant collected during this expedition is currently growing in the Botanical Society Conservatory at Kirstenbosch National Botanical Gardens, Cape Town (SW Angola, July 1996, Clair Bell 1120/96). However, opinions are divided on the correct identification of this taxon in Angola. According to John Lavranos (pers. comm.) a plant collected inland from Namibe by Dr Philip Downs in 1971 suckered freely and did not have the solitary rosettes characteristic of *Aloe dinteri*. Furthermore, it bore leaves of no longer than 50–70 mm and consistently produced simple inflorescences. Lavranos, therefore, considers it to be closer to *A. sladeniana*.

A. esculenta L.C. Leach in Journal of South African Botany 37: 249 (1971). Type: Angola, near Pereira d'Eça, 7 August 1967, Leach & Cannell 13818 (PRE, holo.; BM, K!, LISC!, SRGH, iso.).

Acaulescent or sometimes with short, thick, often decumbent stem, up to 0.4 m long; rosettes suckering to form dense clumps. Leaves condensed rosulate, erectly spreading or recurved, greyish green, with pinkish brown tinge in dry conditions, densely white-spotted on both surfaces, spots more copious on lower surface, arranged in irregular transverse bands, pungent blackish brown spines along median line, lanceolate, up to 500 mm long, 80 mm wide at base; margin with pungent, blackish brown teeth, 3–5 mm long, 10–20 mm apart; leaf exudate not bitter. Inflorescence up to 2 m high, erect, 3–5-branched, lower branches sometimes sparsely rebranched. Raceme cylindrical-acuminate, 300–500 mm long, lax. Floral bracts 20–27 × 10–11 mm. Pedicels 5–6 mm long. Flowers: perianth pink with cream-coloured stripes, becoming yellowish when mature, 28–30 mm long, ± 6 mm across ovary, enlarging towards middle, distinctly subclavate; outer segments free for 15–18 mm. Stamens exserted up to 6 mm. Style exserted up to 8 mm. Flowering time: July to August.

Diagnostic characters: spotted aloe. Acaulescent plants forming clumps, frequently of shrubby habit. Leaves copiously white-spotted, with large spots arranged in transverse bands. Strong blackish brown spines along median line on underside of leaf. Flowers distinctly subclavate; stigma exserted up to 8 mm.

Relationships with other species: at first sight this species looks very much like a stemless form of *Aloe littoralis*, to which it is closely allied. Leach (1971) stated that it may well be considered as an ecologically separated subspecies of *A. littoralis*. Glen & Hardy (2000) regarded it as conspecific with *A. angolensis*, with the latter name

taking priority according to the rules of the International Code of Botanical Nomenclature (McNeill 2006).

Habitat: sandy soils of flats of inland drainage areas.

Distribution: southern Angola (Cunene, Huila), north-western Botswana, northern Namibia, southwestern Zambia (Figure 5).

Illustrations: Rothmann: 62, 63 (2004).

Additional specimens examined

ANGOLA.—1515: Huila, (–AC), Carrisso & Sousa 193 (LISC). 1614: Huila, Roçadas, (–DB), 8 July 1970, Menezes 3384 (K, LISC, PRE, SRGH); Cunene, Cuamato, Roçadas, entre Dimba e Humbe, (–DB), 20 July 1970, Santos & Barroso 2761 (LISC, PRE). 1715: Baixo Cunene, Cuamato, Roçadas, a 34 km para a Missão do Cuamato, (–AA), 1 July 1970, Santos & Barroso 2695 (LISC, PRE); Huila, Roçadas, Cuamato, (–AA), 4 July 1970, Menezes 3379 (LISC, PRE); Baixo Cunene, Cuanhama, Pereira d'Eça, entre Namacunde e Chiede, (–BB), 9 July 1970, Santos & Barroso 2717 (LISC, PRE).

A. gossweileri Reynolds in Journal of South African Botany 28: 205 (1962). Type: Angola, Cuanza Sul District, Seles, 7 miles [11 km] SE of Vila Nova de Seles, 15 July 1961, Reynolds 9760 (PRE, holo.; K!, LISC!, iso.).

Thicket-forming shrub. Stem 1.0–1.5 m long, branching from ground level only, ascending or divergent, without persistent dried leaves. Leaves subdensely rosulate at branch apices, spreading to slightly recurved, green, mostly without spots, lanceolate-attenuate, ± 300 mm long, 50 mm wide at base; margin with pale deltoid teeth, 3–4 mm long, 15 mm apart. Inflorescence 0.4–0.5 m high, erect, pyramidal, divaricately 6–8-branched. Raceme cylindric-acuminate, 100–150 mm long, terminal raceme the longest, dense, flowers subsecund when open. Floral bracts 3 × 2 mm. Pedicels 10 mm long. Flowers: perianth scarlet, paler at tips, 30 mm long, 6 mm across ovary, very slightly narrowed above ovary, slightly enlarging towards trigonal mouth; outer segments free for 10–12 mm. Stamens exserted 1–2 mm. Style exserted 2–3 mm. Flowering time: March.

Diagnostic characters: forms thickets. Stems branched at ground level only, 1.0–1.5 m long. Inflorescence divaricately branched, pyramidal with almost horizontal racemes with subsecund flowers.

Relationships with other species: its closest ally appears to be *Aloe palmiformis* (Reynolds 1966).

Habitat: rocky hills.

Distribution: endemic to Angola (Benguela, Cuanza Sul) (Figure 4).

Illustrations: Reynolds: 372 (1966).

Additional specimens examined

ANGOLA.—1114: Vila Nova de Seles, (–AD), March 1941, Gossweiler 13313 (LISC, para.). 1214: Benguela, Bocoio, a caminho da povoação da Chicuma, andados ± 40 km da povoação de Chila, (–AA), 24 May 1973, Raimundo, Matos & Figueira 1415 (LISC).

A. grata Reynolds in Journal of South African Botany 26: 87 (1960). Type: Angola, Bié District, 30 miles [48 km] S of Chinguar, on Chimbango Hill, 19 June 1959, Reynolds 9246 (PRE, holo.; K!, LUA, iso.).

Acaulescent or with short stem, suckering to form dense groups of rather compact rosettes. Leaves densely rosulate, erect to erectly spreading, upper surface green,

tinged reddish brown, without spots, lower surface paler glaucous green, with many crowded, pale green, circular, 1 mm spots in lower quarter, lanceolate-attenuate, 200–250 × 70–80 mm; margin sinuate-dentate, sometimes almost serrate, with teeth 2–3 mm long, 5–8 mm apart; leaf exudate drying pale yellow. *Inflorescence* 0.7–0.9 m high, erect, simple in young plants, up to 3-branched in older plants. *Raceme* capitate or subcapitate, 80–100 mm long, fairly dense. *Floral bracts* 2 × 1.5 mm. *Pedicels* ± 20 mm long. *Flowers*: perianth scarlet, 25–28 mm long, 6 mm across ovary, slightly narrowed above ovary, enlarging towards middle, slightly narrowing at mouth, trigonous; outer segments free for 7 mm. *Stamens* exerted 1–2 mm. *Style* exerted 2–3 mm. *Flowering time*: June.

Diagnostic characters: leaves with small crowded marginal teeth that are sometimes almost serrate, lower surface with copious white, small, circular spots near base. Inflorescence simple in young plants, forked in older plants, 2- or 3-branched in largest specimens. Racemes capitate or almost so. Perianth scarcely trigonously indented above ovary. Floral bracts 2 mm long, 1-nerved.

Relationships with other species: the nearest ally to this species seems to be *Aloe mzimba* Christian from central and southeastern tropical Africa (Reynolds 1966).

Habitat: hillsides, mostly on rocks.

Distribution: endemic to Angola (Benguela, Bié, Huambo) (Figure 4).

Illustration: Reynolds: 117 (1950).

Additional specimen examined

ANGOLA.—1215: Benguela, Serra do Moco, (–AC), 3 June 1940, Gossweiler 12597 (LISC).

A. guerrae Reynolds in *Journal of South African Botany* 26: 85 (1960). Type: Angola, Bié District, E of General Machado, 18 June 1959, Reynolds 9218 (PRE, holo.!; K!, LUAI, iso.).

Acaulescent or with very short stem; rosettes single, usually slightly tilted to one side. *Leaves* densely rosulate, suberectly spreading to spreading with slightly recurved apical portion, dull green, obscurely lineate on upper surface, grey-green with no markings on lower surface, lanceolate-attenuate, ± 400 mm long, 60–70 mm wide at base; margin with pungent, pale brown or reddish brown teeth, 4–5 mm long, 10–15 mm apart; leaf exudate drying yellow. *Inflorescence* 0.9–1 m high, erect, divaricately 8–10-branched, lower branches sometimes rebranched. *Raceme* cylindrical, ± 200 mm long, oblique to almost horizontal, dense, buds and flowers secund, almost erect. *Floral bracts* 6–8 × 4 mm. *Pedicels* ± 5 mm long. *Flowers*: perianth scarlet with a bloom, 40 mm long, 8 mm across ovary, scarcely narrowed above ovary, cylindric-trigonous towards slightly upturned mouth, straight or slightly curved; outer segments free for 10–12 mm. *Stamens* exerted up to 2 mm. *Style* exerted up to 3 mm. *Flowering time*: May to June.

Diagnostic characters: inflorescence divaricately branched with oblique to subhorizontal racemes of secund flowers.

Relationships with other species: its nearest ally is *Aloe secundiflora* Engl. from eastern and northeastern Africa (Reynolds 1966).

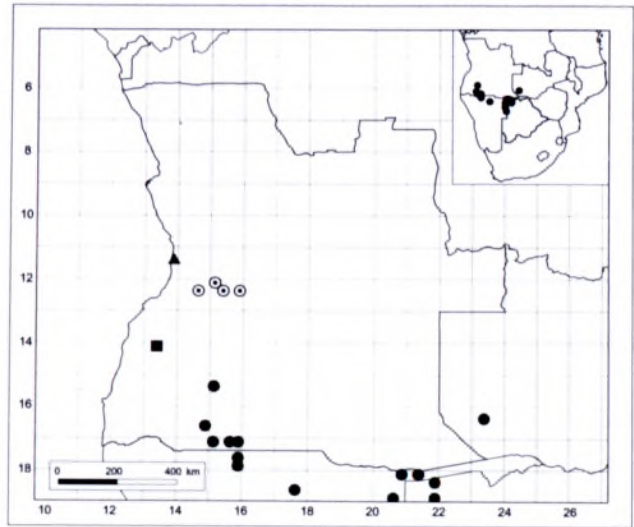


FIGURE 5.— Distribution of *Aloe esculenta*, ●; *A. guerrae*, ○; *A. inamara*, ▲; and *A. vallis*, ■.

Habitat: grassland with scattered bushes.

Distribution: endemic to Angola (Benguela, Huambo) (Figure 5).

Illustration: Reynolds: 229 (1966).

Additional specimens examined

ANGOLA.—1214: Balombo, 23 miles [37 km] E of Monte Belo, 6 miles [9.6 km] W of Balombo, (–BC), 3 July 1959, Reynolds 9325 (PRE). 1215: Benguela, Nova Lisboa, (–AA), 9 May 1937, Exell & Mendonça 1677 (LISC); Benguela, Calupiano, (–AD), 31 May 1940, Gossweiler 12600 (LISC); Bié Province, Posto do Cunje, near Silva Porto, (–BD), 1 August 1955, Reynolds 6885 (PRE).

A. hereroensis Engl. in *Botanische Jahrbücher* 10: 2 (1888), var. *hereroensis*. Type: Namibia, Usakos, 28 May 1886, Marloth 1438 (B, holo.!; NBG!, PRE!, iso.).

Acaulescent; rosettes solitary or suckering to form small clumps. *Stem* sometimes develops in older plants, up to 1 m long, simple or branched, procumbent, with persistent dried leaves. *Leaves* densely rosulate, arcuate erect, greyish green or often bronzed, obscurely lineate, usually without spots on upper surface, few to many irregularly scattered single or double H-shaped whitish spots on lower surface, ovate-lanceolate, 300–400 mm long, 60–90 mm wide at base; margin slightly cartilaginous, with pungent, reddish brown, spreading, sometimes bifid teeth, 3–4 mm long, 8–12 mm apart. *Inflorescences* up to 1 m high, erect, 4–8-branched, lower branches rebranched. *Raceme* corymbose-capitate, 60–80 mm long, very dense. *Floral bracts* 20–25 × 3–4 mm. *Pedicels* 30–50 mm long. *Flowers*: perianth scarlet, sometimes orange, 25–35 mm long, 8–9 mm across ovary, widening slightly towards middle, narrowing slightly towards upturned mouth, cylindric-trigonous; outer segments free for 14–16 mm. *Stamens* exerted 2–4 mm. *Style* exerted up to 5 mm. *Flowering time*: June to September.

Diagnostic characters: leaves obscurely lineate with spotted lower surface. Much branched inflorescence with short, broad racemes. Flowers distinctly shaped, with upturned mouth, red or sometimes orange.

Relationships with other species: *Aloe hereroensis* is included in Section *Asperifoliae* (A. Berger) Glen &

D.S. Hardy and is closely allied to *A. viridiflora* Giess from central Namibia (Glen & Hardy 2000).

Habitat: arid, stony desert conditions with very low rainfall. Usually grows on quartzite, but has been found on dolomite in the Kalahari. Confined to summer rainfall area.

Distribution: southwestern Angola (Huambo, Namibe), Namibia, South Africa (Northern Cape, Free State) (Figure 6).

Illustrations: Reynolds: 101 (1966); Rothmann: 66, 67 (2004).

Additional specimens examined

ANGOLA.—1215: Huambo, entre Alto Hama e Águas Quentes, (–BA), 20 August 1967, *Silva 2104* (LISC). 1512: Moçâmedes, andados 30 km de Moçâmedes para Dois Irmãos, (–AB), 2 May 1960, *Mendes 3898* (LISC); Benguela Province, 20 miles [32 km] NE of Moçâmedes, (–AB), 28 June 1959, *Reynolds 9283* (PRE); Moçâmedes, Caraculo, a ± 25 km para Moçâmedes, (–AB), 7 May 1962, *Santos 1007* (LISC, SRGH); Moçâmedes, Reserva de Moçâmedes junto ao limite NE, (–DA), 5 March 1969, *Teixeira 12871* (LISC); Moçâmedes, Reserva de Moçâmedes, (–DA), 11 April 1969, *Teixeira 12942* (LISC).

A. inamara L.C. Leach in Journal of South African Botany 37: 259 (1971). Type: Angola, Cuanza Sul District, S of Novo Redondo, at mouth of Quicombo River, 11 October 1970, *Leach & Cannell 14608* (LISC, holo.!, PRE, iso.!).

Plants hanging on cliff faces. *Stem* up to 2 m long, pendent, branching at base and more sparsely above, forming dense mats, without persistent dried leaves. *Leaves* rosulate on branch apices, widely spreading, curved with apices pointing downwards, pale yellowish green, turning brown when exposed, obscurely lineate with few small, whitish, H-shaped spots, more spots in transverse bands on lower surface, falcate, 450–600 \times 40–50 mm; margin whitish or faint pink, with whitish, often brown-tipped teeth, 0.3–1 mm long, 4–20 mm apart; leaf exudate yellow, not bitter. *Inflorescence* 0.4–0.55 m long, pendulous with tip upturned, 4–6-branched. *Raceme* shortly cylindrical-conical to almost subcapitate, terminal raceme ± 75 mm long, lateral racemes shorter, arcuate-ascending, lax. *Floral bracts* 7.5–9.0 \times ± 3 mm. *Pedicels* 22–27 mm long. *Flowers*: perianth dull red with greenish tips, becoming somewhat yellowish with age, 26–29 mm long, 8 mm across ovary, abruptly narrowed above ovary, enlarging towards middle, narrowing again at mouth, slightly decurved, basally truncate and inflated; outer segments free for 6.5–8.0 mm. *Stamens* not or only rarely slightly exerted. *Style* scarcely or not exerted. *Flowering time*: apparently an extended period including October.

Diagnostic characters: leaves obscurely lineate with H-shaped spots. Racemes short, sometimes almost subcapitate. Pedicels 22–27 mm long. Flowers dull red with much inflated truncate base and genitalia scarcely or not exerted.

Relationships with other species: its nearest ally appears to be *Aloe swynnertonii* Rendle from eastern south tropical Africa (Leach 1971).

Habitat: almost vertical cliff faces.

Distribution: endemic to Angola (Cuanza Sul) (Figure 5).

Illustrations: Leach: 261, 263, 264 (1971).

Notes: this species is only known from the type locality.

A. lepida L.C. Leach in Journal of South African Botany 40: 102 (1974). Type: Angola, Huambo District, Morro de Sume, ± 27 km SSE of Nova Lisboa, 15 February 1973, *Baptista de Sousa s.n. in Leach 14538A* (LISC, holo.!, SRGH, iso.).

Low, much-branched shrub, up to 0.3 m high. *Stem* branching at base, stout, erect, without persistent dried leaves. *Leaves* densely rosulate at branch apices, widely spreading, rigidly strongly recurved, bright to dark yellowish deep green, conspicuous but irregular white spots in wavy transverse bands, spots smaller and more numerous on lower surface, broadly ovate-attenuate, 200–280 \times 75–90 mm; margin with pungent, brown-tipped teeth with whitish base, 3–7 mm long, 6–12 mm apart; exudate crusty when dry. *Inflorescence* 0.3–0.5 m high, erect, 1- or 2-branched. *Raceme* cylindrical-acuminate, ± 200 mm long, lax. *Floral bracts* 6–7 \times 3.0–3.5 mm. *Pedicels* 15–20 mm long. *Flowers*: perianth pale orange-scarlet, somewhat yellowish striped, 25–29 mm long, ± 5.5 mm across ovary, narrowed above ovary, enlarging towards wide open mouth, cylindric, slightly curved; outer segments free for 5–6 mm. *Stamens* not exerted. *Style* only occasionally very shortly exerted. *Flowering time*: February to May.

Diagnostic characters: leaves dark yellowish green, strongly recurved, conspicuously marked with irregular transverse wavy bands of whitish spots, armed with large marginal teeth. Inflorescence with lax, cylindric-acuminate racemes, with buds quickly nodding. Flower slender with outer segments free for 5–6 mm, with mouth widely open, stamens included and stigma only occasionally very shortly exerted.

Relationships with other species: *Aloe lepida* seems to be closely related to *A. andongensis* and also shows a strong link in vegetative characters with *A. squarrosa* Baker from Socotra (Leach 1974).

Habitat: rocky slopes in shade of trees.

Distribution: endemic to Angola (Huambo) (Figure 6).

Illustrations: Leach: 103, 104, 105 (1974).

Additional specimen examined

ANGOLA.—1315: Huambo District, Morro de Sume, ± 27 km SSE of Nova Lisboa, (–BA), 14 May 1973, *Leach, Cannell & De Sousa 14538* (BM, PRE).

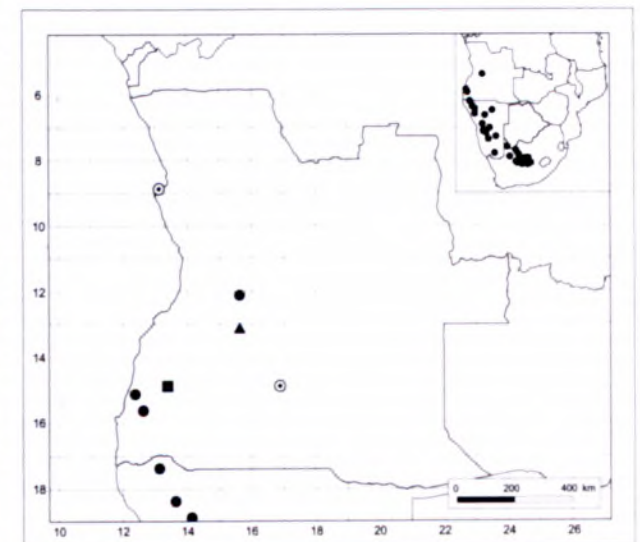


FIGURE 6.— Distribution of *Aloe hereroensis* var. *hereroensis*, ●; *A. lepida*, ▲; *A. mendesii*, ■; and *A. metallica*, ○.

A. littoralis Baker in Transactions of the Linnean Society of London 1: 263 (1878). Type: Angola, near Luanda, Barra do Bengo, 1854, *Welwitsch* 3727 (BM, holo.!; K!, LISU!, iso.-PRE, photo.).

A. rubrolutea Schinz: 39 (1896). Types: Namibia, Rehoboth, *Fleck* 497a; Namibia, !Kuisib, *Fleck* 472; Botswana, Olifantskloof, *Fleck* 263 (Z, syn.).

A. schinzii Baker: 459 (1898). Type: Botswana, Olifantskloof, April 1888, *Schinz* 42 (K, holo.!).

Solitary, arborescent plant 2–4 m high. *Stem* unbranched, erect, with persistent dried leaves. *Leaves* densely rosulate, erectly spreading to slightly recurved, pale greyish green with reddish tinge in dry conditions, without spots when mature, few spots on young plants, lanceolate, \pm 600 mm long, 100–130 mm wide at base; margin cartilaginous, yellow, with pungent, red-brown teeth, 3–4 mm long, 10–15 mm apart; leaf exudate drying yellow. *Inflorescence* 1–2 m high, erect, up to 10-branched, lower branches usually rebranched. *Racemes* narrowly cylindrical-acuminate, 300–600 mm long, lax. *Floral bracts* 12–18 \times 5–6 mm. *Pedicels* 6–10 mm long. *Flowers*: perianth pinkish red, yellowish towards tips when mature, with bloom, 27–34 mm long, 6 mm across ovary, enlarging very slightly towards middle, cylindrical and almost straight; outer segments free for 15–17 mm. *Stamens* exerted 1–2 mm. *Style* exerted 2–3 mm. *Flowering time*: July to February, varying according to locality and rainfall.

Diagnostic characters: caulescent, simple-stemmed, solitary plants. Leaves without spots when mature, few spots on young plants. No spines along median line of leaf. Inflorescence branched from low down. Flowers cylindrical, stigma seldom if ever exerted more than 3 mm.

Relationships with other species: closely allied to *Aloe esculenta* (see notes under latter species). *A. littoralis* is included in Section *Pachydendron* (Haw.) Salm-Dyck (Glen & Hardy 2000).

Habitat: usually grows on rocky outcrops in mixed open woodland and grassland. Also on calcrete or sand. Summer rain and very dry, warm to cool winters.

Distribution: Angola (Bengo, Benguela, Cuanza Norte, Cuanza Sul, Huambo, Huíla, Luanda, Lunda Norte, Malange, Moxico, Namibe), Botswana, western Mozambique, Namibia, South Africa (Limpopo), southern Zimbabwe (Figure 7).

Illustrations: Reynolds: 317, 318 (1966); Rothmann: 68, 69 (2004).

Additional specimens examined

ANGOLA.—0720: Arredores de Dundo, (–BD), April 1953, *S.c.* 135 (LISC). 0813: Luanda, (–CB), *Exell & Mendonça* 37 (LISC); Luanda, próximo da Corimba, (–CC), 29 August 1961, *Santos* 433 (LISC); Luanda, near Cacucaco, 10 miles [16 km] NE of Luanda, (–CD), 12 July 1959, *Reynolds* 9402 (PRE); Luanda, Viana, Vale do Bengo, (–CD), 23 April 1966, *Teixeira* 10326 (LISC). 0914: Luanda, Cambambe-Dondo, (–CB), 18 August 1931, *Gossweiler* 9633 (LISC); Cuanza Norte, Dondo, Rio Cuanza, (–CB), March 1938, *Gossweiler* 11963 (LISC); Cuanza Norte, Dondo, (–CB), *Gossweiler* 12613 (LISC). 0915: Malange, Cacuso, próximo do salto do Cavalo, (–DB), 15 July 1970, *Raimundo* 327 (LISC); Malange, na picada que vai da Aldeia Formosa para o salto do Cavalo, (–DB), 15 July 1970, *Raimundo, Matos & Figueira* 327 (LISC). 1013: Foz de Cuvo, (–DD), 30 March 1973, *Bamps & Martins* 4342 (LISC). 1113: Cuanza Sul, Gabela, picada para o Pau do Caçador e Gungo a 43 km de Novo

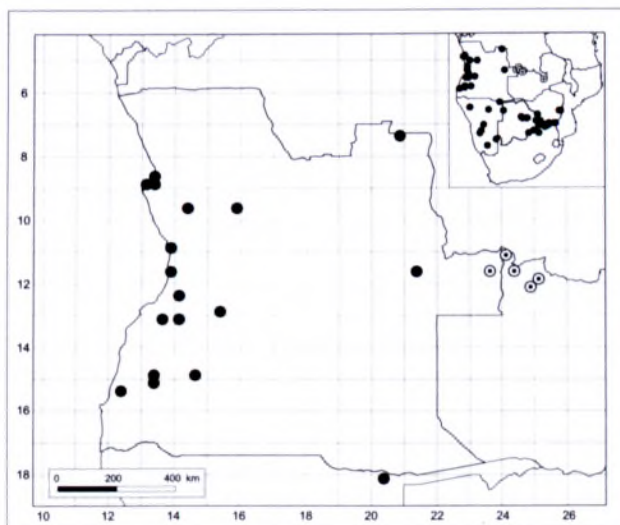


FIGURE 7.— Distribution of *Aloe littoralis*, ●; and *A. milne-redheadii*, ○.

Redondo, (–DB), 19 April 1969, *Teixeira* 11430 (LISC). 1121: Lago Calundo, (–CB), January 1955, *Machado* 358 (LISC). 1214: Lobito, 9 miles [14.5 km] W of Bocoio (Sousa Lara), 49 miles [79 km] E of Lobito, (–AC), June 1959, *Reynolds* 9317 (PRE). 1215: Benguela, Chicala-Calenga, near Sete River, (–CD), 19 June 1940, *Gossweiler* 12598 (LISC). 1313: Benguela, Catengue, (–BA), 29 July 1940, *Gossweiler* 12619 (LISC). 1314: Benguela, près de Caimbambo, (–AA), 17 February 1974, *Dechamps, Murta & Silva* 1095 (LISC). 1413: Serra da Chela, Vila Arriaga, Bibala, (–CD), 12 August 1941, *Gossweiler* 13297 (LISC); Huíla, Moçâmedes, Bibala, Cacanda, (–CD), 7 May 1960, *Mendes* 4003 (LISC); Sá da Bandeira, Mapunda, (–CD), 16 June 1963, *Santos* 1126 (LISC, LISU), Huíla, Sá da Bandeira, Mapunda, (–CD), 16 June 1963, *Santos* 1128 (LISC, LISU); Moçâmedes, Vila Arriaga, Montipa, (–CD), *Teixeira & Santos* 3855 (SRGH). 1414: Huíla, at Vila Paiva Couceiro (Quipuno), 28 miles [45 km] E of Sá da Bandeira, (–DC), 25 June 1959, *Reynolds* 9267 (PRE). 1512: Moçâmedes, 30 km a ocidente do Pico do Azevedo, (–AD), 9 March 1969, *Teixeira* 12888 (LISC). 1513: Huíla, 11 km do Jau para Bata Bata, (–AB), 30 February 1961, *Barbosa* 9554 (PRE); Serra da Chela, Tchivinguiro, Humpata, (–AB), 6 October 1941, *Gossweiler* 13346 (LISC). No grid: Cascata do Rio Cuango Muquê, 16 July 1954, *Machado* 200 (LISC).

A. mendesii Reynolds in Journal of South African Botany 30: 31 (1964). Type: Angola, Huíla District, Humpata, Tundavala escarpment, 4 July 1963, *Santos & Henriques* 1131 (LISC, holo.!; LISU!, LUAI, PRE!, iso.).

Plants growing pendent on vertical cliff faces. *Stem* usually unbranched, up to 1 m long, pendent, without persistent dried leaves. *Leaves* rosulate at stem apex, hanging downwards, green, obscurely lineate, without spots, ensiform, falcately decurved, 500 \times 70–80 mm; margin narrow cartilaginous edge, with blunt, cartilaginous teeth, 1–2 mm long, 10–15 mm apart. *Inflorescence* up to 0.6 m long, pendent, 3- or 4-branched. *Racemes* cylindrical-acuminate, 100 mm long, arcuate-ascending, dense; buds hidden by imbricate bracts. *Floral bracts* 12 \times 5 mm. *Pedicels* 18–20 mm. *Flowers*: perianth scarlet, 25 mm long, 4 mm across ovary, enlarging towards mouth, narrowing just below mouth, cylindric, slightly ventricose; outer segments free for 20 mm. *Stamens* exerted 2–3 mm. *Style* exerted up to 3 mm. *Flowering time*: April to July.

Diagnostic characters: grows hanging down on cliffs. Leaves broad, unspotted. Branched inflorescence pendent, with only racemes arcuate-ascending. Flowers scarlet. Floral bracts and pedicels relatively long.

Relationships with other species: appears to be closely allied to *Aloe vesei* Reynolds from Zambia (Reynolds 1966).

Habitat: vertical cliff faces.

Distribution: endemic to southwestern Angola (Huila, Namibe) (Figure 6).

Illustrations: Verdoorn: t. 1764 (1964); Reynolds: 170, 171 (1966).

Notes: this species is sometimes wrongly recorded as occurring in northwestern Namibia (Newton 2001). The species in Namibia with which it is mistaken is the Kaokoland endemic *A. corallina* I. Verd.

Additional specimens examined

ANGOLA.—1413: Huila, Sá da Bandeira, Tundavala, (–CD), October 1967, *Leach 14015* (PRE); Huila, Lubango, Humpata, Buraco do Bimbe, (–CD), 22 April 1960, *Mendes 3815* (LISC, para.); Huila, Lubango, Escarpa da Tundavala (serra da Chela), (–CD), 20 May 1964, *Menezes 1133* (LISC, PRE); Huila, Sá da Bandeira, Humpata, Bimbe, (–CD), 3 May 1963, *Santos 1109* (LISC, para.).

^E*A. metallica* Engl. & Gilg in Warburg, Kunene-Zambesi Expedition: 191 (1903). Type: Angola, Bié District, near Cuchi, above Capulo, 4 May 1900, *Baum 891* (B, holo.!–LISC, photo.).

Acaulescent or stem short; rosettes single. *Leaves* densely rosulate, erectly spreading, bluish grey with metallic sheen (sometimes lost, especially in cultivation), without spots or markings, broadly lanceolate-attenuate, 250–400 mm long, 70–90 mm wide at base; margin slightly reddish brown, horny, with pungent, reddish brown teeth, 2–3 mm long, 10–20 mm apart. *Inflorescence* up to 1.2 m high, erect, sparsely branched. *Racemes* narrowly cylindrical-acuminate, terminal raceme 350 mm long, dense; buds hidden by large, densely imbricate bracts. *Floral bracts* 18–20 × 8 mm. *Pedicels* 8 mm long. *Flowers:* perianth reddish pink, 32 mm long, 7 mm across ovary, enlarging slightly from middle towards mouth, slightly compressed-trigonal; outer segments free for 13 mm. *Stamens* exerted up to 2 mm. *Style* exerted up to 3 mm. *Flowering time:* April to July.

Diagnostic characters: bracts long, white, prominently nerved. Apical buds of racemes at first covered by densely imbricate bracts.

Relationships with other species: Reynolds (1966) placed *Aloe metallica* in his Group 9. It keys out with *A. massawana* Reynolds (now a synonym of *A. eumasawana* S. Carter & M. G. Gilbert) from eastern Africa, *A. vacillans* Forssk. and *A. officinalis* Forssk. from Yemen.

Habitat: top of rocky gorge, between high sandstone rocks. *Distribution:* endemic to Angola (Cuando-Cubango, Luanda) (Figure 6).

Illustration: Reynolds: 152 (1966).

Additional specimens examined

ANGOLA.—0713: Luanda, estrada da Corimba, (–CC), 7 March 1971, *Henriques 1329* (LISC, LISU). 1416: Cuchi River Gorge, (–DD), *Leach 13850* (PRE); Menongue, Cuchi, Cáquima, Rio Cuchi, (–DD), 3 April 1960, *Mendes 3444* (LISC), 16 July 1964, *Reynolds 10104* (LISC, PRE).

A. milne-redheadii Christian in Journal of South African Botany 6: 177 (1940a). Type: Angola, Moxico District, between River Zambezi and River Lusavo, *Milne-Redhead 4253 ex Christian 926* (SRGH, holo.; K, iso.).

Acaulescent or with short stem, suckering to form dense clumps. *Leaves* densely rosulate, erect and curving inward, greyish green to brownish green, becoming slightly reddish in dry conditions, densely white-spotted on both surfaces, spots more copious on lower surface and arranged in transverse bands, ovate-lanceolate, 200–300 mm long, 60–80 mm wide at base; margin cartilaginous, with minute, brown-tipped teeth, 2–3 mm long, 10–15 mm apart. *Inflorescence* 0.6–0.9 m high, erect, 1–7-branched. *Raceme* narrowly cylindrical-acuminate, 200–250 mm long, dense. *Floral bracts* 5–6 × 2–3 mm. *Pedicels* 13–18 mm long. *Flowers:* perianth bright coral-red, 28–35 mm long, ± 8 mm across ovary, slightly narrowed above ovary, curved and widening towards mouth, cylindrical-trigonal; outer segments free for 10 mm. *Stamens* exerted 0–1 mm. *Style* exerted 1–2 mm. *Flowering time:* June to July.

Diagnostic characters: racemes short, rather dense. *Pedicels* long. *Leaves* copiously spotted with spots in transverse bands. *Plants* forming clumps.

Relationships with other species: its nearest ally is *Aloe bukobana* Reynolds from Rwanda, Burundi and Tanzania (Reynolds 1966).

Habitat: ridges of hills.

Distribution: eastern Angola (Moxico), northwestern Zambia (Figure 7).

Illustration: Reynolds: 110 (1966).

Additional specimen examined

ANGOLA.—1123: Moxico District, between River Zambezi and River Lusavo, (–DA), material from type plant, 7 July 1941, *Verdoorn PRE29568* (PRE).

A. nuttii Baker in Hooker's, Icones plantarum: t. 2513 (1897). Type: Zambia, Fwambo, South of Lake Tanganyika, 1896, *Nutt s.n.*; Zambia, Fwambo, 1894, *Carson 29* (K, syn.!–PRE, photo.).

A. brunneo-punctata Engl. & Gilg: 189 (1903). Type: Angola, Longa, oberh. Minnesera, 2 February 1900, *Baum 698* (B, holo.; BR!, E!, K!, M!, iso.–PRE, photo.).

A. corbisieri De Wild.: 29 (1921). Type: DRC, Katanga, Elisabethville, Welgelegen, 1912, *Corbisier 623* (BR, syn.); DRC, Lukafu, February 1900, *Verdick 417* (BR, syn.).

A. mketiensis Christian: t. 785 (1940b). Type: Tanzania, Inringa District, Sao Highlands, north of Mketi, 17 June 1938, *Pole Evans & Erens 795* (PRE24803) (PRE, holo.).

Grass aloe, growing singly or with 2 or 3 stems, sometimes up to 12 and more tufted stems. *Stems* very short or up to 0.2 m long, erect. *Leaves* rosulate, erectly spreading, sometimes deflexed at about middle, green, upper surface sometimes obscurely lineate, usually with few pale spots near base, lower surface usually copiously spotted near base, spots occasionally spinulose, grass-like and subfleshy, linear, 400–500 mm long, up to 40 mm at dilated base, abruptly narrowed to 15–20 mm, tapering towards apex; margin very narrow, white, with densely crowded, minute, white, soft, cartilaginous teeth, up to 1 mm long. *Inflorescence* 0.6–0.8 m high, erect, unbranched. *Raceme* cylindrical-acuminate, 150–200 mm long, dense; buds entirely covered by large imbricate bracts. *Floral bracts* 15–25 × 10–20 mm. *Pedicels* 25–35 mm long. *Flowers:* perianth coral-pink to orange-red with green tips, 35–42 mm long, 7–9 mm across

ovary, not narrowed above ovary, cylindrical-trigonus, base tapering into pedicel; outer segments free almost to base or for $\frac{3}{4}$ of length. *Stamens* not exerted. *Style* exerted 0–1 mm. *Flowering time*: January to March, depending on locality and rainfall.

Diagnostic characters: leaves grass-like, rosulate. Flowers salmon-pink.

Relationships with other species: its nearest ally is *Aloe buehneri* Baker from Malawi (Reynolds 1966).

Habitat: montane grassland, often on rocky slopes.

Distribution: southeastern Angola (Cuando-Cubango), southern Democratic Republic of the Congo, Malawi, southwestern Tanzania, northern Zambia (Figure 8).

Illustrations: Christian: t. 762 (1940c); Reynolds: 33, 34 (1966); Lane: 9 (2004).

Additional specimens examined

ANGOLA.—1417: Menongue, Vila Serpa Pinto, vale do Rio Cabumbé, (–DB), 15 February 1960, *Mendes* 2575 (LISC). 1517: Menongue, andados 50 km de Caiundo para Vila Serpa Pinto, (–BC), 4 February 1960, *Mendes* 2354 (LISC). 1519: Bié, Menongue, Rio Cuito, Vale do ribeiro Sobi, (–AC), 13 March 1906, *Gossweiler* 4213 (LISC). 1718: Menongue, entre Longa e Vila Serpa Pinto, vale do Luassingua, (–CA), 22 March 1960, *Mendes* 3243 (LISC). No grid: Longa, oberh. Minnesera, 2 February 1900, *Baum* 698 (BM, BR, E, K, M–PRE, photo.); Moxico, between Kangeshi River and Kaboli River, 20 January 1938, *Milne-Redhead* 4260 (K–PRE, photo.).

A. paedogona A. Berger in *Journal of Botany, British and Foreign* 44: 57 (1906). Type: Angola, Malange, June 1903, *Gossweiler* 946 (BM, holo.!; K, iso.).

Acaulescent, with leaf bases enlarged below ground to form bulb-like swelling; rosettes single, rarely suckering to form small groups. *Leaves* rosulate, usually deciduous, erectly spreading to slightly recurved, green, obscurely lineate, sometimes with few scattered whitish spots, surface smooth, ensiform, 450 × 50–60 mm; margin whitish, cartilaginous, with firm unevenly spaced teeth, 3 mm long, 5–40 mm apart. *Inflorescence* up to 2 m high, erect, 3–5-branched. *Racemes* cylindrical-conical to subcapitate, 70 mm long, dense. *Floral bracts* 15–25 × 4–6 mm. *Pedicels* 25–30 mm long. *Flowers*:

perianth yellow-green, ± 35 mm long, 9–11 mm across ovary, constricted above ovary, forming globose basal swelling, enlarging towards middle, narrowing towards mouth; outer segments free only at tips. *Stamens* not exerted. *Style* exerted up to 2 mm. *Flowering time*: September to April.

Diagnostic characters: underground bulb. Leaves ± 450 × 50–60 mm, with firm teeth of ± 3 mm long. Unusual shape of flowers with globose basal swelling. Floral bracts linear-lanceolate, long-acuminate, 15–25 mm long.

Relationships with other species: Reynolds (1966) considered *Aloe paedogona* to be conspecific with *A. buettneri* together with *A. bulbicaulis*. Carter (1994) stated that the three taxa are morphologically clearly distinct and also separated geographically and therefore does not agree with Reynold's opinion that the three taxa are conspecific.

Habitat: floodplains, woodland, savanna and grassland.

Distribution: Angola (Bié, Huambo, Huíla, Malange), northern Namibia (Figure 8).

Illustrations: as *Aloe buettneri* in Rothmann: 46, 47 (2004).

Additional specimens examined

ANGOLA.—0915: Malange, near Mateti, 20 miles W of Malange, (–BD), 10 April 1960, *Reynolds* 9384 (PRE). 0916: Malange, type locality, (–CB), July 1959, *Reynolds* 9388 (PRE). 1117: Malange, (–DA), 1903, *Almeida s.n.* (LISC); Malange, Capunda, Mulundo, Reserva da Palanca Preta, picada do Luasso, (–BC), 5 August 1965, *Correia* 3013 (LISC); Malange, Capunda, Mulundo, Reserva da Palanca Preta, (–BC), 6 August 1965, *Henriques* 575 (LISC, LISU), 19 August 1965, *Menezes* 1984 (LISC). 1215: Nova Lisboa, 24 miles [38.5 km] E of Balombo, 134 miles [215.5 km] E of Lobito on road to Nova Lisboa, (–AC), 31 March 1960, *Reynolds* 9328 (PRE). 1216: Bié Province, 4 miles [6.5 km] E of Chinguar, about midway between Silva Porto and Nova Lisboa, (–CB), 31 January 1960, *Reynolds* 9234 (PRE). 1217: Bié, between Coemba and Cuanza River, (–CB), *Exell & Mendonça* 1752 (LISC). 1315: Caconda, Cunene River, Cadincololo, (–CC), 27 July 1905, *Gossweiler* 1792 (LISC). 1415: Ganguelas, Dongo, ribeiro Cussaba, (–DA), 1 August 1905, *Gossweiler* 1807 (LISC). 1416: Huíla, Ganguelas, Vila Artur de Paiva, (–AD), 25 January 1960, *Mendes* 2175 (LISC).

A. palmiformis Baker in *Transactions of the Linnean Society of London* 1: 263 (1878). Type: Angola, Huíla District, Morro de Lopolo, April 1860, *Welwitsch* 3726 (BM, holo.!; K!, LISU!, iso.).

Shrubby plants. *Stem* very slender, 1.0–1.5 m long, erect, sparsely branched mostly at base, with persistent dried leaves. *Leaves* rosulate at branch apices, arcuate-ascending-recurved or spreading-recurved, dull green with reddish tinge, lower surface with many small, crowded, pale green almost white spots towards base, narrowly lanceolate-attenuate, up to 300 × 50 mm; sheath lineate, 10 mm long; margin with prominent, pungent, pale brown teeth, 4–5 mm long, 10 mm apart; leaf exudate crusty when dry. *Inflorescence* 0.4–0.5 m high, erect, up to 4-branched, sometimes simple in young plants. *Raceme* cylindrical, slightly acuminate, 100–150 mm long, lax. *Floral bracts* 2–3 × 2 mm. *Pedicels* 13–15 mm long. *Flowers*: perianth rose-scarlet, 30 mm long, 5.5 mm across ovary, slightly enlarging towards mouth, cylindrical-trigonus; outer segments free for 10 mm. *Stamens* exerted up to 1 mm. *Style* exerted up to 2 mm. *Flowering time*: April to June.

Diagnostic characters: stems very slender, usually sparsely branched. Leaves sometimes unspotted on both

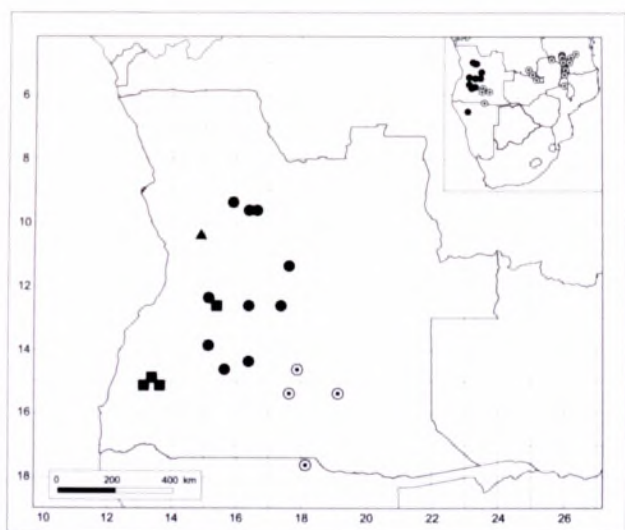


FIGURE 8.— Distribution of *Aloe nuttii*, ○; *A. paedogona*, ●; *A. palmiformis*, ■; and *A. procera*, ▲.

sides, usually copiously spotted on lower surface near base. Marginal teeth prominent. Inflorescence usually 2- or 3-branched, 0.4–0.5 m high.

Relationships with other species: it is closely allied to *Aloe gossweileri* (Reynolds 1966).

Habitat: among standstone rocks in woodland.

Distribution: endemic to Angola (Huambo, Huila, Namibe) (Figure 8).

Illustrations: Reynolds: 354, 355 (1966).

Additional specimens examined

ANGOLA.—1215: Benguela, Capanga, Veva, (–CB), 17 June 1940, *Gossweiler 12599* (LISC). 1413: Huila, Lubango, Tundavala, ao km 16, (–CD), 27 April 1971, *Borges 119* (LISC, PRE); Huila, Lubango, Humpata, pr. do Perimetro Florestal, (–CD), 15 April 1960, *Mendes 3604* (LISC); Huila, Sá da Bandeira, 7 miles [11 km] NE of Humpata, 8 miles [13 km] SW of Sá da Bandeira, (–CD), 29 June 1959, *Reynolds 9292* (BM, PRE); Huila, Sá da Bandeira, Humpata, próximo de Bimbe, (–CD), 3 May 1963, *Santos 1110* (LISC, LISU); Huila, Sá da Bandeira, Humpata, a 6 km de Sá da Bandeira, (–CD), 3 May 1963, *Santos 1112* (LISC, LISU). 1513: Morro de Lopolo, near Huila village, 16 km SE of Sá da Bandeira, (–AA), 27 May 1965, *Reynolds 9288* (LISC, PRE); Huila, Serra do Lopolo, pr. Cascata, (–BA), 20 May 1966, *Correia 3824* (LISC).

A. procera L.C.Leach in Journal of South African Botany 40: 117 (1974). Type: Angola, Cuanza Sul District, ± 50 km N of Quibala, 12 July 1972, *Leach & Cannell 14617* (LISC, holo.; BM, LISC!, SRGH, iso.).

Solitary rosettes, erect. *Stem* short, up to 0.25 m, sometimes acaulescent. *Leaves* densely rosulate, erectly spreading, very slightly recurved at apex, pale green, obscurely lineate, without spots, ovate-attenuate, apical portion drying out, up to 550 mm long including withered apical portion, 80–95 mm wide; margin narrow, cartilaginous, pale yellow, with orange-brown tipped teeth, 1.5–3.5 mm long, 10–18 mm apart. *Inflorescence* 2.2–2.75 m high, erect, 9–12-branched, lower branches rebranched. *Raceme* cylindrical, 250–400 mm long, oblique, lax; buds and flowers secund. *Floral bracts* 5–6 × ± 4 mm. *Pedicels* 1.5–5 mm long. *Flowers:* perianth dull reddish purple, 28–33 mm long, 5–6 mm across ovary, not or only slightly narrowed above ovary, slightly widening at mouth, fairly straight, cylindric-trigonous; outer segments free for 9–11 mm. *Stamens* slightly exserted. *Style* exserted up to 6 mm. *Flowering time:* July to August.

Diagnostic characters: leaves pale green, 80–95 mm wide, apical portion dry and withered. Inflorescence remarkably tall, up to almost 3 m, branched above middle, with long laxly flowered racemes of small purple flowers, subtended by small few-nerved bracts.

Relationships with other species: this species belongs to the group containing *Aloe christianii* from south and central tropical Africa, *A. pretoriensis* from northern South Africa and Zimbabwe and *A. luapulana* L.C.Leach from Zambia, but has its closest affinity with *A. guerrae* (Leach 1974).

Habitat: tall grass in deciduous woodland on steep hillside.

Distribution: endemic to Angola (Cuanza Sul) (Figure 8).

Illustration: Leach: 119 (1974).

Additional specimen examined

ANGOLA.—1014: Cuanza Sul, 50 km N of Quibala, (–BD), 6 August 1972, *Leach & Cannell 14617B* (PRE).

A. rupicola Reynolds in Journal of South African Botany 26: 89 (1960). Type: Angola, Bié District, Chimbango, rocky hills 3 miles [5 km] S of Chinguar, 19 June 1959, *Reynolds 9243* (PRE, holo.; K!, LUAI, iso.).

Arborescent plant, 2–3 m (sometimes up to 5 m) high. *Stem* erect, simple or branched at base, 100–120 mm diam., without persistent dried leaves. *Leaves* densely rosulate, suberectly spreading to spreading, green, obscurely lineate on upper surface, more prominently lineate on lower surface towards base of leaf, lanceolate, apical portion usually drying out, 300–350 mm long plus 100 mm dried apical portion, 60 mm wide; margin with pungent, reddish brown teeth, 4–5 mm long, 10 mm apart; leaf exudate drying pale yellow. *Inflorescence* 0.7–0.9 m high, erect, 3–5-branched. *Racemes* cylindrical, 150–180 mm long, dense. *Floral bracts* ± 9 × 5 mm. *Pedicels* ± 12 mm long. *Flowers:* perianth orange-scarlet, 42 mm long, 7 mm across ovary, slightly enlarged above ovary towards mouth, cylindrical-trigonous, slightly clavate; outer segments free for 21 mm. *Stamens* exserted 2–3 mm. *Style* exserted up to 3 mm. *Flowering time:* June to July.

Diagnostic characters: stems averaging 2–3 m, mostly simple or branched from the base. Old dry leaf remains not persistent. Leaves obscurely lineate on upper surface, more prominently lineate on lower surface, especially in lower half. Perianth slightly clavate.

Relationships with other species: its closest ally appears to be *Aloe volkensii* Engl. from eastern Africa (Reynolds 1966).

Habitat: rocky hills.

Distribution: endemic to Angola (Bié) (Figure 9).

Illustrations: Reynolds: 323, 324 (1966).

Notes: this species is only known from the type locality.

A. scorpioides L.C.Leach in Journal of South African Botany 40: 106 (1974). Type: Angola, Moçâmedes District, near Humbia, towards base of W escarpment of Serra de Chela, April 1973, *Leach & Cannell 14654* (LISC, holo.; BM!, BR, K!, LUA, LUAI, M!, MO!, PRE, SRGH, ZSS, iso.).

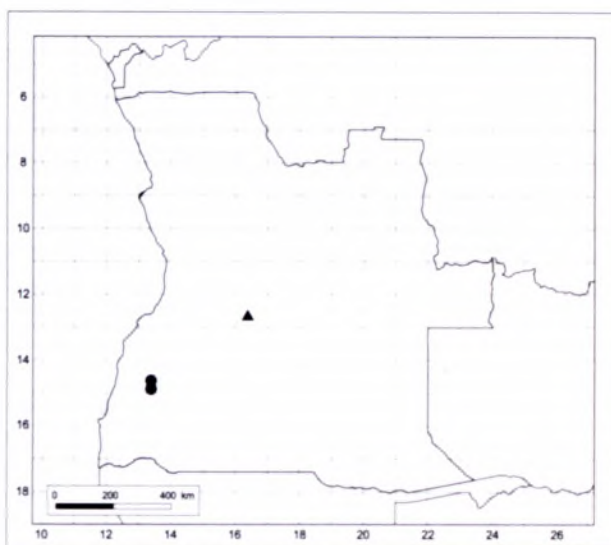


FIGURE 9.— Distribution of *Aloe rupicola*, ▲; and *A. scorpioides*, ●.

Low scrambling shrub, up to 0.5 m high, rarely up to 1 m. *Stem* branching at base and above, slightly divergent, usually widely spreading, only rarely erect, with persistent dried leaves. *Leaves* rosulate at branch apices, more cauline dispersed below, spreading or somewhat recurved, yellowish green, upper surface without spots, lower surface darker, obscurely lineate, rarely with few spots near base, very narrowly ovate-acuminate, up to $300 \times 25\text{--}35$ mm; sheath striate, 10–20 mm long; margin with pungent, yellowish or brownish tipped teeth, somewhat forward-hooked, 2–3 mm long, 10–15 mm apart; leaf exudate crusty when dry. *Inflorescence* ± 0.15 m long, descending at base and curving upwards, simple or 1- or 2-branched. *Raceme* narrowly conical or cylindrical-acuminate, 110–250 mm long, laterals usually shorter, dense. *Floral bracts* $\pm 6.5 \times$ up to 3.5 mm. *Pedicels* 6–10 mm long. *Flowers*: perianth scarlet, yellow-striped with green at base, 21–28 mm long, ± 7 mm across ovary, narrowed above ovary, enlarging towards wide-open mouth, cylindric-trigonous; outer segments free for 8.5–10.0 mm. *Stamens* exserted. *Style* exserted up to 2.5 mm. *Flowering time*: April to May.

Diagnostic characters: plants scrambling and shrubby in habit. Leaves yellow-green, almost invariably immaculate, with small marginal teeth. Inflorescence with very slender peduncle, which is at first usually descending, then arcuately-ascending, with the rather dense, narrow, acuminate racemes held erect. Buds suberect. Flowers curved. Bracts large, prominently nerved, orange-brown.

Relationships with other species: its closest relative seems to be *Aloe palmiformis* Baker (Leach 1974).

Habitat: rocky slopes, often in shade of woodland.

Distribution: endemic to Angola (Huila, Namibe) (Figure 9).

Illustrations: Leach: 107, 108 (1974).

Additional specimen examined

ANGOLA.—1413: Moçâmedes, western slopes of the Serra da Chela, ± 14 miles [22.5 km] W of Sá da Bandeira, (–CB), 21 April 1972, Reynolds 9275 (LISC).

†A. vallis L.C. Leach in Journal of South African Botany 40: 111 (1974). Type: Angola, Huila District, Serra da Chela escarpment, cliffs W of Tchivinguiro, 23 April 1973, Leach & Cannell 14651 (LISC, holo.!; BM!, BR!, K!, LISC!, LUAI, M!, MO!, PRE!, SRGH, WIND, ZSS, iso.).

Shrubby plant, 0.3–0.5 m high. *Stem* branched from base; rosettes tilted to one side, greyish or greenish blue to bluish green. *Leaves* rosulate at branch apices, more widely spaced below, few small, oval or round, whitish spots near base, more spots on lower surface, narrowly ovate-attenuate, $220\text{--}340 \times 40\text{--}50$ mm; sheath copiously spotted; margin narrow, yellowish, with pungent, yellowish, orange- or brown-tipped teeth, 2.0–2.5 mm long, 10–12 mm apart; leaf exudate frothy, drying to opaque, crystalline, yellow crust. *Inflorescence* 0.5–0.6 m, oblique or suberect, simple or divaricately 1-branched. *Racemes* narrowly elongate cylindrical-acuminate, terminal raceme 250–450 mm long, lateral raceme 170–300 mm long, oblique, lax. *Floral bracts* up to 4.5×2.5 mm. *Pedicels* 4.0–4.5 mm long. *Flowers*: perianth bright scarlet, somewhat purplish at apex, mouth becoming

yellowish at maturity, 20–25 mm long, ± 5 mm across ovary, narrowed slightly above ovary, enlarging slightly towards open mouth, slightly curved, cylindric; outer segments free for 4.5–6.0 mm. *Stamens* and *style* not or scarcely exserted up to 1 mm. *Flowering time*: April.

Diagnostic characters: very shrubby plant of relatively dwarf stature, with stem branched from base. Rosettes of grey-blue to blue-green leaves tilted to one side. Inflorescence simple or 1-branched from low down, with narrow acuminate racemes. Short, bright scarlet flowers with outer segments free for only 4.5–6.0 mm carried on relatively short pedicels.

Relationships with other species: it appears to be most closely allied to *Aloe gossweileri* and *A. catengiana* (Leach 1974).

Habitat: cliffs.

Distribution: endemic to Angola (Namibe) (Figure 5).

Illustrations: Leach: 113 (1974).

Notes: this species is only known from the type locality.

†A. venenosa Engl. (insufficiently known sp.) in Botanische Jahrbücher 15: 471 (1893). Type: Angola, Lunda, between Quimbundu and Nyangwe, 20 May 1882, P. Pogge 1460 (B, holo.–LISC, photo!).

Growth form unknown. *Leaves* 350×70 mm; margins with teeth, 6–7 mm long. Inflorescence copiously paniculate. *Raceme* 250–350 mm long. *Pedicels* 25 mm long. *Flowers*: perianth pale red, 27–30 mm long. *Flowering time*: May.

Relationships with other species: unknown.

Distribution: endemic to Angola (Lunda Norte or Lunda Sul).

Notes: this species has not been located since the type specimen was collected by Pogge in May 1882. The true identity of this species, therefore, remains a mystery. Furthermore, the type locality is extremely vague: Quimbundu is in northeastern Angola, whereas Nyangwe is in the eastern Democratic Republic of the Congo. It is therefore possible that this species was not collected in Angola, but in the Democratic Republic of the Congo.

A. zebrina Baker in Transactions of the Linnean Society of London 1: 264 (1878). Type: Angola, Loanda District, Barra do Bengo, Quicuxe towards Cacucaco, July 1854, Welwitsch 3721 designated by Reynolds (1966) (LISU, lecto.!; BM!, G!, K!, isolecto.–LISC, photo!).

A. platyphylla Baker: 264 (1878). Type: Angola, Pungo Andongo, 1879, Welwitsch 3722 (K, lecto.!; BM, G!, LISU!, isolecto.).

A. constricta Baker: 168 (1880). Type: Mozambique, near Sena, 8 April 1860, Kirk 34 (K, holo.).

A. lugardiana Baker: 135 (1901). Type: Botswana, Botletle River, 30 June 1897, Lugard 2 (K, holo.).

A. baumii Engl. & Gilg: 191 (1903). Type: Angola, Chirumbu, 14 October 1899, Baum 275 (B, holo.; E, iso.).

A. bamangwatensis Schönland: 122 (1904). Type: Botswana, Palapye Road, March 1904, Schönland 1656 (GRA, holo.; PRE, iso.).

Acaulescent; rosettes sometimes solitary or usually suckering to form groups. *Leaves* densely rosulate, spreading, dull green, upper surface with transverse bands of conspicuous, whitish, oblong spots, lower surface usually obscurely or copiously spotted, lanceolate, usually dried

and twisted at apex, 150–350 mm long, 60–70 mm wide at base; margin with stout, pungent, red-brown teeth, 4–7 mm long, 10–15 mm apart; leaf exudate yellowish, drying purplish or orange. *Inflorescence* 0.75–2 m high, erect, 4–12-branched, lower branches often rebranching. *Racemes* narrowly cylindrical-acuminate, 300–400 mm long, very lax. *Floral bracts* 6–15 × 2–3 mm. *Pedicels* 6–15 mm long. *Flowers*: perianth dull red to pinkish red or coral-coloured with paler segment margins, 25–35 mm long, basally inflated to 7–9 mm across ovary, abruptly constricted just above ovary, widening towards mouth, slightly decurved, cylindrical-trigonous; outer segments free for 7–11 mm. *Stamens* exerted 1–2 mm. *Style* exerted up to 2 mm. *Flowering time*: variable, (November) February to April (May), or June to July, depending on the locality.

Diagnostic characters: spotted aloe. Upper leaf surface always conspicuously spotted, spotting on lower surface varies. Very laxly flowered racemes, 300–400 mm long; pedicels 6–15 mm long; perianth averaging 30 mm.

Relationships with other species: *Aloe zebrina* belongs to the Section *Pictae* Salm-Dyck or maculate aloes (Glen & Hardy 2000).

Habitat: variety of veld types and soil, mostly grassland and thickets on dry hills.

Distribution: Angola (Bengo, Cuando-Cubango, Cuanza Sul, Cunene, Huambo, Huila, Luanda, Lunda Sul, Malange, Moxico), Botswana, western Mozambique, Malawi, northern Namibia, South Africa (North-West), Zambia, Zimbabwe (Figure 10).

Illustrations: Reynolds: 90 (1966); Rothmann: 94, 95 (2004).

Additional specimens examined

ANGOLA.—0813: Luanda, entre a foz do Dande e a estrada de Caxito, (–AD), 18 July 1964, *Barbosa 10831, 10832* (LISC); Luanda, Quicuxe, (–BD), *Welwitsch 3720, 3724 & 3725* (K, LISU); Luanda, Caxito, praia de S. Tiago a caminho do Dande, (–CB), 8 May 1958, *Monteiro, Santos & Murta 119* (LISC, LISU); Luanda, near Cacuaço, 10 miles [16 km] NE of Luanda, (–CD), 12 July 1959, *Reynolds 9406* (PRE); Luanda, Icola e Bengo, near Dande River, (–DA), June 1944, *Gossweiler 13299* (LISC). 0817: Malange, Cambo, Montalegre, (–CC), 27 May 1948, *Rocha 75* (LISC). 0915: Cuanza Norte, Catete, (–BB), 1930, *Gossweiler 9210* (LISC); Pungo Andongo, (–DA), 1879,

Welwitsch 3722 (G, K). 0920: Lunda, near Vila Henrique de Carvalho, (–CA), 22 April 1937, *Exell & Mendonça 921* (LISC); Lunda, Dala, (–CA), 25 April 1937, *Exell & Mendonça 1134* (LISC). 1013: Cuanza Sul, Porto Amboim, estrada S. Filipe-Porto Amboim, a 10 km de S. Filipe, (–DB), 27 April 1967, *Teixeira 11553* (LISC). 1215: Huambo, Nova Lisboa, Chianga, (–DB), 1 June 1971, *Fernando 4* (LISC). 1320: Moxico, (–BA), *Exell & Mendonça 1662* (LISC). 1413: Huila, Sá da Bandeira, Hoque, (–DB), 2 June 1966, *Henriques 1022* (LISC, LISU); Huila, Lubango, Sá da Bandeira, arredores, próximo da escola do Marquês, (–DC), 7 March 1972, *Couto 192* (LISC); Huila, Sá da Bandeira, Vio, (–DC), 4 May 1965, *Henriques 378* (LISC, LISU). 1417: Menongue, entre Cuchi e Vila Serpa Pinto, vale do Luassenha, (–CA), 4 April 1960, *Mendes 3460* (LISC). 1418: Cuito-Cuanavale, andados 40 km de Longa para Cuango, (–BD), 18 March 1960, *Mendes 3175* (LISC). 1513: Huila, Humpata, Tchivinguiro, (–AB), 24 April 1972, *Menezes 4087* (LISC); Huila, Lubango, ao km 17 da estrada para a Chibia, (–BA), 24 April 1965, *Menezes 1590* (LISC); Huila, próximo da Missão Católica, (–BA), 10 February 1956, *Santos 182* (LISC). 1515: Ganguelas, entre os Rios Cubango e Cunene, Rio Oxo, (–BA), 4 August 1905, *Gossweiler 1834a* (LISC). 1516: Menongue, Cuito, vale de Sobi, (–BD), 15 March 1906, *Gossweiler 3704* (LISC). 1519: Cuando-Cubango, Cuito-Cuanavale, sede, (–AA), July 1967, *Pereira s.n.* (LISC). 1614: Roçadas, Centro de Estudos do Cunene, (–DD), 27 March 1970, *Silva 3151* (LISC). 1714: top of Ruacanã Falls, on Angolan side, (–AC), *Rycroft 2435* (NBG). No grid: Moxico, S of Luhanda River, 15 January 1938, *Milne-Redhead 4146* (K–PRE, photo).

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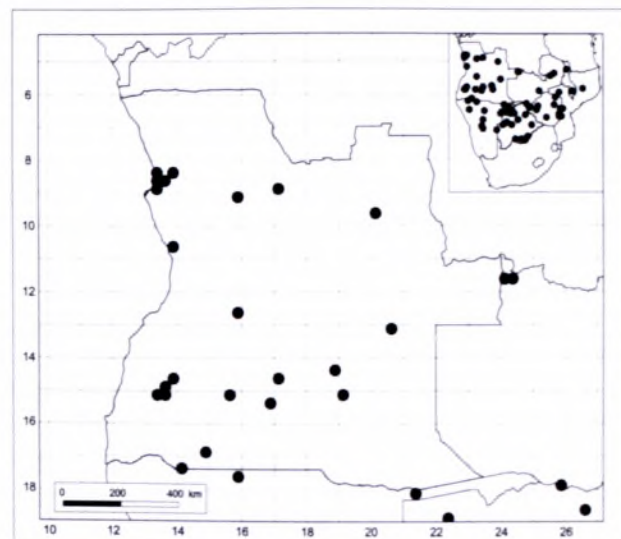


FIGURE 10.— Distribution of *Aloe zebrina*.

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