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## An annotated catalogue of *Aloe* and *Aloiampelos* (Asphodelaceae subfam. Aloioideae) naturalised and escaped in continental Portugal

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### Abstract

Three species of *Aloe*, namely *A. arborescens*, *A. maculata*, and *A. vera*, have been formally recorded as naturalised in the region covered by the *Flora iberica* project, which includes the Iberian Peninsula [Portugal and Spain] and the Balearic islands [an archipelago of islands and islets off the east coast of Spain, in the western Mediterranean Sea]. All three species occur in both Portugal and Spain. At least one further aloe, *A. ×nobilis*, is here formally recorded as naturalised in Portugal. We provide an updated, annotated catalogue of the alooids naturalised or escaped in Portugal, the southwestern-most country included in the *Flora iberica* project. Apart from these four naturalised taxa in *Aloe*, *Aloiampelos ciliaris* var. *ciliaris*, is also recorded as having escaped from cultivation.

**Key words:** cultivated, *Flora iberica*, occurrence, succulents

### Introduction

In the treatment of the Liliaceae for the *Flora iberica* project, which covers the Iberian Peninsula [Portugal and Spain] and the Balearic islands [an archipelago of islands and islets off the eastern coast of Spain, in the western Mediterranean Sea], three species of *Aloe* Linnaeus (1753: 319) were recorded as having become naturalised in the region (Güemes 2013: 308–314). The aloes are *A. arborescens* Miller (1768: first page headed “ALO-ALO”, species # 3), *A. maculata* Allioni (1773: 65 [13]), and *A. vera* (Linnaeus 1753: 320) Burman filius (1768: 83). Historically, *Aloe* and its generic relatives were included in the Liliaceae (see for example Coutinho 1896: 78, Hutchinson 1959: 91, but see Hutchinson 1948: 245, 254) or in the Aloaceae (see for example Smith & Newton 2001: 102–103), but at present is classified in the Asphodelaceae subfam. Aloioideae [following APG II (The Angiosperm Phylogeny Group 2003), see also Klopper (2023)] or Asphodelaceae subfam. Asphodeloideae [following APG IV (The Angiosperm Phylogeny Group 2016)]. This group of plants is most speciose in southern Africa and Madagascar. The genus *Aloe* is also naturally present on the Arabian Peninsula and in the Mascarene Islands (Smith & Figueiredo 2020: 477). The only other subfamily, Asphodelaceae subfam. Asphodeloideae [following APG II (The Angiosperm Phylogeny Group 2003)], has a wide natural geographical distribution range in the Old World and occurs from southern through tropical Africa to Mediterranean Europe and western Asia (Smith & Van Wyk 1998), with present-day centres of species diversity in Mediterranean-climate southern Africa and Europe’s Mediterranean region.

Recent fieldwork in Portugal yielded an additional aloe, *A. ×nobilis* Haworth (1812: 78), *pro sp.*, apart from *A. arborescens*, *A. maculata*, and *A. vera*, as having become naturalised along Portugal's southwestern Alentejo and southern Algarve coasts. A further alooid, *Aloiampelos ciliaris* (Haworth 1825: 281) Klopper & Gideon F.Sm. in Grace *et al.* (2013: 10) var. *ciliaris*, has escaped from cultivation, especially along the west-central coast of Portugal in the vicinity of Lisbon and indications are that it is on the brink of becoming naturalised.

We here provide an updated, annotated catalogue of the alooids variously naturalised in Portugal. An identification key to distinguish among the species is provided and all the taxa are illustrated. Where appropriate, taxa with which the naturalised alooids can be confused are also illustrated.

## Material and methods

The occurrence and spread of alooids in Portugal have been recorded on several occasions during sporadic fieldwork conducted over the past *ca.* 20 years. Descriptions of the various taxa recorded are based on comparative morphological studies of living, naturalised or cultivated alooid material, specifically in Portugal, and on data extracted from the Aloes of the World database. Measurements were taken by hand using a ruler, except for floral measurements below 4 mm, which were taken using hand-held magnifying equipment.

Plant invasion terminology used in this paper is predominantly based on Pyšek *et al.* (2004: 135–136, Box 1), i.e.:

- “alien plants” = “Plant taxa in a given area whose presence there is due to intentional or unintentional human involvement”; and
- “naturalised plants” = “Alien plants that sustain self-replacing populations for at least 10 years without direct intervention by people (or in spite of human intervention) by recruitment from seed or ramets capable of independent growth”.

Taxa that are not “weeds” in the sense of Pyšek *et al.* (2004: 135–136, Box 1) are here referred to as “casual and escaped taxa”.

Following Beentje & Williamson (2010: 44), “ephemeral” refers to plants that remain for a very short time and soon disappear.

The descriptions of the alooids recorded for Portugal mostly follow the Aloes of the World descriptive template (see Smith *et al.* 2008a, b), but with slight amendments to make them comparable to the descriptions included in *Flora iberica* (Güemes 2013: 308–314).

Provinces follow *Flora iberica* (Güemes 2013: XVIII, also see map on inside front cover): AAl (Alto Alentejo), Ag (Algarve), BA (Beira Alta), BA1 (Baixo Alentejo), BB (Beira Baixa), BL (Beira Litoral), DL (Douro Litoral), E (Estremadura), Mi (Minho), R (Ribatejo), TM (Trás-os-Montes).

Author attributions of the scientific plant names cited follow IPNI (2023+), albeit in the format required by *Phytotaxa*, i.e., protologues of names are cited as full bibliographic references. For the sake of clarity and accuracy the full author citations, in *Phytotaxa* style, are given at first mention of a scientific plant name in the text, as well as under ‘Results’, below, where the respective taxa are discussed individually.

## Results

The content provided under the headings used in the species treatments specifically refer to Portugal.

1. *Aloe arborescens* Miller (1768: first page headed “ALO-ALO”, species # 3) (Fig. 1A–F).

**Locally used synonyms:**—None recorded.

**Common name(s):**—*Portuguese:* aloé, aloé-candelabro, babosa, foguetes-de-natal, vela (Güemes 2013: 312). *English:* candelabra aloe, krantz aloe (Grace *et al.* 2011).

**Description:**—Shrub, 1.5–3.5 m tall, much-branched. *Stems* erect to slanted sideways, upper parts clothed in persistent dried leaves. *Leaves* densely rosulate at branch apices, spreading-recurved, 40–60 cm long, 4–7 cm wide at base, lanceolate-attenuate, dull green to grey-green, distinctly tinged reddish in dry conditions, lacking whitish maculations, texture smooth; *margin* whitish, not horny; *marginal teeth* 5–20 mm apart at mid-leaf, 3–5 mm long, firm, pale; *exudate*

pale yellow. *Inflorescence* 0.6–1.0 m long, erect, usually simple, occasionally with 1 or 2 short branches. *Raceme* 20–35 cm long, conical to conical-cylindric, dense-flowered. *Floral bracts* 15–20 × 10–12 mm. *Pedicels* 30–40 mm long. *Flowers*: *perianth* 30–40 mm long, 7 mm across ovary, of ± even diameter throughout, very slightly narrowed above ovary, widening to middle, narrowing slightly towards mouth, apices flared, cylindric-trigonous, bright orange to scarlet, dark green-tipped in bud, often turning pinkish at anthesis; *outer segments* free to base; *stamens* and *style* exerted to 6 mm. *Capsule* ± 2 cm long, oblong.



**FIGURE 1.** *Aloe arborescens* in Portugal. **A.** Cultivated in beds next to the Estufa Fria, Lisbon. Photograph taken on 30 December 2013. **B.** Cultivated near the old town centre of Coimbra, en route to the University of Coimbra. Photograph taken on 8 January 2018. **C.** Cultivated in the Botanical Garden of the University of Porto. Photograph taken on 22 December 2017 (see Smith & Figueiredo 2014). **D.** Escaped into natural vegetation at Nazaré, Estremadura (see Smith & Figueiredo 2009). Photograph taken on 4 October 2008. **E.** Naturalised at Praia da Ilha Pessegueiro, along the Alentejo Litoral coast, near Porto Covo. Photograph taken on 30 December 2017. **F.** Naturalised at Porto Covo. Photograph taken on 30 December 2017. All photographs by Gideon F. Smith.

**Flowering time:**—(November–)December–January(–February).

**Habitat:**—Mostly on coastal rocky slopes (Franco & Afonso 1994: 46).

**First mention of the species as naturalised in Portugal:**—1980 (Webb 1980: 21).

**Localities recorded:**—Franco & Afonso (1994: 46) recorded it for “CW. olissip., CS.arrab.”, and Pedro (1991: 105) recorded it for Arrábida, i.e., in the centre, in the Lisbon area. Güemes (2013: 312) recorded it for E and Ag. Presently the distribution is extended to: DL, BL (for example at Nazaré), E (for example at Cascais, Oeiras, Lisbon, and Arrábida), BAI (for example at Praia da Ilha do Pessegueiro and Porto Covo), and Ag.

**Country / region of origin:**—Southern Africa, from the Cape Peninsula (where it has arguably become naturalised), along the south and east coast of South Africa, somewhat inland through the provinces of Western Cape, Eastern Cape, and KwaZulu-Natal, and in the interior of Mpumalanga and Limpopo, just entering the eastern Free State, as well as further north, in south-tropical Africa, to Mozambique and the eastern mountains of Zimbabwe and Malawi (Smith *et al.* 2008, 2012a).

**Secondary distribution range:**—*Aloe arborescens* is sparingly naturalised worldwide in areas with a Mediterranean climate. It is reportedly known from the western Mediterranean area: France (Riviera and Corsica; Tison & de Foucault 2014), Spain (for example Guillot Ortiz *et al.* 2008, Aymerich & Sáez 2019), Gibraltar (Lamb 1996), Italy (naturalised only in Sardegna, casual elsewhere; Galasso *et al.* 2018, Pavone *et al.* 2022), and Malta (Mifsud 2022). It is furthermore naturalised in the Canary Islands (Dobignard & Chatelain 2010; elsewhere in northern Africa, it is probably merely cultivated or ephemeral). It is also naturalised on the eastern coast of Australia (New South Wales, Queensland, and Victoria; Randall 2007, Weeds of Australia 2023), New Zealand (Schönberger *et al.* 2021), California in the U.S.A., Japan, South Korea, and the Marshall Islands. In some areas of its secondary range, *A. arborescens* is considered to be a minor environmental weed.

The origin of most of the *A. arborescens* plants now grown in the northern hemisphere, is likely from plants cultivated at the Cape of Good Hope (now in the Western Cape Province of South Africa) in the 17<sup>th</sup> and 18<sup>th</sup> centuries. Using leaf exudate chemistry, Reynolds & Herring (1991) proved that the origin of *A. arborescens* growing in Gibraltar is indeed from the Western Cape, South Africa, and not from further north in the natural distribution range of the species.

**Status in Portugal:**—Naturalised.

**References:**—Webb (1980), Franco & Afonso (1994), Almeida & Freitas (2006), Smith & Figueiredo (2009), Almeida (2012), Güemes (2013), Silva *et al.* (2015).

**Notes:**—*Aloe arborescens* is a distinctive, large-growing species of up to 5 m tall. It grows as a much-branched shrub with rather robust stems and branches, as opposed to *Aloiampelos ciliaris* that has thin, slender, and weak branches. The greyish green leaves are carried in dense rosettes, with the leaves sporting pale yellow teeth on the margins. Stems and branches are usually clothed in the dried remains of desiccated leaves. The inflorescences—elongated, conical racemes—are usually simple and dense-flowered (Smith *et al.* 2008c, 2012a, Klopffer *et al.* 2020: 21).

It is not known whether *A. arborescens* introduced to Portugal was definitely from South Africa, where it occurs virtually along the entire southern and eastern coasts, from the Cape Peninsula eastwards, and would have been easily detected by passing ships that made landfall, for example at Plettenberg Bay (Figueiredo & Smith 2017: 31), or instead sourced from Mozambique, a former Portuguese colony, where it is also indigenous, or from both countries. Similar uncertainty surrounded the original location from which *A. spicata* Linnaeus filius (1782: 205) was collected and taken to Portugal (Glen & Hardy 1995, 2000: 118–119).

Regardless of the origin of material of *A. arborescens* that is grown in Portugal, the species is very commonly cultivated in the country, from the Algarve in the south to at least as far north as Porto (Fig. 1A–C).

*Aloe arborescens* was recently recorded from Nazaré (Smith & Figueiredo 2009) (Fig. 1D). The species is here recorded for the first time from Praia da Ilha Pessegueiro (Fig. 1E) and from Porto Covo (Fig. 1F), two locations along the Alentejo coast.

Mateus *et al.* (2015) recorded a species of thrips, *Hercinothrips dimidiatus* Hood (1937: 105) (Thysanoptera: Thripidae), on *A. arborescens* from several localities in the vicinity of Lisbon. This was the first record of this thrips species for Europe, and Mateus *et al.* (2015) speculate that its introduction into Portugal resulted from infected plants from South Africa having entered Portugal via Lisbon, a major port city. *Hercinothrips dimidiatus* was first described from South Africa. Material of *A. arborescens* from well beyond Lisbon, for example from Coimbra, appears to also have been infected with the thrips (personal observations by GFS and EF).

2. *Aloe maculata* Allioni (1773: 65 [13]) subsp. *maculata* (Fig. 2).

**Locally used synonyms:**—*Aloe saponaria* (Aiton 1789: 467) Haworth (1804: 17).

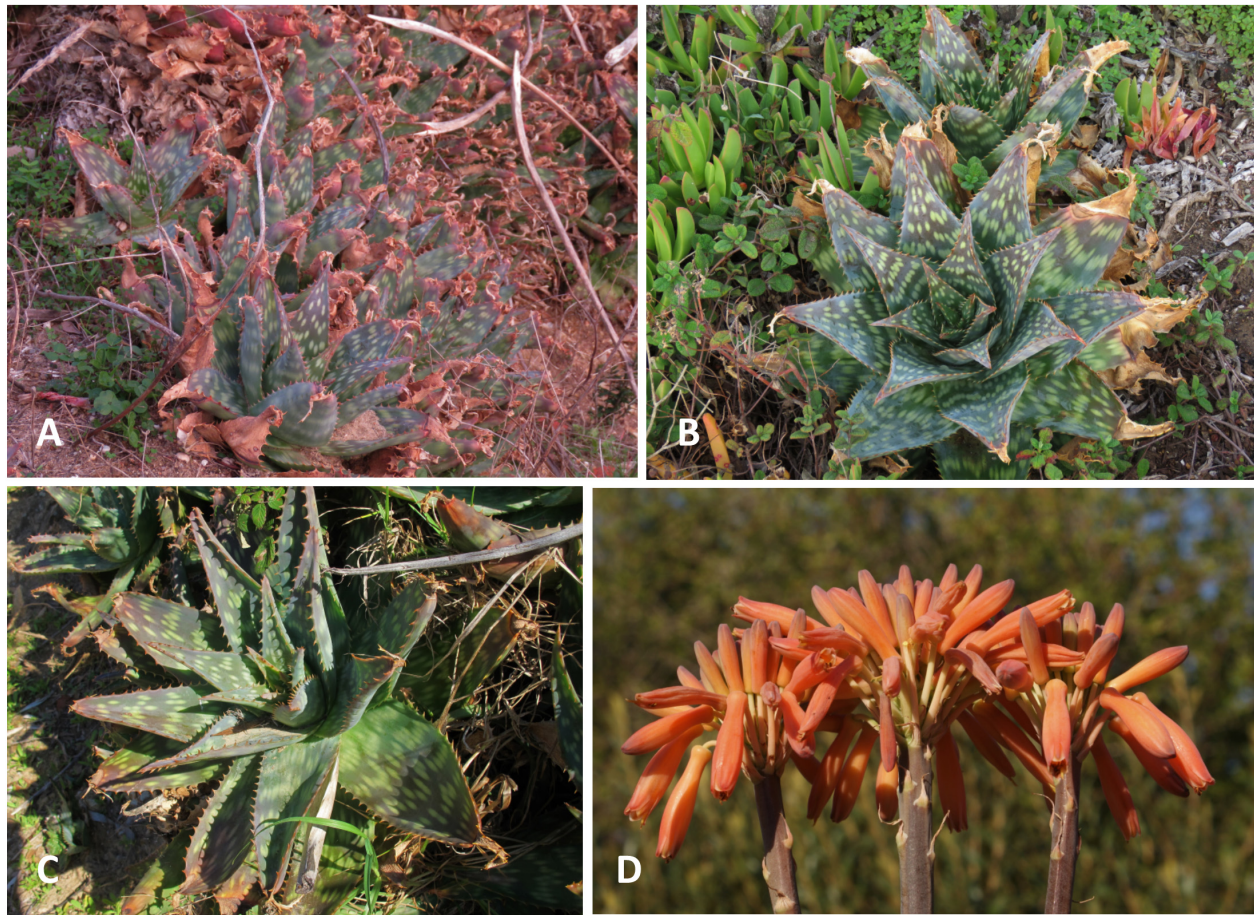
**Common name(s):**—*Portuguese:* álve-manchado. *English:* soap aloe (Grace *et al.* 2011).

**Description:**—Plants acaulescent or with *stem* up to 0.5 m tall; *rosettes* solitary or suckering to form dense groups. *Leaves* densely rosulate, erectly spreading to slightly recurved, up to 25–30 × 8–12 cm, ovate-lanceolate, with dried twisted apex, adaxial surface pale to darker green, with numerous, dull, H-shaped or irregularly shaped, white maculations in irregular broken, wavy, transverse bands, abaxial surface paler green, obscurely lineate and usually without maculations; *margin* horny, brown; *marginal teeth* ± 10 mm apart, 3–5 mm long, pungent, reddish brown; *exudate* clear. *Inflorescence* 0.4–1.0 m high, erect, branched. *Racemes* 10–12 cm long, capitate-corymbose, dense. *Floral bracts* ± 12–23 × 3–5 mm. *Pedicels* 35–45 mm long. *Flowers:* *perianth* 35–50 mm long, up to 10 mm across ovary, abruptly constricted above ovary to form sub-globose basal swelling, enlarging towards wide open mouth, slightly decurved, usually salmon pink to orange; *outer segments* free for 10–15 mm; *stamens* exerted 1–3 mm; *style* exerted to 5 mm. *Capsule* (2.0–)2.5–3.0 cm long, oblong.

**Flowering time:**—April–July.

**Habitat:**—On old (stone) walls and in abandoned gardens (Almeida 2012: 209). A range of sites in natural vegetation, including on coastal cliffs and sand dunes.

**First mention of the species as naturalised in Portugal:**—1998 (*vide* Almeida & Freitas 2006: 119).



**FIGURE 2.** *Aloe maculata* in Portugal. **A.** Naturalised at Almogrove along the Baixo Alentejo coast. Photograph taken on 29 December 2017. **B.** Naturalised at Porto Covo along the Alentejo Litoral coast. Photograph taken on 30 December 2017. **C.** Naturalised at Malveira da Serra, Almoinhas Velhas, in Cascais, near metropolitan Lisbon. Photograph taken on 28 September 2014. **D.** Close-up of an inflorescence that carries salmon-orange flowers. The racemes are distinctly capitate and flowers have prominent basal swellings. All photographs by Gideon F. Smith.



**FIGURE 3.** Two nothospecies with which *Aloe maculata* can be confused. **A.** *Aloe*  $\times$  *schimperii* [*A. maculata*  $\times$  *A. striata*] cultivated in the Botanical Garden of the University of Porto, Porto. Note the distinctly pinkish leaf margins, a character inherited from *A. striata*. **B.** The flowers of *A. xschimperii* lack the prominent basal swellings present in *A. maculata*. Both photographs A and B were taken on 22 December 2017. **C.** The rosettes of *A. xcommutata* [*A. grandidentata*  $\times$  *A. maculata*] resemble those of *A. maculata*, but, as shown in **D**, its inflorescences are elongated (not capitate) and the flowers of this nothospecies, too, lack basal swellings, as found in *A. grandidentata*. Both photographs C and D were taken in the Huntington Botanical Gardens, San Marino, California, U.S.A., on 27 April 2011. All photographs by Gideon F. Smith.

**Localities recorded:**—Almeida (2012: 209, as “*Aloe saponaria*”) recorded it as casual in BL (Alhadas) and Ag (Sagres). Güemes (2013: 314) recorded it for E (Serra d’El Rei), BAI, and Ag. Silva *et al.* (2015: 69–70, 75) recorded it as casual and escaped at Cascais, Oeiras, north of Lisbon. It is here recorded at the following further localities; São João do Estoril (E); Almogrove, Porto Covo (BAI), Cabo de Sagres (Ag).

**Country / region of origin:**—Southern Africa. It occurs from the Cape Peninsula through the provinces of Western and Eastern Cape, into the eastern Free State, through KwaZulu-Natal to Mpumalanga, South Africa, as well as in Lesotho and Eswatini.

**Secondary distribution range:**—*Aloe maculata* is very sparingly naturalised in areas with a Mediterranean climate. It is reportedly known as such from the western Mediterranean area: France (Provence and Corsica; Tison & de Foucault 2014), Spain (Guillot Ortiz *et al.* 2008, Aymerich & Sáez 2019), Gibraltar (Lamb 1996), and Malta (Mifsud 2022; erroneously as ‘*A. microstigma* subsp. *microstigma*’). In Italy, it is a mere casual (Galasso *et al.* 2018).

It is furthermore locally naturalised in the Canary Islands (unpublished records by FV) and in Algeria in North Africa (Sakhraoui *et al.* 2023). It is also naturalised in parts of Australia (Randall 2007, Weeds of Australia 2023) and New Zealand (Schönberger *et al.* 2021). In some areas of its secondary range, *A. maculata* is considered to be an environmental weed.

**Status in Portugal:**—Naturalised. It was previously recorded in a list of “more or less naturalised” taxa (Almeida & Freitas 2006: 118), and later recorded as casual (Almeida 2012: 209) and as “Casual. Cultivated, escaped” (Silva *et al.* 2015: 75).

**References:**—Almeida & Freitas (2006); Almeida (2012); Güemes (2013); Silva *et al.* (2015).

**Notes:**—*Aloe maculata* has been recorded as naturalised in the Iberian Peninsula, in Spain and Portugal (Almeida & Freitas 2006: 119, Guillot Ortiz *et al.* 2008: 28–32, Almeida 2012: 209, Güemes 2013: 312). In places in Portugal the species has become naturalised through self-replacing populations and is now spreading without human aid. At some locations *A. maculata* has become invasive.

*Aloe maculata* is a distinctive species that can be easily identified based on the adaxial leaf surface that is spotted, often densely so, with whitish maculations (Fig. 2A–C) and its capitate inflorescences (Fig. 2D). Depending on the provenance of material of this species, flowering can take place at virtually any time of the year. Thus far only summer-flowering material of *A. maculata* has been observed in Portugal.

The only alooid material cultivated in Portugal with which *A. maculata* can be confused is *A. ×schimperi* Todaro (1878: 70, plate 16) [*A. maculata* × *A. striata* Haworth (1804: 18)] (Fig. 3A–B), of which the arguably better known name *A. ×schoenlandii* Baker (1902: 430), as ‘*Schönlandi*’, *pro sp.*, is a synonym (Figueiredo & Smith 2016: 14). However, the leaf margins of *A. ×schimperi* are distinctly pinkish—a character inherited from *A. striata*—and the flowers lack the prominent basal swellings evident in the flowers of *A. maculata*.

*Aloe ×commutata* Todaro (1876: 75, t. 18) (Fig. 3C–D) (see Figueiredo & Smith 2012), of which the parents are *A. grandidentata* Salm-Dyck (1822: 3 [species no. 2]) and *A. maculata*, has a similar, typically ‘maculate aloe’-like vegetative morphological appearance as *A. maculata*. However, *A. ×commutata* has elongated racemes (not capitate ones) and clavate (not basally inflated) flowers, and the leaf margins are concolorous, unlike those of *A. ×schimperi* that are pinkish. Thus far we have not observed *A. ×commutata* in cultivation anywhere in continental Portugal, although it is popular as a garden subject in some parts of the world, for example in the Boyce Thompson Arboretum, in Superior, Arizona, U.S.A. (see Smith 2005) and in the Huntington Botanical Gardens, in San Marino, California, U.S.A. (see Smith 1997), but, interestingly, not in South Africa, from where its parents originate.

In *A. maculata*, one other subspecies, *A. maculata* subsp. *ficksburgensis* (Reynolds 1937: 148) Gideon F.Sm. & Figueiredo in Smith *et al.* (2012b: 15), is recognised, which is only known from the eastern Free State, South Africa, and western Lesotho. This subspecies has not been observed in continental Portugal.

### 3. *Aloe ×nobilis* Haworth (1812: 78) *pro sp.* (Fig. 4).

**Locally used synonyms:**—None recorded.

**Common name(s):**—*Portuguese:* None recorded. *English:* golden tooth aloe.

**Description:**—Plants acaulescent or with short *stem* up to 0.2 m long; *rosettes* profusely suckering from the base to form large, dense, mound-shaped clusters. *Leaves* generally densely rosulate, erectly spreading to slightly in- or recurved, 10–15 × (2–)4–6 cm, lanceolate-triangular to lanceolate-deltoid, dark green, white maculations generally lacking, both ad- and especially abaxial surfaces sometimes with scattered teeth on white base; *margin* concolorous; *marginal teeth* ± 10 mm apart, (3–)5 mm long, firm, white to slightly yellowish. *Inflorescence* 0.5–0.8 m high, erect, sometimes 1-branched. *Racemes* 10–20(–30) cm long, cylindrical-conical, subdense. *Floral bracts* ± 15–18 × (5–)6 mm. *Pedicels* 25–30 mm long. *Flowers:* *perianth* 35–40 mm long, 6–8 mm across ovary, of ± even diameter throughout, very slightly narrowing towards mouth, ± straight, cylindric, bright orangey red; *outer segments* free for 10–12 mm; *stamens* exerted 2–4 mm; *style* exerted to 5 mm. *Capsules* not seen.

**Flowering time:**—(May–)June–July(–September).

**Habitat:**—Coastal dunes.

**First mention of the species as naturalised in Portugal:**—Not previously recorded.

**Localities recorded:**—Ag (Praia do Amado, near Portimão).

**Country / region of origin:**—A hybrid that very likely originated in Europe.

**Secondary distribution range:**—*Aloe ×nobilis* is very rarely reported as an escape, doubtlessly owing to it being confused with *A. mitriformis* Miller (1768: first page headed “ALO-ALO”, species # 1), one of its alleged parents. It can be reasonably assumed that at least some of the naturalised populations of the latter in fact refer to *A. ×nobilis*.

Guillot Ortiz & Laguna Lumbreras (2019) published the first Spanish (and European) record of *A. ×nobilis* in the wild. Its status in Spain is uncertain; however, in Catalonia it is considered to be merely ephemeral (Aymerich & Sáez 2019).



**FIGURE 4.** *Aloe ×nobilis* in Portugal. **A.** The leaves are dark green, often more so when growing in shaded positions, as here. Leaf margins are concolorous and carry rather widely spaced, firm, white to slightly yellowish teeth, which gave rise to the English common name, golden tooth aloe. In full sun the leaves are usually distinctly reddish-infused. **B.** The cylindrical-conical, subdense racemes are up to 30 cm long. Photograph taken on 29 June 2012 of a plant cultivated in central Portugal. **C.** *Aloe ×nobilis* (in the container on the right) is commonly cultivated in Portugal, here in a domestic garden near the town of Serra de Santo António in the centre of the country. A  $\times$ *Gasteraloe* Guillaumin (1931: 339) hybrid [*Aloe*  $\times$  *Gasteria* Duval (1809: 6)] grows in the container on the left. Photograph taken on 1 January 2013. **D.** Naturalised in dune vegetation at Praia do Amado, near Portimão, Algarve. Photograph taken on 17 September 2013. All photographs by Gideon F. Smith.

**Status in Portugal:**—Naturalised.

**References:**—Smith & Figueiredo (2015a: 156, 2015b: 75).

**Notes:**—*Aloe ×nobilis* is most often misidentified as *A. perfoliata* Linnaeus (1753: 319–320). The name *A. perfoliata* is variously interpreted, with, most recently, the proposal having been made that the name applies to what has been known consistently as *A. microstigma* Salm-Reifferscheid-Dyck (1854: 6, § 26, f. 4) (Mottram 2013; see also Klopper *et al.* 2016). However, the true identity of *A. perfoliata* remains uncertain (Klopper *et al.* 2016).

Reynolds (1950: 385) and Grace *et al.* (2011: 110) suggest *A. arborescens* and *A. mitriformis* as possible parents of *A. ×nobilis*. Based on its comparatively small stature, Smith & Figueiredo (2015a: 156, 2015b: 75) speculate that *A. brevifolia* Miller (1768: first erratum page) and *A. mitriformis* could be the parents of this hybrid. However, the



leaves of the latter two species, especially those of *A. brevifolia*, are generally variously glaucous green, while those of *Aloe ×nobilis* are a deep green colour (Fig. 4A, C–D). The subdense, cylindrical-conical inflorescences of *A. ×nobilis* are reminiscent of those of *A. brevifolia* (Fig. 4B). All three putative parents have been in cultivation in Europe for several centuries (Cullen 1986: 159 [*A. brevifolia*], 160 [*A. mitriformis*, in error as *A. perfoliata*], 161 [*A. arborescens*]). *Aloe ×nobilis* itself was not mentioned in Webb (1980) nor in Cullen (1986) though. Note that reference to *A. perfoliata* in Webb (1980: 20 [species # 6]) is in fact to *A. mitriformis*, as evidenced by, inter alia, mention of “Racemes [...] subcapitate”.

*Aloe ×nobilis* is clearly an old hybrid that has remained well-known in European horticulture. In the late-1700s, it was for example illustrated by the Bauer brothers for Father Boccius’s *Liber regni vegetabilis*, also known as *Codex Liechtenstein*, some years before it was formally named by Adrian H. Haworth in 1812 (Mabberley 2017: 3). This nothospecies has remained popular in outdoor cultivation in parts of southern Europe with a mild-climate (Fig. 4C), but also thrives under glass in more severe climates.

#### 4. *Aloe vera* (Linnaeus 1753: 320) Burman filius (1768: 83) (Fig. 5).

**Locally used synonyms:**—*Aloe barbadensis* Miller (1768: first page headed “ALO-ALO”, species # 2).

**Common name(s):**—*Portuguese:* aloé, aloé-de-Barbados, azebre, azebre-vegetal, azevre, babosa, cacto-dos-aflitos, cura-câncros, erva-azebra, erva-babosa, erva-que-arde, planta-dos-milagres, planta-mistério, planta-que-cura. *English:* medicinal aloe (Grace *et al.* 2011).

**Description:**—Plants acaulescent or with very short *stem* up to 0.3 m; suckering at base to form dense groups. *Leaves* densely rosulate, erectly spreading, generally straight, up to 30–60 × 5–8 cm, lanceolate-attenuate, dull greyish green, sometimes with scattered, dull, irregularly shaped, whitish maculations when young, maculations generally lacking at maturity; *margin* concolorous to pinkish; *marginal teeth* 1–2 mm long, 10–15(–20) mm apart, harmless, firm, pale to whitish; *exudate* yellow. *Inflorescence* 0.5–1.0 m high, erect, sometimes 1- or 2-branched. *Racemes* 30–50 cm long, cylindrical acuminate, dense. *Floral bracts* ± 10 × 5–7 mm. *Pedicels* ± 5 mm long. *Flowers:* slightly to distinctly ventricose; *perianth* 25–30 mm long, up to 8 mm across ovary, narrowing towards mouth, slightly upcurved, yellow, green-tipped and -lined in bud; *outer segments* free for 15–18 mm; *stamens* exerted 3–5 mm; *style* exerted to 5 mm. *Capsule* 1.5–2.0 cm long, oblong.

**Flowering time:**—(March–)May–June(–July).

**Habitat:**—Maritime rocks (Coutinho 1939: 151); escarpments and sea cliffs (Franco & Afonso 1994: 45).

**First mention of the species as naturalised in Portugal:**—1896 (Coutinho 1896: 78, as “*Aloe vulgaris*”). Coutinho (1896) based the record on material collected between Sines and Vila Nova de Milfontes (BAI) by Friedrich Welwitsch who had an interest in succulents cultivated in Portugal (Figueiredo *et al.* 2018).

**Localities recorded:**—Coutinho (1939: 151) recorded it from the coast of the same province, i.e., BAI. Later, Franco & Afonso (1994: 46) recorded it as rare in “SW mer.”, i.e. the southern west coast (BAI). Almeida (2012: 209) and Güemes (2013: 312) also recorded it for BAI only. Mabberley & Placito (1993: 47) further recorded it as naturalised at Praia D. Ana, Lagos (Ag).

**Country / region of origin:**—Uncertain (see Newton 2020: 675–676 for a discussion).

**Secondary distribution range:**—*Aloe vera* is widely naturalised, especially in areas with a Mediterranean climate. It was first indicated as escaped on the Iberian Peninsula by Colmeiro (1874: 1) and its naturalisation has been reported from many countries in the Mediterranean area, for example Spain (e.g. Guillot Ortiz *et al.* 2008), Gibraltar (Lamb 1996, as *A. barbadensis*), Italy (naturalised only in the southernmost areas, casual elsewhere; Galasso *et al.* 2018, Musarella *et al.* 2020), Malta (Mifsud 2022), and Greece (Arianoutsou *et al.* 2010). It is furthermore naturalised in the Atlantic Islands (Canary Islands, Madeira) and most of North Africa (Morocco, Tunisia, Algeria, and Libya) (Dobignard & Chatelain 2010). It is also naturalised in, among others, India, Indonesia, Mexico, and the Caribbean. In some areas of its secondary range, *A. vera* is considered to be an invasive species.

**Status in Portugal:**—Naturalised.

**References:**—Coutinho (1939), Webb (1980), Franco & Afonso (1994), Almeida & Freitas (2006), Almeida (2012), Güemes (2013).

**Notes:**—Globally, *A. vera* is the most important medicinal aloe and it is widely cultivated for various leaf components (see for example Reynolds 2004 and Grace *et al.* 2015) (Fig. 5A–B). It is therefore unsurprising that it has become naturalised in various parts of the world.

In Portugal, *A. vera* is essentially a summer-flowering species with a relevant, at the time, contemporary mention of its cultivation given by Gomes & Beirão (1852). Some variation has been observed in the timing of flowering,

especially in other parts of the world, but plants generally do not flower in winter. The flowers of *A. vera* are yellow (Fig. 5C–D), but also in this case, some variation is evident, with orangey red flowers having been recorded in some variants of the species. *Aloe indica* Royle (1839: 390) has been interpreted as such a red-flowered variant of *A. vera* (see Reynolds 1966: 145, 150, 524). However, non-yellow-flowering material of *A. vera* is yet to be formally recorded as naturalised in Portugal.



**FIGURE 5.** *Aloe vera* in Portugal. **A.** Potted specimens of *A. vera* (plant on the left) and *A. ×nobilis* (plant on the right) grown on a windowsill in Caldas da Rainha, Estremadura. Especially *A. vera* is often kept near a kitchen with its leaf juices used to treat minor burns and skin abrasions. Photograph taken on 11 September 2011. **B.** Grown in a large plant container on the stoep of a house near the town centre in Golega, in the centre of the country. Photograph taken on 17 January 2018. **C.** A branched inflorescence. **D.** Close-up of flowers and buds. All photographs by Gideon F. Smith.

5. *Aloiampelos ciliaris* (Haw.) Klopper & Gideon F.Sm. in Grace *et al.* (2013: 10) var. *ciliaris* (Fig. 6).

**Locally used synonyms:**—*Aloe ciliaris* Haworth (1825: 281).

**Common name(s):**—*Portuguese:* None recorded. *English:* climbing aloe, rambling aloe, scrambling aloe.

**Description:**—Much-branched, tangled shrub. *Stems* long and slender, up to 5–6 m long, 1.0–1.5 cm diam., repeatedly branched, scandent, only terminal 0.3–0.6 m with leaves. *Leaves* cauline-dispersed, spreading to recurved, green, without spots, rather thin, linear-lanceolate, long acuminate, 10–15 cm long, 1.5–2.5 cm wide; sheath distinctly auriculate with ciliate margin, cilia 2–4 mm long, obscurely green-lineate, 5–15 mm long; margin with firm, white, cartilaginous teeth,  $\pm 1$  mm long,  $\pm 3$  mm distant. *Inflorescence* 0.2–0.3 m long, ascending, arising laterally below apical leaves, usually simple, sometimes with short branch. *Peduncle* 0.12–0.15 m long, biconvex at base, with few scattered, deltoid-subulate sterile bracts,  $\pm 5$  mm long. *Racemes* broadly cylindrical, 8–15 cm long, 4–5 cm wide, erect, sparse to subdense to dense; buds spreading, flowers nodding to pendulous when open. *Floral bracts* ovate-acuminate, 4–5 mm long, 1–2 mm wide, white, thin, scarious, 3-nerved. *Pedicels* 5–8 mm long. *Flowers:* *perianth* orange to orange-red to scarlet red with yellowish green tips, 28–35 mm long,  $\pm 5$  mm across ovary, enlarging slightly to  $\pm 7$  mm towards mouth, slightly clavate or cylindrical; outer segments free for 6 mm, tips straight or slightly incurved; *stamens* with filiform-flattened filaments, exerted 2–4 mm; *ovary* 4 mm long, 2 mm diam., pale green; *style* exerted 3–4 mm. *Fruit* capsule oblong,  $\pm 18 \times 9$  mm. *Chromosome number:*  $2n = 42$  (hexaploid).

**Flowering time:**—(November–)December–January(–February), i.e., generally during mid- to late-winter, but can sporadically flower during any month of the year.

**Habitat:**—Vicinity of gardens where it is cultivated, for example through surplus material being irresponsibly discarded.

**First mention of the species as naturalised in Portugal:**—Not previously recorded as naturalised. It is here recorded as casual and escaped.

**Localities recorded:**—E (Malveira da Serra, Cascais and Ulgueira, Sintra).

**Country / region of origin:**—Eastern Cape, South Africa.

**Secondary distribution range:**—*Aloiampelos ciliaris* is very sparingly naturalised, especially in areas with a Mediterranean climate. In Mediterranean Europe its local naturalisation has been reported from Spain (Aymerich & Sáez 2019). Elsewhere in the Mediterranean area and on the Atlantic Islands, it is considered to be an ephemeral escape (see for example Galasso *et al.* 2018 and Dobignard & Chatelain 2010). It is also naturalised in, among other places, Australia (Randall 2007) and New Zealand (Schönberger *et al.* 2021). In some areas of its secondary range, *A. ciliaris* is considered to be an invasive species.

**Status in Portugal:**—Casual and escaped. Previously recorded as “Cultivated” (Silva *et al.* 2015: 75).

**References for the area:**—Liberato & Caixinhas (2006: 8), Sirovs (2014).

**Notes:**—The alooids, in particular the genus *Aloiampelos* Klopper & Gideon F.Sm. in Grace *et al.* (2013: 10), have long horticultural and research histories in Portugal, especially through cytogenetics and taxonomic work conducted by Flávio Resende (1907–1967) on this predominantly southern African group (Figueiredo *et al.* 2019, Smith & Figueiredo 2019: 36, Smith & Silva 2019, Smith *et al.* 2020). While working on the cytogenetics of a range of alooids at the University of Lisbon, Portugal, Resende described several new taxa at the rank of *forma* in species of rambling aloe, a group that, at the time, was interpreted as *Aloe* ser. *Macrifoliae* Haworth (1825: 280), later as *A. sect. Macrifoliae* (Haw.) Glen & Hardy (2000: 92), now as the genus *Aloiampelos*. One of the *formae* described by Resende, *Aloe ciliaris* f. *gigas* Resende (1943: 101), is a hybrid between the hexaploid *Aloiampelos ciliaris* var. *ciliaris* and the tetraploid *A. ciliaris* var. *redacta* (S.Carter in Brandham & Carter 1990: 643) Klopper & Gideon F.Sm. in Grace *et al.* (2013: 10) and was recently raised to the rank of nothovariety, as *A. ciliaris* nothovar. *gigas* (Resende 1943: 101) Smith & Figueiredo (2019: 38).

*Aloiampelos ciliaris* is widely known as a rambling or scrambling aloe and is generally characterised by its creeping, shrubby, or climbing habit (Fig. 6A–B). The rather narrow, thin leaves are spirally arranged along thin, slender stems and are separated by prominent internodes, so placing the distinctly ciliate-fringed sheathing bases on display (Fig. 6C). The almost invariably unbranched inflorescences (but see Fig. 6D) can be either sparse-flowered or subdense and cylindrical, or near-capitate and dense-flowered, and predominantly in winter carry rather large, cylindrical flowers that range from orange to orange-red to scarlet red with yellowish green tips (Smith *et al.* 2021) (Fig. 6A–B, D).

The species is very commonly grown along the Mediterranean coast of Europe where it will develop into large, dense stands of heavily tangled stems.



**FIGURE 6.** *Aloiampelos ciliaris* in Portugal. **A.** A dense planting in the Botanical Garden of the University of Lisbon (see Smith & Figueiredo 2016). Photograph taken on 2 January 2013. **B.** Grown in a garden at Casa Mata, Malveira Serra, near Lisbon. Photograph taken on 29 April 2017. **C.** Close-up of the distinctly ciliate leaf bases. **D.** Inflorescences are usually unbranched, but could rarely be once-branched. All photographs by Gideon F. Smith, except B, which was taken by Vasco Silva.

**Identification key to the variously naturalised or casual and escaped alooid species recorded for continental Portugal**

- 1. *Racemes* distinctly capitate; *flowers* basally sub-globose-inflated; *leaves* at maturity adaxially spotted with H-shaped or irregularly-shaped, whitish maculations ..... *Aloe maculata*
- 1'. *Racemes* broadly or narrowly cone-shaped; *flowers* not basally globose-inflated; *leaves* at maturity lacking whitish maculations ..  
.....2
- 2. *Plants* low-growing, lacking a stem or with short stem up to 0.5 m long.....3
- 2'. *Plants* tall-growing, with distinct, usually much-branched stems and branches, stem > 0.5 m.....4
- 3. *Flowers* bright orangey red ..... *Aloe ×nobilis*
- 3'. *Flowers* yellow ..... *Aloe vera*
- 4. *Stem* and *branches* robust, ascending; *sheathing leaf base* lacking cilia ..... *Aloe arborescens*
- 4'. *Stem* and *branches* thin, variously scrambling; *sheathing leaf base* ciliate ..... *Aloiampelos ciliaris* var. *ciliaris*



**FIGURE 7.** *Aloe mitriformis*, a distinctive, South African representative of the genus, has long, creeping stems. It occurs naturally in the western parts of the Western Cape province and southern Northern Cape province, an area that experiences a Mediterranean-type climate, i.e., mild, wet winters and hot, dry summers, not unlike that prevalent over much of Portugal. Photograph: Gideon F. Smith.

## Conclusions

We here confirm the occurrence of *A. arborescens*, *A. maculata*, and *A. vera* as naturalised in Portugal, and for the first time formally record *A. ×nobilis* as also naturalised in the country. We also confirm that *Aloiampelos ciliaris* var. *ciliaris* has escaped from cultivation and occurs as a casual alien in Portugal.

Reference to *A. perfoliata*, when referring to *A. mitriformis*, is not correct. Note though that during our fieldwork, *A. mitriformis*, a distinctive South African species with long, creeping stems (Fig. 7), was not encountered in the wild in Portugal.

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