

A synopsis of feral *Agave* and *Furcraea* (Agavaceae, Asparagaceae s. lat.) in the Canary Islands (Spain)

Filip Verloove^{1,*}, Joachim Thiede², Águedo Marrero Rodríguez³, Marcos Salas-Pascual⁴, Jorge Alfredo Reyes-Betancort⁵, Elizabeth Ojeda-Land⁶ & Gideon F. Smith⁷

¹Meise Botanic Garden, Nieuwelaan 38, B-1860 Meise, Belgium

²Schenefelder Holt 3, 22589 Hamburg, Germany

³Jardín Botánico Canario Viera y Clavijo, Unidad Asociada al CSIC, C/ El Palmeral nº 15, Tafira Baja, E-35017 Las Palmas de Gran Canaria, Gran Canaria, Canary Islands, Spain

⁴Instituto de Estudios Ambientales y Recursos Naturales (i-UNAT), Campus Universitario de Tafira, Universidad de las Palmas de Gran Canaria, E-35017 Las Palmas de Gran Canaria, Gran Canaria, Canary Islands, Spain

⁵Jardín de Aclimatación de La Orotava (ICIA). C/ Retama 2, 38400 Puerto de la Cruz, Canary Islands, Spain

⁶Viceconsejería de Medio Ambiente. Gobierno de Canarias. C/ Avda. de Anaga, 35. Planta 11. 38071 Santa Cruz de Tenerife, Canary Islands, Spain

⁷Department of Botany, P.O. Box 77000, Nelson Mandela University, Port Elizabeth, 6031 South Africa / Centre for Functional Ecology, Departamento de Ciências da Vida, Calçada Martim de Freitas, Universidade de Coimbra, 3001-455 Coimbra, Portugal

*Corresponding author: filip.verloove@meisebotanicgarden.be

Background – Species of *Agave* and *Furcraea* (Agavaceae, Asparagaceae s. lat.) are widely cultivated as ornamentals in Mediterranean climates. An increasing number is escaping and naturalising, also in natural habitats in the Canary Islands (Spain). However, a detailed treatment of variously naturalised and invasive species found in the wild in the Canary Islands is not available and, as a result, species identification is often problematic.

Methods – The present study is based on many years of fieldwork on the islands of Fuerteventura, Gran Canaria, Lanzarote and Tenerife.

Results – Fourteen species and several additional infraspecific taxa of *Agave* have been identified. In addition to the widely naturalised and invasive *Agave americana*, *A. fourcroydes* and *A. sisalana* (incl. the not previously reported var. *armata*), the following species of *Agave* were observed: *A. angustifolia* (incl. var. *marginata*), *A. attenuata*, *A. filifera*, *A. franzosinii*, *A. lechuguilla*, *A. macroacantha*, *A. murpheyi*, *A. oteroi*, *A. salmiana* (var. *ferox* and var. *salmiana*), *A. aff. tequilana* and *A. vivipara*. From the genus *Furcraea* three species were found: *F. foetida*, *F. hexapetala* and *F. selloana*. Several of these newly detected species of *Agave* and *Furcraea* are at least locally naturalised. A key for the identification of the representatives of these genera in the study area is presented and all species are illustrated. Additional nomenclatural, taxonomic and ecological notes are also provided.

Keywords – Agavaceae; *Agave*; Canary Islands; Fuerteventura; *Furcraea*; Gran Canaria; Lanzarote; nomenclature; Spain; taxonomy; Tenerife.

INTRODUCTION

Agave L. and *Furcraea* Vent. are two genera from the Agavaceae (s. str.), a well-known succulent plant family of the New World, that now is usually included in Asparagaceae, based on molecular studies (Bogler et al. 2006; Chase et al. 2009). The adherence to traditional concepts, such as the Agavaceae s. str., represents a permissible and alternative, narrower family concept (Thiede 2016). The exact number of species in *Agave* is uncertain and varies from one author to another, depending on species delimitation, and new species are still regularly described (e.g. Giraldo-Cañas 2017; Arzaba-Villalba et al. 2018; Starr et al. 2018; García Mendoza et al. 2019). A recent synopsis (Thiede in press) covers some 265 species which range on the mainland from the southern U.S.A. to Panama and Venezuela. Several additional species are found in the Caribbean. The center of diversity is in Mexico where at least 125 species occur (García-Mendoza & Galván 1995; García-Mendoza 2002). The majority of species occur in arid to semiarid habitats in or near deserts, especially in desert grasslands and oak-pine woodlands. The genus is economically important, either as agricultural crops for the production of fibres (sisal, henequen, ixtle) or beverages (tequila, pulque, mescal), or as ornamentals. *Furcraea* is a smaller genus with ca. 23 species (Thiede in press) that are distributed throughout tropical America. Although they usually occur in less arid climate types, they are more frost-sensitive than most agave species. Several species are economically important: they are grown as agricultural crops, mostly for the production of fibres, or as ornamentals.

The generic boundaries of *Agave* have long been and to some extent still are controversial. Most molecular sequence data thus far available (e.g. Bogler et al. 2006; Good-Ávila et al. 2006; Flores-Abreu et al. 2019) demonstrated that, as traditionally circumscribed, the genus is paraphyletic. In order to render *Agave* monophyletic, the genera *Manfreda* Salisb., *Polianthes* L. and *Prochnyanthes* S. Watson needed to be merged with it (Thiede 2012). If traditional generic concepts for these genera were retained, these would be in conflict with molecular phylogenetic data and derived classification concepts (Thiede 2016). However, AFLP molecular markers showed these genera to group separate from and not nested within *Agave* (Gil-Vega et al. 2007). *Furcraea* is morphologically distinguished from *Agave* in several respects. Its inflorescence always is a massive pyramidal panicle (vs. narrowly elongate to \pm broad panicles or elongated spikes or racemes) with pendent white or whitish flowers (vs. erect flowers that are rarely whitish). Leaves are often more flexible with a much less prominent terminal spine and stamens are only half as long as tepals (vs. usually longer than the tepals). Also, the tepals are (almost) free (vs. basally fused to form a \pm long tube). According to recent molecular and morphological phylogenies, *Furcraea* is sister to *Beschorneria* Kunth, and both together are sister to *Agave* in most analyses (Hernández-Sandoval 1995; Bogler & Simpson 1996; Bogler et al. 2006).

While evidently no indigenous representatives of *Agave* and *Furcraea* exist in the Canary Islands, a number of species have become naturalised in the archipelago. Some even reproduce prolifically in natural habitats and are considered

invasive species. According to Acebes Ginovés et al. (2010) this applies at least to *Agave americana* L. and *Furcraea foetida* (L.) Haw. The identity, however, of the species currently found in the wild there required critical re-assessment: some morphologically similar species had been overlooked so far, whereas several additional distinct species have been recorded in recent years, some of them at least locally naturalised.

In this paper a synopsis of the genera *Agave* and *Furcraea* in Gran Canaria, Tenerife, Lanzarote and Fuerteventura is presented. A key for the identification of all species currently found in the wild is presented and all species are illustrated. Further nomenclatural, taxonomic and ecological comments are also provided.

MATERIALS AND METHODS

The present study is based on many years of fieldwork on the islands of Fuerteventura, Gran Canaria, Lanzarote and Tenerife by most of the authors (FV, AMR, MSP, JARB, EOL). The other authors (JT, GFS) assisted with the identification of some of the more critical taxa and provided further useful information on the genera *Agave* and *Furcraea*. In addition, numerous literature references (including original descriptions and protologues) were consulted in order to better understand the distinguishing features used for the separation of the relevant taxa.

Each entry includes: (1) the scientific name of the taxon (accompanied by one or more synonyms, if useful); (2) a list of localities (including geographical coordinates which enable local governments to eradicate plants or populations, if deemed desirable) and voucher specimens when available; (3) the distribution of the taxon (native as well as introduced area); (4) ecology and habitat data; and (5) additional useful comments, usually about its invasiveness (for definitions, see Blackburn et al. 2011), identification and/or nomenclatural or taxonomic issues. Photographs are presented for all taxa (figs 1–7). Taxa nomenclature is mostly in accordance with recent insights. Authorities of plant names follow the International Plant Names Index (IPNI 2019).

As a rule, all records were documented by photographs only (deposited with the authors). Herbarium specimens were exceptionally collected and these were deposited in the herbaria of Meise Botanic Garden, Belgium (BR) and the Botanic Garden Viera y Clavijo in Las Palmas de Gran Canaria (LPA). Herbarium acronyms follow Thiers (continuously updated).

RESULTS AND DISCUSSION

Agave L. (Linnaeus 1753: 323).

Taxonomic synopsis of *Agave* in the Canary Islands (Fuerteventura, Gran Canaria, Lanzarote, Tenerife) (based on Thiede in press and Thiede et al. 2019).

Subgenus *Agave*

Section *Agave*

Agave americana L.

Agave franzosinii (Sprenger) P.Sewell

Section *Ditepalae* Hochstätter

Agave murpheyi F.Gibson

Section *Rigidae* (Baker) R.H.Webb & G.D.Starr

Agave angustifolia Haw.

Agave fourcroydes Lem.

Agave macroacantha Zucc.

Agave sisalana Perrine

Agave aff. *tequilana* F.A.C.Weber

Section *Salmianae* (A.Berger) Verloove & Thiede

Agave salmiana Otto ex Salm-Dyck

Agave salmiana var. *ferox* (K.Koch) Gentry

Agave salmiana var. *salmiana*

Section *Viviparae* (Baker) Verloove & Thiede

Agave vivipara L.

Subgenus *Littaea* (Tagl.) Baker

Section *Heteracanthae* Salm-Dyck

Agave lechuguilla Torr.

Agave oteroi G.D.Starr & T.J.Davis

Section *Inermes* Salm-Dyck

Agave attenuata Salm-Dyck

Section *Littaea* (Tagl.) Benth

Agave filifera Salm-Dyck

Subgenus *Agave*

Inflorescence panicate (often several times compound) with flowers in large umbellate clusters on lateral peduncles.

Section *Agave* (= Group *Americanae* Baker nom. inval.)

This section, formerly referred to as Group *Americanae* Baker, includes the type of the genus, *Agave americana*. The autonym section *Agave* should hence be used (art. 22.2 & art. 22 ex. 2 and 4, art. 37.1 of the ICN; Turland et al. 2018). Plants are usually medium- to large-sized, have long and lanceolate, glaucous leaves, a usually strong surculose habit and tall, open panicles with yellow flowers with long tepals and stamens (Gentry 1982; Thiede in press). In the study area it is reportedly represented by the very widely distributed and highly invasive species *A. americana* (Acebes Ginovés et al. 2010). The latter, however, is extremely variable and records of it may hide related or similar cryptic taxa (see below). During our field studies we noticed that a second species, *A. franzosinii* (Sprenger) P.Sewell, also escapes from cultivation, at least in Gran Canaria.

Agave americana L. (Linnaeus 1753: 323)

Fig. 1A–C

Known in the Canary Islands from all islands – naturalised and invasive (Acebes Ginovés et al. 2010). Category E *sensu* Blackburn et al. (2011) (Fully invasive species, with individuals dispersing, surviving and reproducing at multiple sites

across a greater or lesser spectrum of habitats and extent of occurrence).

Agave americana is a highly polymorphic species from the southern U.S.A. and Mexico and includes several infraspecific taxa. In addition to cultivars with variegated leaves, four varieties or subspecies can be distinguished according to Gentry (1982): var. *americana*, var. *expansa* (Jacobi) Gentry (syn.: subsp. *expansa* (Jacobi) Hochstätter), var. *oaxacensis* Gentry and subsp. *protamericana* Gentry. In the study area *A. americana* also occurs in many forms. The invasive form is usually a relatively small plant with short, erect and stiff leaves. It somehow resembles var. *expansa*, a more or less distinct ‘race’ that is naturalised in parts of South Africa (Smith & Figueiredo 2011) and Australia (Forster 1986). This variety is medium-sized to large with leaves erect to stiffly spreading, adaxially deeply channeled and distinctly widened towards the tip, less succulent and with an apical leaf spine 20–30 mm long. Seeds are never produced. Although var. *expansa* was an early introduction in continental Europe (Jacobi 1869) it apparently was not able to escape, unless it remained unnoticed. The invasive Canarian plants probably do not belong to this variety since they lack the distinctly widened upper part of the leaf and the terminal spine is longer (fig. 1A). Another expression of *A. americana* found in the study area is a massive plant with thickly succulent leaves that are usually drooping to one side, adaxially not deeply channeled and with an apical leaf spine 30–50 mm long (fig. 1B). Such plants probably correspond with var. *americana*. This taxon is extremely variable, especially in leaf characters. Leaf margins sometimes are remarkably sinuate, especially in young individuals or in re-growth (after cutting). Also, marginal teeth can considerably vary in length and form, even in a single individual. All these glaucous-leaved forms of *A. americana* are believed to represent two or more clones but are all assigned to a single taxon, var. *americana*.

In addition to plants with glaucous leaves several cultivars with variegated leaves are widely grown as ornamentals in the study area. One such form is particularly common in cultivation and is locally naturalised as well, at least in Gran Canaria and Tenerife. It has leaves with broad pale yellowish margins and is here assigned to var. *marginata* Trel. (fig. 1C). Like var. *americana* it has a suckering habit and easily escapes. It has been recorded on rather numerous occasions. However, naturalised populations were only rarely observed, for instance in the following localities:

Observation records

Gran Canaria

Las Palmas de Gran Canaria, La Matanza, Calle El Mondalon, 28°29.92’N, 15°26’21.23’W, 193 m a.s.l., abundantly naturalised in roadside and edges of fields, 16 Apr. 2018, obs. F. Verloove.

Las Palmas de Gran Canaria, Monte Lentiscal, Montaña de Tafira, 28°3’8.79’N, 15°28’28.12’W, 474 m a.s.l., volcanic slope, frequent, 24 Apr. 2018, obs. F. Verloove.

Las Palmas de Gran Canaria, GC-4 at Barranco del Salto del Negro, 28°3’16.8’N, 15°26’36.19’W, 230–260 m a.s.l., several groups, 1 Nov. 2018, obs. Á. Marrero.

**Identification key for the species of *Agave* occurring in the wild
in Fuerteventura, Gran Canaria, Lanzarote and Tenerife**

The key is primarily based on vegetative characters since non-flowering individuals are encountered more often than flowering ones. Only races and forms occurring in the study area are taken into account. For each species the known occurrence in the Canary Islands is provided between brackets (abbreviations: H = El Hierro; P = La Palma; G = La Gomera; T = Tenerife; C = Gran Canaria; F = Fuerteventura; L = Lanzarote).

1. Leaf margins filiferous (i.e., margins separating as hair-like threads), unarmed.....*Agave filifera* (T)
 - 1'. Leaf margins never filiferous, armed or not..... 2
 2. Leaves narrow and sword-shaped (ensiform), c. 10–20 × as long as wide with almost straight margins (hardly narrowed towards the base), very rigid and radiately spreading. Flowers always greenish-yellow and in a panicle inflorescence. Plants surculose and very often bulbiliferous (*A. angustifolia* complex) 3
 - 2'. Leaves wider; if narrow then not very rigid and straight-margined and inflorescence not panicle. Flowers variable. Plants surculose or not, bulbiliferous or not..... 7
 3. Leaves usually (much) less than 100 cm long, sometimes with white or yellow margins. Stem absent or short 4
 - 3'. Leaves usually (much) longer, never with white or yellow margins [from *A. sisalana* and *A. tequilana*, cultivars with variegated margins are known, but these are much less commonly cultivated than those of *A. angustifolia*, and appear to be absent from the Canaries]. Stem present, short or distinct 5
 4. Leaves 40–60(–100) cm long, light green to glaucous grey, often with white or yellow margins (var. *marginata*). Inflorescence 3–5 m *A. angustifolia* (C, F, T)
 - 4'. Leaves 25–35 cm long, bluish-grey glaucous. Inflorescence ca. 2 m..... *A. macroacantha* (F, P, T)
 5. Leaf margin unarmed (exceptionally with well-developed triangular teeth but then not or only very weakly glaucous leaved and with smaller flowers). Plant usually green, either yellowish or dark green. Flowers relatively small, 55–65 mm long..... *A. sisalana* (C, F, L, P, T)
 - 5'. Leaf margin with regularly spaced and distinct teeth. Plant often glaucous or greyish green. Flowers usually longer, 60–80 mm long..... 6
 6. Apical leaf spine short, 10–20 mm long. Leaves glaucous, with almost parallel margins, rarely exceeding 120 cm in length. Inflorescence with 20–25 partial inflorescences.....*A. aff. tequilana* (C)
 - 6'. Apical leaf spine usually longer, 20–30 mm long. Leaves usually greyish-green, tapering towards both ends, often longer. Inflorescence with 10–18 partial inflorescences.. *A. fourcroydes* (C, F, G, L, P, T)
 7. Leaves with conspicuous horny margin. Inflorescences narrowly elongate panicles..... 8
 - 7'. Leaves without horny margin. Inflorescence narrowly elongate or broad panicles..... 9
 8. Leaves narrow, 10–20 × as long as wide, marginal teeth typically deflected, weak and friable, regular in size, 2–6 mm. Inflorescence laxly flowered, with linear bracts.....*A. lechuguilla* (C)
 - 8'. Leaves broadly-ovate, sometimes not much longer than wide (especially the innermost), marginal teeth deltoid or irregular, (10–) 20–40 mm. Inflorescence densely flowered, with deltoid bracts.....*A. oteroii* (C)
 9. Leaves large to massive, often at least 100 cm long in normally developed plants (except in *A. salmiana* var. *ferox*). Leaf margins with very distinct teeth. Inflorescence never bulbiliferous..... 10
 - 9'. Leaves medium-sized (usually not exceeding 70 cm in length). Leaf margins smooth or with short teeth ca. 1–4 mm long. Inflorescence bulbiliferous or not..... 12
 10. Leaves green. Inflorescence pole short, hardly longer than wide*A. salmiana* (C, T)
 - 10'. Leaves glaucous. Inflorescence pole elongate, at least twice as long as wide11
 11. Leaf surface smooth. Plant glaucous, usually not distinctly patterned with green (variegated in var. *marginata*).....*A. americana* (C, F, G, H, L, P, T)
 - 11'. Leaf surface rough. Plant glaucous to whitish, often patterned with dark green where the glaucous covering was rubbed off (never variegated).....*A. franzosinii* (C)
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- 12 Leaves ovate-acuminate, often arching or sigmoid. Margins either smooth or with closely and regularly spaced teeth 13
- 12'. Leaves lanceolate, arching, not sigmoid. Margins regularly toothed, small, mostly 3–4 mm *A. murpheyi* (C)
- 13 Leaves always with smooth margins and soft apical spine. Inflorescence spicate, very densely flowered and arching, not bulbiferous; tepals greenish-yellow. Stem always present at maturity, up to 100 cm long *A. attenuata* (C, F, P, T)
- 13'. Leaves with margins with closely-spaced short teeth 3–7 mm and distinct apical spine. Inflorescence paniculate, erect, bulbiferous; tepals bright yellow. Stem absent *A. vivipara* (C)

Tenerife

Candelaria, Cuesta de Las Tablas, TF-28 road close to Embalse, 28°23'26.36"N, 16°21'8.37"W, 220 m a.s.l., five individuals with *A. fourcroydes*, 7 Feb. 2010, obs. E. Ojeda-Land.

San Cristóbal de La Laguna, Bajamar, 28°33'23.40"N, 16°20'4.42"W, 70 m a.s.l., three young individuals in a field near the road together with *Furcraea selloana*, 2 May 2011, obs. E. Ojeda-Land.

San Cristóbal de La Laguna, La Cuesta, Barranco Los Menceyes, 28°28'14.00"N, 16°17'44.86"W, 375 m a.s.l., three established individuals on anthropised slopes of ravine, 18 May 2017, obs. E. Ojeda-Land.

La Matanza de Acentejo, Carretera El Caletón, at several points (for instance at 28°27'16.26"N, 16°27'43.18"W; 28°27'17.32"N, 16°27'42.83"W; 28°27'28.87"N, 16°27'54.67"W), roadside, between 50 and 250 m a.s.l., 18 Apr. 2018, obs. E. Ojeda-Land.

Santa Úrsula, La Quinta, 28°26'1.62"N, 16°29'40.75"W, 195 m a.s.l., four individuals near houses and another five near the roundabout of the TF-5, 28°25'38.28"N, 16°29'37.12"W, 255 m a.s.l., 25 Apr. 2018, obs. E. Ojeda-Land.

Specimen collected

Gran Canaria

Santa Lucía de Tirajana, bajada a La Sorrueda, Llanos de la Piedra, 27°53'32.8"N, 15°32'06.5"W, 550 m a.s.l., antiguos banales, subespontánea, estolonífera, 29 Jun. 2019, *Á. Marero & R. López González 37495-37496* (LPA).

Similar plants with leaf margins with intercalary teeth (i.e., with a mixture of smaller and larger teeth) are sometimes distinguished as *Agave ingens* A.Berger var. *picta* (Salm-Dyck) A.Berger (syn.: *A. picta* Salm-Dyck) (Guillot Ortiz & van der Meer 2003, 2010, 2013a; Guillot Ortiz et al. 2012; Rubal et al. 2013). However, this taxon probably is of limited taxonomic value. In Gran Canaria (for instance in La Matanza, Las Palmas de Gran Canaria) plants with variegated leaves and intercalary teeth have been observed but on the same plant normally developed teeth are also found. Some plants from Tenerife are yet different and even more closely approach *A. ingens* var. *picta*. Apart from the presence of intercalary teeth in most or all leaves they differ in having leaves with a brighter, almost shiny green part. It is obvious that the variegated plants show some degree of variation, and may possibly be of multiple origins. However, *A. ingens* (incl. var. *picta*) is considered a heterotypic synonym of *A.*

americana by most contemporary authors (Gentry 1982; Thiede in press) and this taxonomy is followed here.

At least two additional glaucous-leaved species have a similar general appearance and also attain very large rosette and inflorescence dimensions: *Agave lurida* Aiton and *A. weberi* J.F.Cels ex J.Poiss. Both have been recorded as escapes from cultivation (e.g. Guillot Ortiz & van der Meer 2008b; Franck 2012; Sáez & Guillot Ortiz 2015; Smith & Figueiredo 2015; Verloove et al. 2018) and can be expected to occur in the study area as well. *Agave lurida* differs from *A. americana* in being only sparingly surculose (if at all) with leaf margins with more regularly and closely spaced, slightly shorter teeth (1–2 cm apart and 5–7 mm long vs. 2–5 cm apart and 4–10 mm long) (Gentry 1982). *Agave weberi* was placed in Group *Sisalanae* by Gentry (1982) but more likely belongs in section *Agave* (Ullrich 1990; Smith & Figueiredo 2015; Thiede in press). Compared with *A. americana* it has leaves with teeth either absent or minute to small and then closely spaced. The inflorescence pole often leans or droops as opposed to the rigidly erect inflorescence pole of *A. americana*.

Agave franzosinii (Sprenger) P.Sewell (Sewell 1889: 639)

Figs 1D–F, 2A

Agave americana L. var. *franzosinii* Sprenger (Sprenger 1885: 130). – **Type:** [icon in] *Curtis's Botanical Magazine* 136: t. 8317 (Berger 1910) (Thiede 2017).

Agave beaulueriana Jacobi (Jacobi 1869: 150). – **Type:** [icon in] *Curtis's Botanical Magazine* 136: t. 8317 (Berger 1910) (Thiede 2017).

New to the flora of the Canary Islands – category C2 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, but population not self-sustaining).

Observation records

Gran Canaria

Las Palmas de Gran Canaria, Tamaraceite, 28°5'32.46"N, 15°28'45.95"W, 193 m a.s.l., roadside, a single plant (escaped from an ornamental plantation ca. 250 m further north), 18 Apr. 2018, obs. F. Verloove (fig. 1D–E).

Las Palmas de Gran Canaria, Tafira Baja, close to Finca La Palmita, 28°4'6.78"N, 15°27'25.61"W, 327 m a.s.l., abandoned area, scattered individuals (relic of former planta-



Figure 1 – **A.** *Agave americana*, Adeje, Taucho (T), July 2016. This is a very variable species in the study area. This form looks like but is not identical with var. *expansa*. It is a relatively small plant with shorter leaves that are held stiffly upright. **B.** Idem, Santa Brigida (C), April 2018. Another expression of the same species is massive with very large, rather pliable leaves. This form is reminiscent of *A. franzosinii*. **C.** Idem. Var. *marginata*, Santa Lucía de Tirajana (C), April 2018. **D.** *A. franzosinii*, Las Palmas de Gran Canaria (Tamaraceite) (C), April 2018. **E.** Idem. The glaucous covering of the leaves is easily rubbed off. **F.** Idem. Comparison of leaf colour and spine orientation in *A. franzosinii* (upper) and *A. americana*. Photographs: A–E by F. Verloove; F by M. Salas Pascual.



Figure 2 – A. *Agave franzosinii*, Las Palmas de Gran Canaria (La Paterna) (C), May 2018. This species has a somewhat laxer inflorescence than *A. americana*. B. *A. murpheyi*, Santa Lucía de Tirajana (C), April 2018. C. Idem. Detail of leaf marginal spines. D. *A. angustifolia*, Mogán (C), December 2017. Inflorescences are nearly always bulbiliferous in this species. E. Idem. Detail of leaf spination of green form. F. Idem, Güímar (T), January 2017. Photographs: A by Á. Marrero; B–F by F. Verloove.

tion?), 24 Apr. 2018, obs. F. Verloove, Á. Marrero Rodríguez & M. Salas Pascual.

Specimen collected Gran Canaria

Las Palmas de Gran Canaria, Tafira Baja, entornos del Campus, 28°04'12.2"N, 15°27'16.0"W, 320 m a.s.l., zonas ajardinadas algo abandonadas, subespontánea, estolonífera, 27 Jun. 2019, *A. Marrero 37476-37477* (LPA).

Agave franzosinii is not known in the wild. It is frequently grown as an ornamental, for instance in parts of the Mediterranean area, the West Indies and – more recently – also in the Canary Islands. It is very closely similar to *A. americana* and, like the latter, is highly surculose. As a result, it easily escapes and is increasingly observed in the wild, also in continental Europe, for instance in Spain (Guillot Ortiz et al. 2008; Sáez et al. 2014; Mesquida et al. 2016) and Italy, incl. Sardinia and Sicily (Celesti-Grappo et al. 2010; Galasso et al. 2018). It is expected to be present also in Portugal (Smith & Figueiredo 2007) and is here reported for the first time as an escape in the Canary Islands (Gran Canaria). Escaped individuals are likely found wherever this species has been planted in the past.

With its diameter of 3.5–4 m, *Agave franzosinii* is one of the largest agaves (fig. 1D). Smaller or less glaucous individuals can be confused with *A. americana*. However, *A. franzosinii* is distinguished by its more intense bluish to almost whitish, pruinose leaves with a rough upper surface. The lower portion of the leaf is often patterned with dark green where the glaucous covering was rubbed off (fig. 1E). The leaves have large dark teeth along the margins that contrast a lot with the pale surface (fig. 1F). In addition, leaves are much thinner in cross-section and hence very easily bend, especially in the upper third. Finally, *A. franzosinii* appears to have a somewhat laxer inflorescence (fig. 2A).

The taxon was first described by Sprenger (1885) as *A. americana* var. *franzosinii*. The description of *A. franzosinii* by Sewell (1889), dated 30 Nov. 1889, is seen as a new combination at species rank based on Sprenger's *A. americana* var. *franzosinii* (see Thiede 2017), and antedates the description by Watson (1889). At Villa Hanbury the plant was thought to be a hybrid of *A. americana* with another unidentified species. It was in fact validly described 20 years earlier by Jacobi (1869), as *A. beaulueriana*. The correct name of the species would therefore be *A. beaulueriana* Jacobi (as pointed out by Howard 1979), a binomial that is rarely used except perhaps in the Caribbean where the species is frequently grown as an ornamental (e.g. Wagenaar Hummelinck 1987; Fournet 2002; Proctor & Acevedo-Rodríguez 2005; see also Hochstätter 2015). A proposal to conserve the name *A. franzosinii* against the name *A. beaulueriana* was published (Thiede 2017) in order to foster nomenclatural stability. We here adhere to the binomial *A. franzosinii* following Recommendation 14A.1. of the ICN applicable to proposals for the conservation of names (Turland et al. 2018): "When a proposal for the conservation (Art. 14) or protection (Art. F.2) of a name has been referred to the appropriate specialist committee for study, authors should follow existing usage of names as far as possible pending the General Committee's recommendation on the proposal."

Section *Ditepalae* Hochstätter (= Group *Ditepalae* Gentry nom. inval.)

Gentry (1982) first published this name but it was not valid since the type of the name was not indicated (Art. 37.1 of the ICN; Turland et al. 2018). This section includes 17 species from the southern U.S.A. (Arizona, New Mexico) and Mexico (Thiede in press). Plants are usually small to medium-sized (leaves usually well below 100 cm in length), generally surculose and tepals are strongly dimorphic with the outer lobes conspicuously larger (Gentry 1982; Thiede in press). A single species has been recorded in the study area.

Agave murpheyi F.Gibson (Gibson 1935: 83–85, f. 1)

Fig. 2B–C

New to the flora of the Canary Islands – category C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, and population self-sustaining).

**Specimens collected
Gran Canaria**

Santa Lucía de Tirajana, La Sorrueda, 27°53'32.10"N, 15°32'6.48"W, 554 m a.s.l., stony sun-exposed slope at long-abandoned finca, several individuals in two discrete subpopulations, 28 Apr. 2018; *F. Verloove 13205* (BR) (fig. 2B–C). Santa Lucía de Tirajana bajada a La Sorrueda, Llanos de la Piedra, 27°53'32.1"N, 15°32'06.6"W, 545 m a.s.l., ambientes del tabaibal xerófilo-termoesclerófilo, en antiguas terrazas de cultivos, subespontánea, estolonífera, 26 May 2018, *Á. Marrero & C. Santiago 37295-37297* (LPA).

In the wild *Agave murpheyi* is only known from relatively few localities in central and southern Arizona in the U.S.A. and in northwest Sonora in Mexico (Gentry 1982; Thiede in press). It is known only from around pre-Columbian agricultural and settlement areas and thought to have been a very important food source (Irish & Irish 2000; Reveal & Hodgson 2002). It is in fact much more widely distributed in horticulture. In a long-abandoned finca in Santa Lucía de Tirajana in Gran Canaria several individuals persist for many decades in two small subpopulations.

Agave murpheyi is characterised by its dark glaucous-green, spatulate, acuminate leaves (ca. 63 × 9 cm in mature plants in the Canarian population) with light cross-banding and a clear bud imprint (fig. 2B). Leaf margins have short brownish-reddish teeth that are more numerous in the lower half of the blade (fig. 2C). The apical spine is non-decurrent and short (less than 2 cm long). The species is moderately surculose and produces a lot of bulbils (seed set is very rare). From closely similar ornamental agaves like *A. chrysantha* Peebles and *A. palmeri* Engelm., it is readily separated by its very short terminal spine (Gentry 1982; Thiede in press).

Although relatively widely available in the horticultural trade *Agave murpheyi* had – to our knowledge – not been recorded before in the wild outside of its native distribution range.

Section *Rigidae* (Baker) R.H.Webb & G.D.Starr (≡ Group *Rigidae* Baker ["Gentry"]; = Group *Sisalanae* Trel., incl.

sect. *Sisalanae* Thiede & Gideon F.Sm.; = Unterreihe *Sisalanae* A.Berger)

Plants from this section have linear, ensiform and rigid leaves with almost straight margins and a usually non-decurrent (or rarely thinly decurrent) terminal spine. All have a surculose habit, greenish-yellow flowers and frequently bulbiferous inflorescences (Gentry 1982; Thiede in press). The group includes 14 species that are mainly distributed in Mexico. Several are only known from cultivation. Five have been recorded in the study area; several of these are quite expansive and can be considered invasive species.

This section – and more precisely those species closely related to or derived from *Agave angustifolia* – is by far the most critical one in the study area. It is composed of Gentry's *Rigidae* Group and evidently also includes *A. sisalana* from the *Sisalanae* Group (Ullrich 1990). All species recorded in the area under study are morphologically similar. While their extreme expressions are relatively easily told apart, intermediate forms are often found. Three of the species here recognised (*A. fourcroydes*, *A. sisalana* and *A. tequilana*) are sexually sterile clones that were derived from *A. angustifolia* for commercial purposes (mostly for fiber or beverages). They are not known from natural populations. Gentry (1982) already admitted that they are “maintained as species more for taxonomic convenience than founded on basic morphological and biological knowledge”. Indeed, based on our field observations all these species seem to be distinguished only on quantitative characters. *Agave angustifolia* tends to have shorter leaves (although large-leaved forms also exist, including in the area under study) and a shorter stem than its derivative species but there is considerable overlap. *Agave sisalana* (var. *sisalana*) has smooth leaf margins but a form with well-developed triangular teeth (*A. sisalana* var. *armata* Trel.) occurs throughout the species' range of occurrence. *Agave fourcroydes* is much reminiscent of *A. sisalana* (habit, robustness of leaves and stems) and mostly seems to differ by the constant presence of regularly spaced marginal teeth. Similarly, *A. tequilana* resembles *A. fourcroydes* and merely differs in having a shorter terminal leaf spine and a shorter stem.

In this account we follow traditional species circumscriptions, also because combinations at a lower taxonomic rank under the progenitor species are mostly lacking. However, it is clear that maintaining *A. fourcroydes*, *A. sisalana* and *A. tequilana* at species rank is untenable (Thiede 2016). All are preferably subsumed under *A. angustifolia*, either as mere cultivars of the latter or as varieties or subspecies (Thiede in press).

This section was referred to as Group *Viviparae* by Thiede (2001) since *A. angustifolia* and *A. vivipara* were considered conspecific, based on Wijnands (1983). These are, in fact, two very distinct species (García-Mendoza & Chiang 2003) and belong to different sections, section *Rigidae* and *Viviparae* respectively. The traditional infrageneric classification (Trelease 1913; Berger 1915; Gentry 1982) for these species should therefore be retained.

Agave angustifolia Haw. (Haworth 1812: 72)

Figs 2D–F, 3A–B

New to the flora of the Canary Islands – category C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, and population self-sustaining).

Observation records

Gran Canaria

Mogán (Las Casillas), road GC-200, 27°52'5.65"N, 15°44'12.02"W, 168 m a.s.l., roadside, a single large clone with many rosettes, 31 Mar. and 14 Dec. 2017, obs. F. Verloove (fig. 2D–E).

San Bartolomé de Tirajana, Monte León, 27°48'50.50"N, 15°37'0.99"W, 382 m a.s.l., sun-exposed rocky slope facing Barranco de Chamoriscán, by the dozen, 22 Dec. 2017 and 19 Apr. 2018, obs. F. Verloove (fig. 3B).

San Bartolomé de Tirajana, Monte León, Calle Mozart, close to Calle Bach, 27°49'20.14"N, 15°36'54.18"W, 531 m a.s.l., foot of steep slope, a single individual, 19 Apr. 2018, obs. F. Verloove.

Mogán, Barranco del Cura, 27°48'42.26"N, 15°43'49.36"W, 81 m a.s.l., rocky slope, a single individual, 25 Apr. 2018, obs. F. Verloove.

Tenerife

Güímar (Puertito de Güímar), 28°17'58.74"N, 16°22'27.13"W, 17 m a.s.l., long-abandoned plant nursery, small population, 11 Jan. 2017, obs. F. Verloove (figs 2F, 3A).

El Rosario, Tabaiba Alta, 28°24'39.34"N, 16°20'07.72"W, 348 m a.s.l., in abandoned lot, a solitary flowering individual, together with *Opuntia ficus-indica*, *Austrocylindropuntia subulata*, etc., 3 Jun. 2018, obs. J.A. Reyes-Betancort.

Puerto de la Cruz, La Paz above Camino de La Costa, 28°24'58.62"N, 16°31'49.60"W and 28°24'54.57"N, 16°31'52.37"W, 71 and 82 m a.s.l., in abandoned lot close to urbanisations, at least 50 individuals, escaped and naturalised from plantation, with *A. fourcroydes*, 1 Aug. 2018, obs. J.A. Reyes-Betancort; idem, 18 Jan. 2019, obs. F. Verloove & J.A. Reyes-Betancort.

Fuerteventura

La Oliva, Corralejo, 28°43'42.31"N, 13°52'15.20"W, 24 m a.s.l. to 28°43'35.50"N, 13°52'17.79"W, 26 m a.s.l., very numerous individuals growing on the abandoned grounds of the former Acua Water Park, 26 May 2018, obs. E. Ojeda-Land.

Agave angustifolia is the most widespread species of the genus and ranges from northern Mexico to Panama. In addition, it is commonly cultivated as an ornamental and very easily escapes. It is naturalised in, for instance, Florida (Franck 2012), South Africa (Steyn & Smith 2000, sub *A. vivipara*; Walters et al. 2011), India (Drummond & Prain 1906; sub *A. wightii* J.R.Drumm. & Prain) and western Australia (Forster 1996). In Europe it has been recorded in the Valencia area and in the Balearic Islands in Spain (Guillot Ortiz et al. 2008; Sáez et al. 2016) as well as in Italy (Manni 2015).

This species is extremely variable and counts many infraspecific taxa and synonyms. Gentry (1982) distinguished six varieties in addition to the nominal variety: var. *deweyana* (Trel.) Gentry, var. *letonae* (F.W.Taylor) Gentry, var.

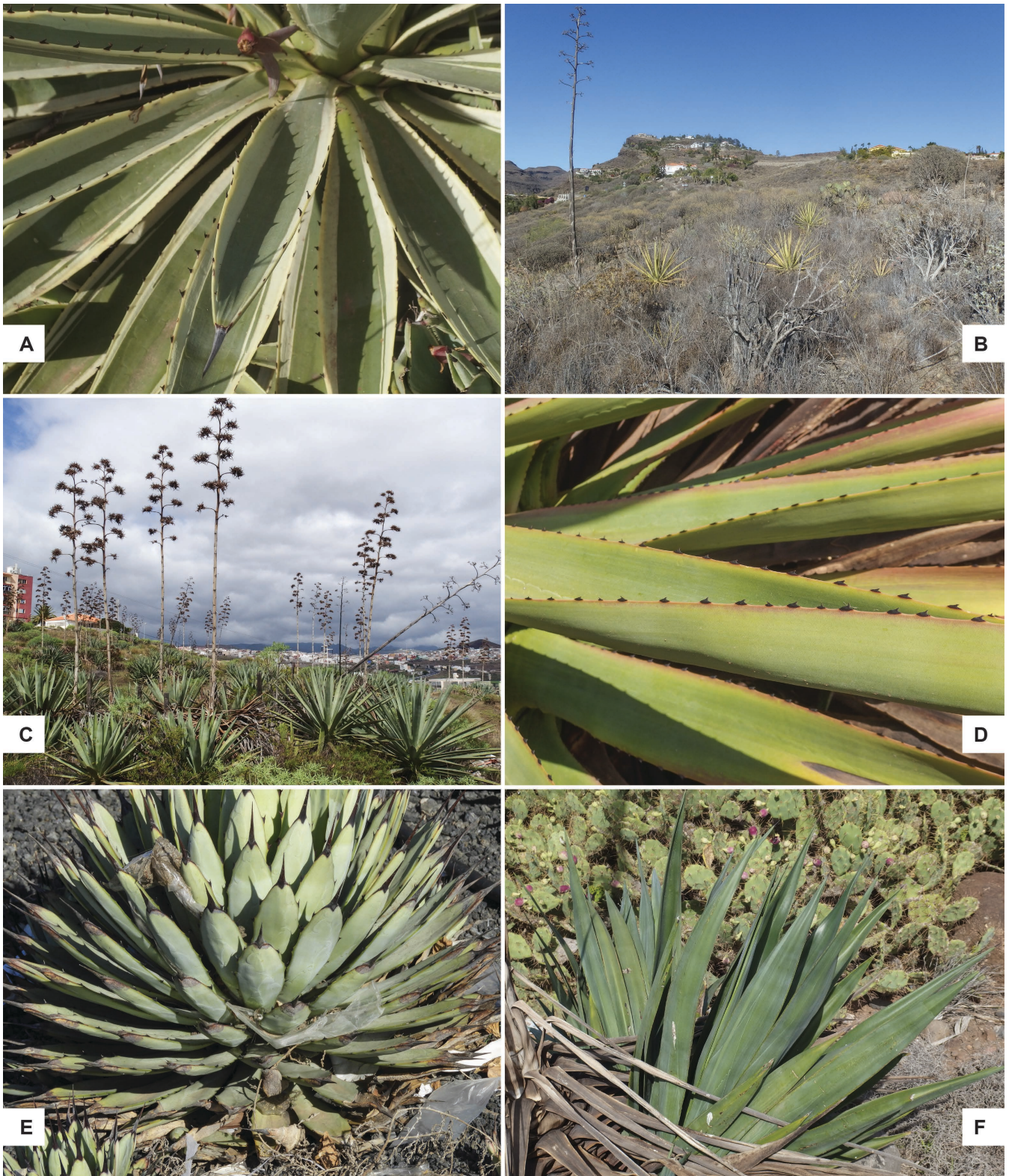


Figure 3 – A. *Agave angustifolia*, Güímar (T), January 2017. This form with variegated leaves (var. *marginata*) is most frequently cultivated as ornamental. B. Idem, San Bartolomé de Tirajana (Monte León) (C), December 2017. In this population inflorescences are not bulbiliferous although they usually are in this species. C. *A. fourcroydes*, Santa Cruz de Tenerife, Santa Maria del Mar (T), November 2014. Inflorescences are very bulbiliferous in this species. D. Idem, Güímar (T), January 2017. Detail of leaf spination. E. *A. macroacantha*, La Oliva (F), May 2018. The blackish spines contrast a lot with the pale foliage. F. *A. sisalana*, Santa Lucía de Tirajana, Pozo Izquierdo (C), November 2015. Leaf margins are smooth in the typical variety of this species. Photographs: A–D, F by F. Verloove; E by E. Ojeda-Land.

marginata Hort. ex Gentry, var. *nivea* (Trel.) Gentry, var. *rubescens* (Salm-Dyck) Gentry and var. *sargentii* Trel. Most of these, however, are mere cultivated selections and cultivars and should better be named as such (Thiede in press). Compared with most other members of this section (except *A. macroacantha*; see there), most plants of *A. angustifolia* currently found in the wild in the study area are distinctive in being only medium-sized with less parallel-sided, flatter leaves (fig. 2D–F). Even in the tallest mature individuals, leaves are rarely more than 60 cm long (see below, however), much less than in *A. fourcroydes*, *A. sisalana* and *A. aff. tequilana*. Although bulbils are usually produced in the inflorescences of this species, these appear to be absent in the naturalised population in Monte León in Gran Canaria (fig. 3B). Trelease (1913) already noticed that this species indeed sometimes fails to produce bulbils. In ornamental plantings a cultivar with white to pale yellow leaf margins is frequently observed (var. *marginata* Trel.) (fig. 3A). Small populations of this variety are established in a long-abandoned plant nursery in Puertito de Güímar in Tenerife as well as on the abandoned grounds of the former Acua Water Park in Corralejo in Fuerteventura. The genuinely wild form with unvariegated leaves is much less frequently seen in cultivation. Escaped and naturalised plants are only known from Mogán (Las Casillas) (fig. 2D–E) and San Bartolomé de Tirajana (Monte León) in Gran Canaria.

Another extreme expression that we refer to this species is naturalised in several places in Tenerife. It has markedly longer mid-green leaves up to 100 cm long with regularly toothed margins. From a distance, especially based on stature and leaf length and colour, it is somehow reminiscent of *A. sisalana* (var. *armata*). However, it has a much stronger and longer terminal spine that is thin but very distinctly decurrent, a feature only known to occur in *A. angustifolia* in this section (Gentry 1982). Such plants are locally naturalised in an abandoned lot close to a residential area in Puerto de la Cruz (La Paz). Identical plants have also been observed in Granadilla de Abona (El Médano, San Isidro) and in Arona (Cho).

Wijnands (1983) considered *Agave angustifolia* to be conspecific with *A. vivipara* and it was accepted under this name by several subsequent students of the genus (e.g. Forster 1992; Smith & Steyn 1999a; Thiede 2001). However, García-Mendoza & Chiang (2003) showed that these are in fact two very distinct species with non-overlapping distribution ranges. *Agave angustifolia* is a species from continental America that ranges from Mexico to Panama whereas *A. vivipara* originates in the West Indies (Curaçao, Aruba, Bonaire and other islands off the Venezuelan coast). Although *A. angustifolia* is much more frequent as an ornamental (and as an escape), genuine *A. vivipara* is also available in the ornamental trade and has been introduced outside of its native distribution area, albeit very rarely so (see further).

***Agave fourcroydes* Lem. (Lemaire 1864: 66)**

Fig. 3C–D

Known in the Canary Islands from numerous localities (none enumerated here) in Fuerteventura, Gran Canaria, La Gomera, La Palma, Lanzarote and Tenerife – naturalised and

invasive (Acebes Ginovés et al. 2010; Santos-Guerra et al. 2013). Category E *sensu* Blackburn et al. (2011) (Fully invasive species, with individuals dispersing, surviving and reproducing at multiple sites across a greater or lesser spectrum of habitats and extent of occurrence).

Agave fourcroydes is known as a cultivated plant only. It is a sexually sterile clone that was probably derived from *A. angustifolia*. It is cultivated nearly worldwide in tropical regions, either for the production of hard fibre (henequen) or as an ornamental. Like other members of this group it copiously produces bulbils on the inflorescence (fig. 3C). These often already root whilst still attached to the plant and otherwise quickly do so once dropped to the ground. As a result, *A. fourcroydes* easily establishes itself wherever introduced. In hilly landscapes like those in the study area it naturalises or even becomes invasive, penetrating natural habitats (laderras, barrancos).

In its most typical form this species is easily distinguished from *Agave angustifolia* and *A. sisalana*. Compared with the former it is a much coarser, often gigantic plant with leaves sometimes attaining 2 m in length. With age it also develops a distinct trunk although this is only evident if lower leaves are cut. From *A. sisalana* it differs in its leaf margins that are distinctly and regularly toothed throughout (fig. 3D). The separation of *A. aff. tequilana* and *A. fourcroydes* in the study area is much less clear-cut (see under *A. aff. tequilana*).

***Agave macroacantha* Zucc. (Zuccarini 1833: 676)**

Fig. 3E

New to the flora of Fuerteventura and Tenerife. Previously reported from La Palma (Otto & Verloove 2018) – category C1 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild (i.e. outside of captivity or cultivation) in location where introduced, no reproduction).

Observation records

Fuerteventura

La Oliva, Corralejo, 28°43'42.31"N, 13°52'15.20"W, 24 m a.s.l. to 28°43'35.50"N, 13°52'17.79"W, 26 m a.s.l., escaping from ornamental plantation on the abandoned grounds of the former Acua Water Park, 26 May 2018, obs. E. Ojeda-Land (fig. 3E).

Tenerife

Güímar, Puertito de Güímar, 28°17'52.07"N, 16°22'31.43"W, long-abandoned plant nursery, now rough ground, persisting and clonally reproducing, 3 Dec. 2018, obs. F. Verloove.

Agave macroacantha is a Mexican endemic that naturally occurs in Puebla and Oaxaca (Gentry 1982; Thiede in press). It is commonly grown as an ornamental, in Spain for instance in Castellón and Valencia provinces (Guillot Ortiz & van der Meer 2006b). Although frequently cultivated, this species is very rarely reported as an escape. According to Randall (2017) it has not yet been recorded as a weed outside of its native range. Otto & Verloove (2018) cited a single casual record from La Palma (Canary Islands). In Tenerife this species persists on the grounds of a long-abandoned plant nursery, along with *A. filifera* and other ornamental succulents. In Fuerteventura *A. macroacantha* was formerly planted as an ornamental in the Acua Water park and now reproduces from

suckers in the abandoned area, although less prolifically than *A. angustifolia*. In Gran Canaria it also freely reproduces in numerous localities where it has been planted in the past. A future naturalization in the Canary Islands is imminent.

Agave angustifolia and *A. macroacantha* are morphologically similar. *Agave macroacantha*, however, is much smaller in stature and leaf size and further distinguished by its blue-gray leaves with dark, nearly black contrasting teeth and spine (fig. 3E). It also has a much stouter terminal spine that is c. 10% of the total leaf length.

Agave macroacantha can sexually reproduce by seeds and propagate vegetatively by aerial bulbils and ground-level basal shoots and rhizomes. Ground-level vegetative offspring and bulbils, however, showed much higher survival rates than seedlings (Arizaga & Ezcurra 2002).

Agave sisalana Perrine (Perrine 1838: 87–88)

Figs 3F, 4A–B

Known in the Canary Islands from numerous localities (none enumerated here) from Fuerteventura, Gran Canaria, La Palma, Lanzarote and Tenerife – naturalised and invasive (Acebes Ginovés et al. 2010; Santos-Guerra et al. 2013). Category E *sensu* Blackburn et al. (2011) (Fully invasive species, with individuals dispersing, surviving and reproducing at multiple sites across a greater or lesser spectrum of habitats and extent of occurrence).

Agave sisalana is known as a cultivated plant only. It is most likely that it was first domesticated in the Yucatan Peninsula in Mexico (Trejo-Torres et al. 2018). It is a sexually sterile, pentaploid clone that was most likely derived from *A. angustifolia*. It is cultivated nearly worldwide in tropical regions, either for the production of hard fibre (sisal) or as an ornamental. It persists indefinitely in and near abandoned plantations. Each plant produces thousands of bulbils that easily drop to the ground and root. The bulbils are in fact perfectly formed plantlets that are carried far and wide, especially in hilly habitats like in the study area. Although *A. sisalana* was merely considered a naturalised introduced species in the Canary Islands (Acebes Ginovés et al. 2010) it has become in fact an invasive species there (at least locally) that penetrates natural habitats, for instance barrancos.

Plants of *Agave sisalana* are usually readily distinguished from the other members of the section on their unarmed leaf margins (fig. 3F). However, in general habit and from a distance it is often indistinguishable from *A. fourcroydes*. It tends to have greener leaves as compared with the more glaucous leaves of *A. fourcroydes* and its flowers are usually a trifle smaller (55–65 mm vs. 60–75 mm). The existence of a form with short but well-developed triangular teeth, var. *armata* Trel. (fig. 4A–B), further blurs the boundaries between these two species. Such plants occur sporadically and at random in widely scattered localities, in cultivation but also in the wild (Gentry 1982). In Europe it has been reported as an escape in Spain (Guillot Ortiz & van der Meer 2006a). In the Canary Islands a well-naturalised population of *A. sisalana* var. *armata* was recently discovered on the slopes of a *barranco* in Lanzarote (see below). This taxon had not been reported before from the study area. It probably is of limited

taxonomic value and often included in the synonymy of *A. sisalana* by contemporary authors (e.g. Thiede in press).

Observation record

Lanzarote

Haría, Barranco Chafariz, 29°07'23.53" N, 13°30'25.91" W, 288 m a.s.l., in the transformed bed of the ravine (abandoned cultivated terraces) and on adjacent slopes, ca. 100 individuals, 24 July 2018, obs. A. Reyes-Betancort (fig. 4A–B).

Agave sisalana Perrine is often wrongly considered to be an invalid name (e.g. Tropicós 2018). On page 8 Perrine (1838) wrote: “Two varieties ... which I take the liberty to christen *Agave Sisalana* ...”, indeed without any further description of the new species. However, on pages 87–88 a detailed description is provided.

Agave aff. *tequilana* F.A.C.Weber (Weber 1902: 220–223, figs. 1–2)

Fig. 4C–D

New to the flora of the Canary Islands – category C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, and population self-sustaining).

Observation record

Gran Canaria

Santa Lucía de Tirajana, La Sorrueda, 27°53'31.61"N, 15°32'13.77"W, 552 m a.s.l., stony slope, sun-exposed, many individuals, widely dispersed, 23 Jul. 2016, obs. Á. Marrero and 18 Dec. 2017, obs. F. Verloove (fig. 4C–D).

Specimens collected

Gran Canaria

Santa Lucía de Tirajana, bajada a La Sorrueda, Llanos de la Piedra, 27°53'33.0"N, 15°32'13.0"W, 550 m a.s.l., ambientes del tabaibal xerófilo-termoesclerófilo, en antiguas terrazas de cultivos, subespontánea, estolonífera, 26 May 2018, *Á. Marrero & C. Santiago* 37288-37290 (LPA).

Ibidem, Llanos de la Piedra, 27°53'30.4"N, 15°32'14.6"W, 540 m a.s.l., setos de bordes de bancales de antiguos cultivos en zona termoesclerófila, subespontánea, estolonífera, 29 Jun. 2019, *Á. Marrero & R. López González* 37492-37494 (LPA).

Agave tequilana is unknown as a wild species although closely similar plants have been found in the wild in Mexico (Gentry 1982). It is cultivated in large plantations in Mexico, especially near the town of Tequila in Jalisco, and is an important source of the distilled liquor tequila (Thiede in press). At present, it is also more or less widely grown as an ornamental in climatologically suitable areas. However, it has only exceptionally been recorded as an escape outside its native area. In Queensland, Australia, it is considered a ‘Non-Declared Weed of Agriculture’ (Randall 2017). In Gran Canaria a population with several dozens of individuals is naturalised on the grounds of a long-abandoned finca in La Sorrueda (fig. 4C). In this locality the reputable German botanist Günther Kunkel (1928–2007) introduced numerous non-indigenous plants for xero-gardening purposes. The site is abandoned since the 1970's and suffered from several severe fires. Nonetheless, many species established themselves, including cacti like *Cylindropuntia imbricata* (Haw.)

F.M.Knuth, *Opuntia leucotricha* DC. and *O. microdasys* (Lehm.) Pfeiff. (Verloove et al. 2017) or agaves like *A. lechuquilla* and *A. murpheyi* (this paper).

The plants naturalised in La Sorrueda most closely resemble *Agave tequilana* and more or less correspond with the plants that are cultivated as ornamentals under this name in Europe. However, they are not identical with the plants from Jalisco (A. Valenzuela-Zapata, Belgium, pers. comm., March 2018). They are much reminiscent of *A. fourcroydes* but are less massive with shorter, distinctly glaucous leaves (ca. 107 × 10 cm on average), a shorter terminal spine (10–20 mm) and inflorescences with 20–25 umbels (rather than 10–18 in *A. fourcroydes* and *A. angustifolia*) (fig. 4D). The material from La Sorrueda also tends to have a shorter stem. Another entity that roughly resembles these plants is *A. ×cavanillesii* Guillot & van der Meer (Guillot Ortiz & van der Meer 2004), a putative hybrid of *A. decipiens* Baker and *A. fourcroydes* that spontaneously arose in the Valencia area in Spain. It shares many features with *A. tequilana*, including the shorter leaves with smaller marginal teeth and apical spine, but it has green leaves (D. Guillot & P. van der Meer, Valencia, Spain, pers. comm., May 2018).

Although the exact identity of the population from La Sorrueda remains somewhat uncertain it is included in this account because it is obviously well-established in this locality and sufficiently different from *Agave fourcroydes* to be treated as a distinct entity. Similar (but identical?) plants also have been observed elsewhere in the study area, for instance in Las Palmas de Gran Canaria (Tafira Alta) and in Grana-dilla de Abona (El Médano) in Tenerife.

Section *Salmianae* (A.Berger) Verloove & Thiede, in Thiede et al. (2019: 257)

Agave [unranked infragen. “Reihe”] *Salmianae* A.Berger

Gentry (1982: xi) explicitly stated that his informal groups are “tantamount to sections”, and he used the term “group” throughout the taxonomic treatment except for the synoptical classification on p. 269 given as “Sectional list of species”. Mottram (2015) used the latter page as indication of sectional rank, albeit otherwise the term “group” is used throughout. We treat the “sectional list” as erroneous and treat all informal groupings as informal groups. Thus, a new combination for “*Salmianae*” was needed which was proposed in Thiede et al. (2019).

This group includes three species (Thiede in press) and is characterised by large to massive green leaves, a densely surculose habit and a pyramidal inflorescence with fleshy, densely imbricate bracts (Gentry 1982). A single variable species with two varieties is naturalised in the study area.

Agave salmiana Otto ex Salm-Dyck (Salm-Dyck 1859: 88)

Figs 4E–F, 5A–C

Agave salmiana, a Mexican endemic, is a variable species and includes several infraspecific taxa (Gentry 1982). In addition to the nominal species the following are most notable: subsp. *crassispina* (Trel.) Gentry (syn.: *A. crassispina* Trel.) and var. *ferox* (K.Koch) Gentry (syn.: *A. ferox* K.Koch). Two

infraspecific taxa, var. *ferox* and var. *salmiana* have been recorded in the study area. They are contrasted in the following couplet:

- 1 Leaves usually massive, 1–2 m long, linear-lanceolate (L/W ratio ca. 5/1), often distinctly sigmoid, dull greyish green, with small or prominent marginal teeth. Flowers large, 90–110 mm long..... var. ***salmiana***
- 1'. Leaves often not exceeding 1 m in length, broadly-oblan-coeolate (L/W ratio ca. 3/1), recurved at tip, often a bright-er, shiny green, with very prominent marginal teeth. Flowers smaller, 70–90 mm long..... var. ***ferox***

Agave salmiana* var. *salmiana

Fig. 4F, 5A–C

New to the flora of the Canary Islands – category C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, and popu-lation self-sustaining). Previous records of ‘*Agave ferox*’ from Gran Canaria (Kunkel 1972) doubtlessly belong here, at least for the most part.

Observation records

Gran Canaria

Las Palmas de Gran Canaria, Tafira Alta, Calle Lomo de En-medio, 28°3'11.76"N, 15°27'20.13"W, 319 m a.s.l., by dirt track, on the verge of barranco, scattered individuals amidst numerous *A. americana*, 6 Dec. 2017, obs. F. Verloove.

Telde, Hornos del Rey, abandoned finca adjacent to Barranco de Las Goteras, 28°2'5.81"N, 15°26'1.93"W, 133 m a.s.l., small population, 16 Apr. 2018, obs. F. Verloove.

Telde, Camino a La Sima, 28°1'47.46"N, 15°26'1.82"W, 164 m a.s.l., roadside, scattered individuals, 16 Apr. 2018, obs. F. Verloove.

Las Palmas de Gran Canaria, Los Hoyos, Camino Sabro and Cuesta de los Espinos, between 28°3'2.23"N, 15°27'38.66"W and 28°2'53.83"N, 15°27'41.25"W, 340–365 m a.s.l., natu-ralised from hedges on edges of crops, roads and paths, very common, 20 Mar. 2018, obs. Á. Marrero Rodríguez and 17 Apr. 2018, obs. F. Verloove (figs 4F, 5A–B).

Santa Brígida, Camino Las Arenillas, 28°2'6.56"N, 15°28'5.64"W, 525 m a.s.l., roadside, few plants, 17 Apr. 2018, obs. F. Verloove.

Las Palmas de Gran Canaria, GC-802 road, W slope of Pico de Bandama, 28°2'27.59"N, 15°27'33.56"W and 28°2'26.60"N, 15°27'38.47"W, 410–412 m a.s.l., roadside, numerous plants, 17 Apr. 2018, obs. F. Verloove.

Las Palmas de Gran Canaria, GC-800 road at San Francisco de Paula, 28°3'21.55"N, 15°27'11.88"W, 359 m a.s.l., one in-dividual, 18 Apr. 2018, obs. F. Verloove.

Las Palmas de Gran Canaria, Tafira Baja, Montaña del So-corro, 28°4'5.36"N, 15°27'11.02"W, 350–380 m a.s.l., hilly shrubland with *Pistacia*, *Olea*, etc., by the dozen, 20 Mar. 2018, obs. Á. Marrero and 24 Apr. 2018, obs. F. Verloove, Á. Marrero Rodríguez & M. Salas Pascual.

Tenerife

Arafo, road down to Arafo, 28°21'32.99"N, 16°25'57.54"W, 955 m a.s.l., border of an abandoned crop lot, a single sur-culose clone with old inflorescences, 11 Jul. 2018, obs. J.A.



Figure 4 – A. *Agave sisalana* var. *armata*, Haria (L), July 2018. B. Idem. In this variety leaf margins are minutely denticulate. C. *A. aff. tequilana*, Santa Lucía de Tirajana (C), April 2018. D. Idem, December 2017. Detail of leaf spination. E. *A. salmiana* var. *ferox*, Los Realejos (T), July 2018. F. *A. salmiana* var. *salmiana*, Las Palmas de Gran Canaria (Los Hoyos) (C), August 2018. Compared with *A. americana* leaves are greenish, not glaucous. Photographs: A, B, E by A. Reyes-Betancort; C, D by F. Verloove; F by M. Salas Pascual.

Reyes-Betancort (fig. 5C); idem, 04 Dec. 2018, obs. F. Verloove.

Specimen collected

Gran Canaria

Las Palmas de Gran Canaria, Tafira Baja, Montaña del Socorro, 28°04'02.1"N, 15°27'10.8"W, 380 m a.s.l., cono volcánico con vegetación termoesclerifila del acebuchal y lentiscal, subespontánea, estolonífera, 27 Jun. 2019, *Á. Marrero* 37481-37482 (LPA).

Agave salmiana var. *salmiana* is endemic to Mexico where many forms are cultivated for the tapping of agua miel for the production of pulque, a fermented, lightly alcoholic beverage. In other parts of the world it is widely grown as an ornamental. It is particularly common in parts of the Mediterranean basin.

In stature and habit *A. salmiana* var. *salmiana* is much reminiscent of forms of *A. americana* and these taxa certainly have been confused by local botanists. Both (and especially the latter) are variable and have several features in common: a heavily surculose habit, massive, ± curved leaves, etc. Non-flowering individuals of *A. salmiana* var. *salmiana* can be separated based on leaf colour: leaves are dull green (fig. 4F) while they are always glaucous in *A. americana*. Typically, leaves are also sigmoidally curved (fig. 4F). The inflorescence pole, however, is most characteristic: it is hardly longer than wide and more or less pyramidal in outline with the longest branches located in the lower half of the pole (fig. 5A). Peduncular bracts tend to be very prominent and fleshier in texture (fig. 5B). The naturalised plants found in Gran Canaria and Tenerife are fairly uniform and further differ from var. *ferox* in being usually massive with much narrower leaves up to or even exceeding 200 cm in length with long-acuminate sigmoidal tips and usually (not always) less pronounced marginal teeth.

In Gran Canaria *Agave salmiana* var. *salmiana* is rare although it is locally naturalised in relative abundance. It is most frequent near Los Hoyos, exactly the place from where '*Agave ferox*' was reported by Kunkel (1972). There is no doubt that Kunkel also saw *A. salmiana* var. *salmiana* and that this species is naturalised for half a century or longer in this area. All recently observed populations are from the northeastern part of the island and often obviously refer to relics of former cultivation (near old fincas, etc.). At present, however, var. *salmiana* is only exceptionally grown as an ornamental in Gran Canaria, var. *ferox* being more frequent now in the horticultural trade. In Tenerife *A. salmiana* var. *salmiana* only occurs in a single locality in Arafo, in a rocky, arid upland locality, at an altitude of nearly 1,000 m.

Agave salmiana var. *salmiana* is a frequent ornamental in parts of the Mediterranean area and in climatologically similar areas elsewhere in the world. It readily escapes and is reportedly naturalised in several countries, for instance in southern France (Tison & de Foucault 2014), Italy (Celesti Grapow et al. 2010), Portugal (Smith & Figueiredo 2007; Silva et al. 2015) and Spain (Guillot Ortiz & van der Meer 2005, 2008a; Guillot Ortiz et al. 2008; Peña & Sánchez 2016). *A. salmiana* var. *salmiana* is considered an invasive species in Sardinia (Podda et al. 2012). It is also known as

a naturalised escape in South Africa (Smith & Figueiredo 2012a).

Records of *Agave atrovirens* Karw. ex Salm-Dyck in Europe (Webb 1980) turned out to refer to *A. salmiana* var. *salmiana* (Smith & Figueiredo 2007). However, the identity of the plant naturalised under this name in Madeira requires further study. According to Vieira (2002) it is highly bulbiferous, a feature compatible with neither *A. atrovirens* nor *A. salmiana* var. *salmiana*.

Agave salmiana var. *ferox* (K.Koch) Gentry (Gentry 1982: 611–612)

Fig. 4E

A. ferox K.Koch (Koch 1860: 23). – *A. salmiana* subsp. *ferox* (K.Koch) Hochstätter (Hochstätter 2015: 23). – **Type:** La Mórtoles, Mr. Hanbury's garden, 2 and 18 Jul. 1896, *Anon. s.n.* (K).

New to the flora of Tenerife. Previous records of '*Agave ferox*' from Gran Canaria (Kunkel 1972) doubtlessly belong to var. *salmiana*, at least for the most part – category C1 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild (i.e. outside of captivity or cultivation) in location where introduced, no reproduction).

Observation records

Tenerife

Los Realejos, La Montañeta, in the SSW slope of the volcano, 28°23'27.72"N, 16°33'36.54"W, 308 m a.s.l., gravelly slope, 3 Jun. 2018, obs. J.A. Reyes-Betancort (fig. 4E); idem, 18 Jan. 2019, obs. F. Verloove & J.A. Reyes-Betancort. Tegueste, road down to El Socorro, 28°30'34.37"N, 16°21'37.35"W, 342 m a.s.l., ravine slope, 3 Jun. 2018, obs. J.A. Reyes-Betancort; idem, 18 Jul. 2018, obs. E. Ojedaland; idem, 18 Jan. 2019, obs. F. Verloove.

Compared with var. *salmiana* this variety usually has a more urn-shaped (urceolate) rosette with smaller (70–90 × 23–30 cm), broadly oblanceolate, outcurving and often more shiny, greener leaves with marginal teeth on more prominent protuberances (fig. 4E). It is easily recognisable but of uncertain systematic status (Thiede in press). At present, *A. salmiana* var. *ferox* is more frequently grown in private or public gardens or as a roadside ornamental in the Canary Islands than var. *salmiana*. On several occasions young plants have been observed close to the planted individuals, doubtlessly a result of its surculose habit, but genuinely wild plants have rarely been recorded so far, and not at all in Gran Canaria. This is of interest since it was previously reported from Gran Canaria and La Gomera in the study area (Kunkel 1972, 1975). However, all records from Gran Canaria that could be verified belong to var. *salmiana* (see before).

In Tenerife *A. salmiana* var. *ferox* has recently been recorded on two occasions. In Los Realejos and in Tegueste it is escaping from an ornamental plantation. Obviously self-sown plants have established themselves in suitable habitats close to the plantations. In the first locality *A. salmiana* var. *ferox* is spreading on the slope of the volcano (together with the similarly spreading *A. americana* var. *marginata*) whereas in Tegueste it is colonising the slope and the dried-out riv-

erbed of a barranco adjacent to the road where it had been planted in the past.

Agave salmiana var. *ferox* has naturalised in the Mediterranean area, although often less commonly so than var. *salmiana*. It is well known from Spain and the Balearic Islands where it has been recorded on several occasions (Guillot Ortiz et al. 2008). Still in the Iberian Peninsula its presence has been reported from Portugal (Smith & Figueiredo 2007) whereas Podda et al. (2012) consider it as naturalised in Sardinia.

Section *Viviparae* (Baker) Verloove & Thiede, in Thiede et al. (2019: 260)

Agave [unranked infragen. “Group”] *Viviparae* Baker

A new name for this assemblage (Group *Vicinae* Thiede) was introduced by Thiede (2001) since the type of Group *Viviparae* (*Agave vivipara*) was thought to be conspecific with *A. angustifolia* (based on Wijnands 1983). These are, however, quite different species that belong to separate sections (García-Mendoza & Chiang 2003). Their traditional infrageneric classification (Trelease 1913; Berger 1915; Gentry 1982) should be retained.

Section *Viviparae* includes eight species from northern South America (Venezuela and Colombia) and the Leeward Islands (Trelease 1913; Wagenaar Hummelinck 1993; Thiede in press). Plants are always surculose (at least after flowering). Leaves are fleshy (not hard), green to slightly glaucous, very broadly lanceolate and curved (sigmoid) with relatively short, regularly spaced marginal teeth. Inflorescences are freely bulbiliferous (Trelease 1913; Álvarez de Zayas 1995). In the Caribbean species this combination of features only occurs in section *Viviparae*. A single species is increasingly cultivated as an ornamental in the study area and easily escapes.

Agave vivipara L. (Linnaeus 1753: 323)

Figs 5D–F, 6A–B

New to the flora of the Canary Islands – category C1 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild (i.e. outside of captivity or cultivation) in location where introduced, no reproduction).

Observation records

Gran Canaria

Las Palmas de Gran Canaria, Parque Central, 28°6'2.54"N, 15°26'45.10"W, 171 m a.s.l., escaping from ornamental plantation, 15 Mar. 2012 and onwards, obs. M. Salas Pascual.

Las Palmas de Gran Canaria, San José del Álamo, 28°4'54.02"N, 15°30'12.59"W, 423 m a.s.l., 5 Apr. 2016, obs. M. Salas Pascual.

Las Palmas de Gran Canaria, Campus Facultad Medicina, San Cristóbal, 28°4'32.67"N, 15°24'59.19"W, 19 m a.s.l., escaping from ornamental plantation, Mar. 2018, obs. M. Salas Pascual.

Las Palmas de Gran Canaria, Lomo de la Cruz, 28°5'28.81"N, 15°26'51.07"W, 207 m a.s.l., on top of slope along GC-23 motorway, escaped from ornamental plantation, several indi-

viduals, 12 Apr. 2018, obs. Á. Marrero; idem, 18 Apr. 2018, obs. F. Verloove (fig. 5 D-F).

Specimen collected

Gran Canaria

Las Palmas de Gran Canaria, Tafira Baja, entornos del Campus; 28°04'20.8"N, 15°27'07.1"W; 315 m a.s.l., bordes de zonas ajardinadas, subespontánea, estolonífera; 27 Jun. 2019, Á. Marrero, 37474-37475 (LPA).

Agave vivipara is the first-named Caribbean species of the genus. It was originally restricted to the Leeward Islands (Aruba, Bonaire, Curaçao and Margarita) (Thiede in press). In recent years, however, it apparently was introduced in the horticultural trade. In Gran Canaria it has been relatively frequently planted as an ornamental for several years. In recent years escaped individuals were seen in scattered localities where *A. vivipara* was formerly planted. The species produces numerous bulbils (fig. 6B) and these easily drop to the ground and root. A future naturalisation (as for other species with a similar biology, especially those from section *Rigidae*) is very likely. *Agave vivipara* also reproduces from suckers. The latter are usually produced only after flowering whereas in the vegetative phase plants often appear solitary (figs. 5D, 6A).

This species is easily recognisable. Its rosette is less than 100 cm in diameter and 50 to 60 cm high. The leaves are all abruptly tapered towards the apex, canaliculate and curved outwards (often distinctly sigmoidal) (figs 5F, 6A). They are broadly lanceolate, widest at about mid length and narrowed above base to ca. ½ leaf width; they are on average 50 × 15 cm (ca. 3.5 × as long as wide). Leaf margins are closely and regularly toothed with short teeth (ca. 4–5 mm long) on lunate bases (fig. 5F). The apical spine is ca. 25 mm long. The colour of the plant is green to glaucous, sometimes slightly pruinose (fig. 6A). The inflorescence is relatively short (ca. 3 m tall) and flowers are bright yellow (fig. 5E). In the Canarian plants leaf marginal teeth are more closely placed than usually recorded. This may indicate introgression or even hybridisation. However, this character also seems to be very variable in autochthonous populations as shown in a specimen collected in Curaçao (Willemstad, March 1913, *N.L. Britton & J.A. Shafer 3060* U.1048296, herb. U).

Trelease (1913) described the very similar *Agave vicina* Trel. from Aruba. It was differentiated by its dull green (vs. transiently glaucous) leaves with heavily triangular marginal teeth from large lunate bases (vs. slender teeth from small lunate bases). Also, marginal teeth are slightly less closely placed in *A. vicina* than in *A. vivipara*. According to Wagenaar Hummelinck (1993) and Álvarez de Zayas (1995), *A. vicina* is best considered conspecific with *A. vivipara*, a point of view with which we disagree (Thiede in press). Nonetheless, it is likely that far too many species of *Agave* have been described in the past in the Caribbean. For instance, in the Lesser Antilles Rogers (2000) reduced the number of species from 12 to a single one, *A. karatto* Mill.

The identification of *A. vivipara* was not straightforward. Canarian plants were initially thought to be *Agave desmetiana* Jacobi, a species that is unknown in the wild but frequently cultivated as an ornamental. In general appearance it closely resembles *A. vivipara* but its leaf margins are ei-

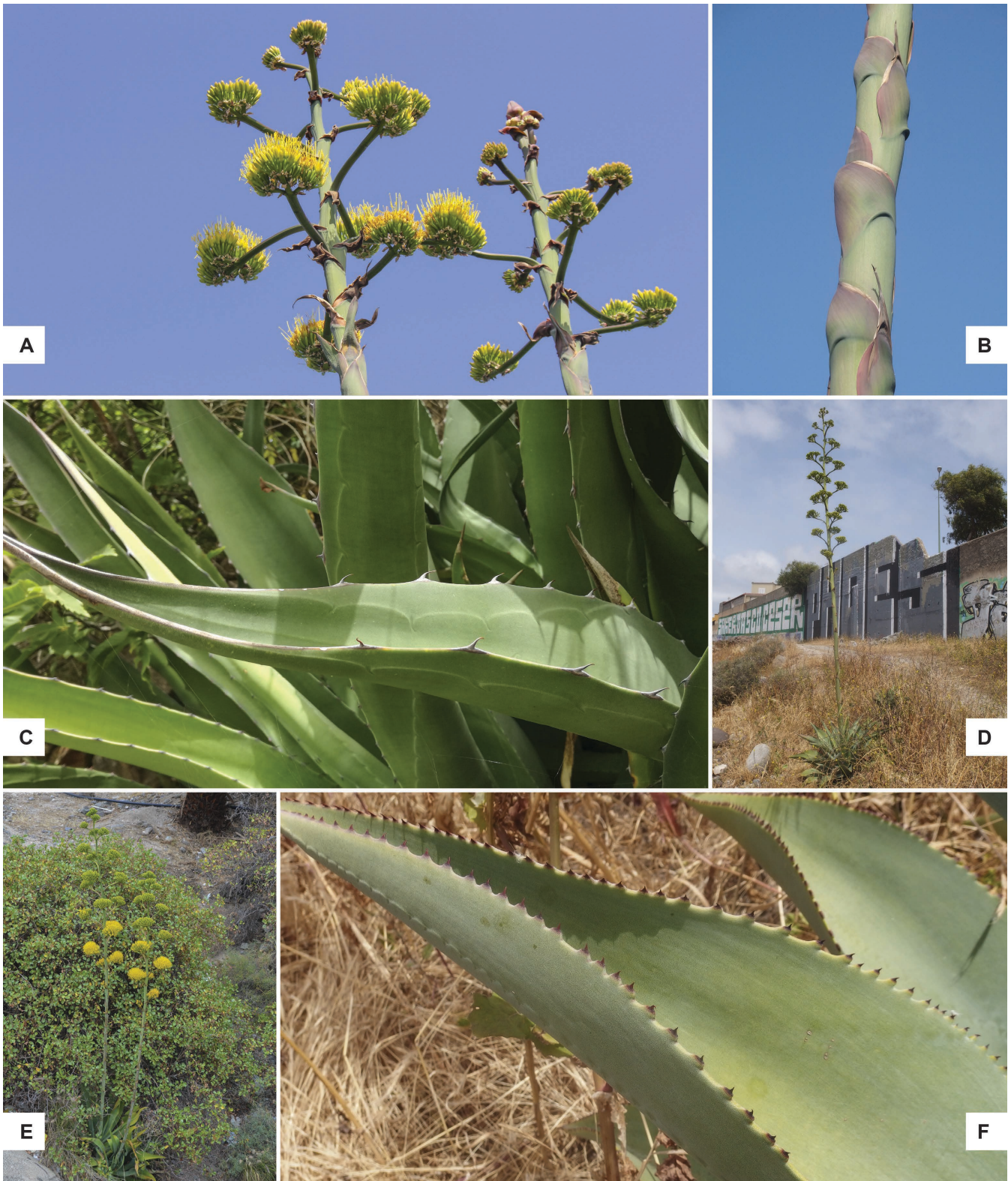


Figure 5 – **A.** *Agave salmiana* var. *salmiana*, Las Palmas de Gran Canaria (Los Hoyos) (C), August 2018. The inflorescence in this species is hardly longer than wide and more or less pyramidal. **B.** Idem, April 2018. Inflorescence bracts in this species are triangular and fleshy. **C.** Idem, Arafo (T), July 2018. In this species leaves are green with a long-decurrent terminal spine. **D.** *A. vivipara*, Las Palmas de Gran Canaria, Lomo La Cruz (C), April 2018. **E.** Idem, May 2018. Flowers of this species are bright yellow. **F.** Idem, April 2018. Detail of leaf spination. Photographs: A by M. Salas Pascual; B, D, F by F. Verloove; C by A. Reyes-Betancort; E by Á. Marrero.

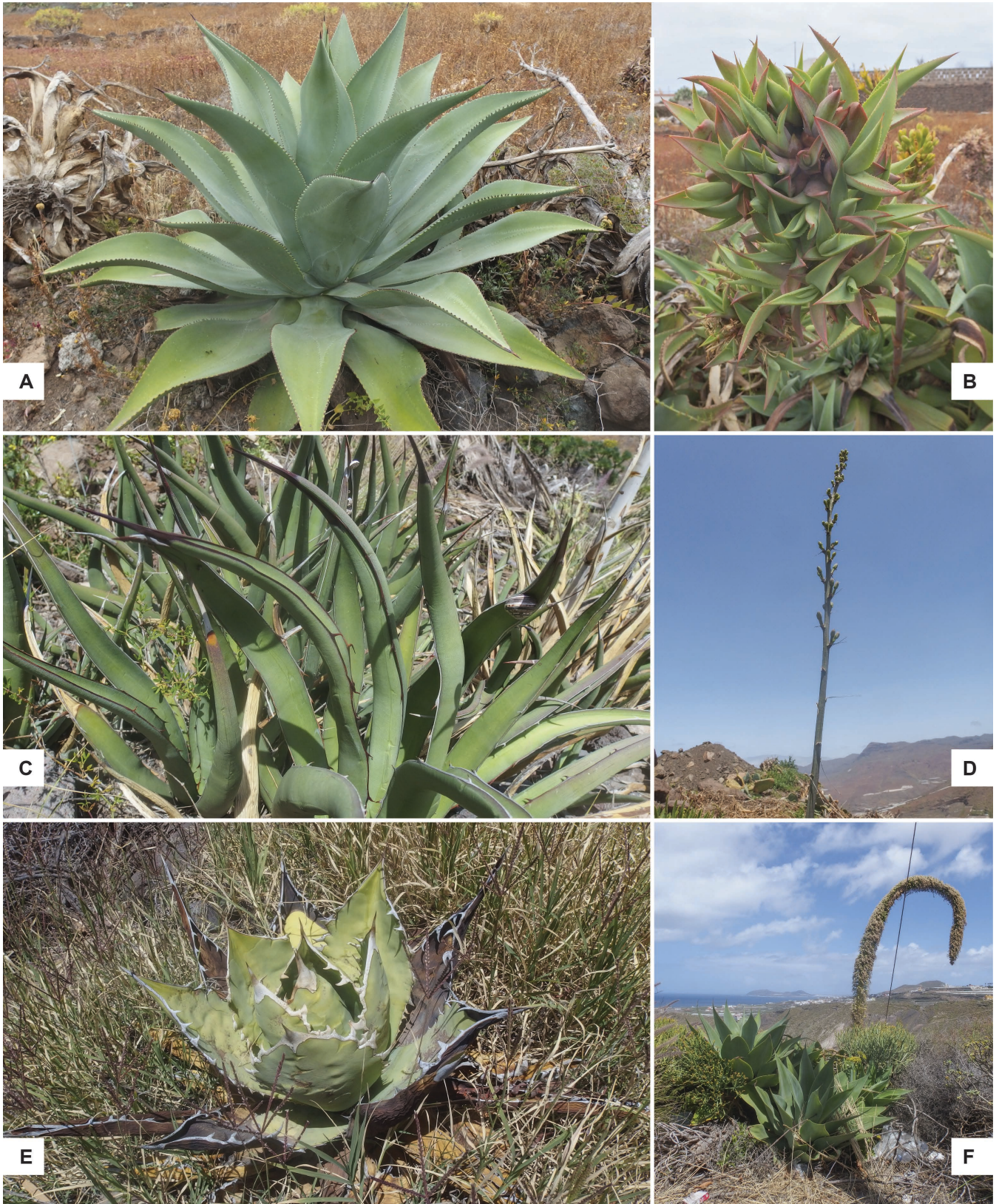


Figure 6 – **A.** *Agave vivipara*, Arucas (C), April 2018. Leaves are abruptly narrowed towards base. **B.** Idem. Inflorescences are bulbiliferous. **C.** *A. lechuguilla*, La Aldea de San Nicolás (C), April 2018. **D.** Idem. The inflorescence of this species is spicate, not racemose. Bracts are linear. **E.** *A. oteroi*, Santa Lucía de Tirajana (C), April 2018. **F.** *A. attenuata*, Fargas (Cambalud) (C), April 2018. The arching, spicate inflorescence is very characteristic and leaf margins are unarmed. Photographs: A–F by F. Verloove.

ther smooth or only have weak or small teeth near the leaf base. In addition, its leaves are longer (50–80 cm) and have a larger length to width ratio. Also, its flowers are a paler yellow (Irish & Irish 2000; Thiede in press). It is locally naturalised in Florida (Franck 2012). *Agave wercklei* F.A.C. Weber ex Wercklé, a species from Costa Rica, is also similar but it is non-surculose, has a much taller inflorescence with very short peduncle, paler, rough (at least when young) leaves with marginal teeth not on distinct protuberances (García-Mendoza & Lott 1994). It has been recorded as an escape in South Africa (Smith & Steyn 2002; Walters et al. 2011). Finally, *A. cocui* Trel. is also very similar and in fact the only species of those mentioned here that is closely related to *A. vivipara* (both belong to section *Viviparae*). It is native to Venezuela and Colombia and also widely occurs in the Leeward Islands where it probably is a naturalised introduction (Wagenaar Hummelinck 1936, 1993). It is a coarser, non-surculose species with slightly longer leaves and a much taller inflorescence reaching 5–10 m in length (Thiede in press). It is, however, not always clearly separated from *A. vivipara* (Wagenaar Hummelinck 1938) and may be a taller, more robust expression of it.

To our knowledge, true *Agave vivipara* is very rarely seen outside of its native distribution area. It was recorded from South Africa (Walters et al. 2011; also Smith & Steyn 1999b, sub *A. decipiens* Baker) but the records require confirmation.

Subgenus *Littaea* (Tagl.) Baker

Inflorescence often dense, elongated panicles with \pm short-stalked partial inflorescences mostly with paired or few clustered flowers ('spicate').

Section *Heteracanthae* Salm-Dyck (= Group *Marginatae* Baker ["Gentry"])

Species from this section have leaves with conspicuous horny margins and moderate to strong marginal teeth. The section accommodates 22 species in Mexico, the southern U.S.A. (New Mexico, Texas) and Guatemala (Thiede in press). Two species are known to occur as escapes in the study area.

Agave lechuguilla Torr. (Torrey 1859: 213–214)

Fig. 6C–D

New to the flora of the Canary Islands – category C1 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild (i.e. outside of captivity or cultivation) in location where introduced, no reproduction).

Specimens collected

Gran Canaria

Santa Lucía de Tirajana, La Sorrueda, 27°53'31.61"N, 15°32'13.77"W, 552 m a.s.l., stony slope, sun-exposed, several individuals, widely dispersed, 28 Apr. 2018, *F. Verloove* 13239 (BR).

Santa Lucía de Tirajana, bajada a La Sorrueda, Llanos de la Piedra, 27°53'33.1"N, 15°32'08.2"W, 550 m a.s.l., ambientes del tabaibal xerófilo-termoesclerófilo, en antiguas terrazas de

cultivos, subespontánea, estolonífera, 26 May 2018, *A. Marrero* & *C. Santiago* 37291-37294 (LPA).

La Aldea de San Nicolás (Tocodomán), 27°57'34.84"N, 15°46'52.38"W, 296 m a.s.l., on top of stony slope, a small colony, 25 Apr. 2018, *F. Verloove* 13231 (BR) (fig. 6 C–D).

A native of the southern U.S.A. (New Mexico, Texas) and Mexico, *Agave lechuguilla* is a characteristic species of the Chihuahuan Desert. It is restricted to desert habitats and prefers limestone soils. It is readily recognisable by its 'spicate' inflorescence, widely suckering habit and narrow, deeply convex leaves with down-slanted teeth on straight margins (Thiede in press) (fig. 6C–D).

Two small populations were recently detected in Gran Canaria. In La Sorrueda it grows on the grounds of a long-abandoned finca, whereas in Tocodomán a few individuals at the beginning of flowering (and with some remains of infructescences of the previous year) were noticed close to the Cactualdea cactus park. The plants grow on top of a slope with various kinds of debris and garden waste and most likely can be considered as having become established from discarded garden material.

To our knowledge and although widely grown as an ornamental, *Agave lechuguilla* has only exceptionally been reported in the wild outside of its native distribution range. Guillot Ortiz & van der Meer (2005) cite a single record from El Saler (Valencia) in Spain. Although further records from northeastern Spain (Maranges 2011; Aymerich & Gustamante 2016) have been considered erroneous (Mesquida et al. 2016), its presence was confirmed lately from Tarragona province (Aymerich 2017). Holm et al. (1979) and Randall (2017) report it as a weed in North America.

The morphologically similar and related *A. difformis* A. Berger was recently also recorded in Spain (López-Pujol et al. 2016). This is usually a more robust species with a much longer inflorescence, wider and longer leaves (often with more or less sinuous margins) and with marginal teeth less frequently down-slanted. Both species, however, are very polymorphic and they are known to intergrade (Gentry 1982). The plants currently known from Gran Canaria have relatively short leaves: they are on average ca. 35 cm long and 2–3 cm wide in flowering individuals. Leaf margins are straight and all teeth are deflected (fig. 6C). Inflorescences are small, not exceeding 2 m in length. All these characters point at *A. lechuguilla*. *Agave funkiana* K. Koch & C.D. Bouché and *A. lophantha* Schiede ex Kunth (syn.: *A. univittata* Haw.; see, however, Smith et al. 2018) are also related species that were found as escapes in Spain (Guillot Ortiz & van der Meer 2008b, 2013b). Both are coarser species with wider and longer leaves and more densely flowered inflorescences. The latter further differs in having sinuous to undulate leaf margins with at least part of the teeth double set (Gentry 1982).

Agave lechuguilla was originally described as '*Agave lecheguilla*' by Torrey (1859) and this spelling is still adopted by databases such as Tropicos (Tropicos 2018). The specific epithet, however, refers to 'lechuguilla', a common name in Chihuahua meaning "small lettuce". Engelmann (1875) already considered this to be a misprint and its spelling was corrected by Gentry (1982).

Agave oteroi G.D.Starr & T.J.Davis (Starr & Davis 2019: 134–136)

Fig. 6E

New to the flora of the Canary Islands – category C1 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild (i.e. outside of captivity or cultivation) in location where introduced, no reproduction).

Observation record

Gran Canaria

Santa Lucía de Tirajana, La Sorrueda, 27°53'17.15"N, 15°32'3.77"W, 481 m a.s.l., stony roadside, a single individual, 28 Apr. 2018, obs. F. Verloove (fig. 6E).

Gentry (1982) described *Agave titanota* from Rancho Tambor and for quite a long time it was only known in the wild from the type locality in northern Oaxaca in Mexico. In recent years it was shown to be more widespread in north-eastern Oaxaca (Pilbeam 2013), and it was also collected in southernmost Puebla (García-Mendoza 2011). In the horticultural trade, however, *A. titanota* was widely distributed from very soon after its discovery. The same applies to similar-looking plants found in 1984 by Felipe Otero in the Sierra Mixteca and distributed under his collection number FO-076. Several forms and cultivars are offered for sale in the horticultural trade (see Guillot Ortiz & van der Meer 2014 for an overview).

Agave titanota is characterised by its ovate, spatulate to broadly lanceolate, glaucous white or blue-white leaves with large, irregular, whitish-grey teeth, the terminal spine forming a broad robust plate on the lower face. The only plant seen in the wild in the study area differs from Gentry's original description, for instance in leaves not being alabaster- or glaucous-white-coloured. They are referable to what was long known as 'Agave FO-076' or *Agave* 'Felipe Otero' and were recently described as a separate species, *A. oteroi* (Starr & Davis 2019). It differs from *A. titanota* by its green, mostly obovate leaves, broader woody margin which is extremely pronounced below the terminal spine on the back of the leaves (fig. 6E). Both species are also separated geographically and inhabit different substrates (Starr & Davis 2019).

Section *Inermes* Salm-Dyck (≡ Group *Amolae* Gentry nom. inval. Art. 37.1.; Turland et al. 2018)

This section includes species with unarmed, non-filiferous soft leaves and inflorescences with densely arranged flowers. Ten species are usually recognised and all are endemic to Mexico, mainly occurring in the Sierra Madre Occidental (Thiede in press). A single species has been observed in the study area.

Agave attenuata Salm-Dyck (Salm-Dyck 1834: 303)

Fig. 6F

New to the flora of Tenerife. Previously reported from Fuerteventura, Gran Canaria and La Palma (Brandes & Fritsch 2002; Verloove 2013; Otto & Verloove 2016) – category C2 or C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, population ± self-sustaining or not).

Observation records

Tenerife (selected records)

Tegueste (El Socorro), Barranco de Las Cuevas, dry gravelly riverbed, 27 Jun. and 5 Nov. 2014, 13 Jan. 2017, obs. F. Verloove.

Candelaria, Barranco de Aroba, 28°21'37.11"N, 16°22'8.02"W, 29 m a.s.l., dry, gravelly riverbed, several individuals in close proximity (looks ± established), 11 Nov. 2014, obs. F. Verloove.

Palm-Mar, rough ground near habitations, 21 Feb. 2015, obs. F. Verloove.

Arona (La Camella towards Valle de San Lorenzo), roadside slope, 21 Jun. 2016, obs. F. Verloove.

Santa Cruz de Tenerife, Barranco de Santos near La Ermita, slope of ravine, 13 Nov. 2016, obs. F. Verloove.

Granadilla de Abona (La Tejina near Urbanización Sotavento), by track, 20 Nov. 2016, obs. F. Verloove.

Granadilla de Abona (San Isidro), Calle Imade, on the verge of dry riverbed, 20 Nov. 2016, obs. F. Verloove.

Arona (Chayofa), Barranco del Verodal, 22 Nov. 2016, obs. F. Verloove.

Güímar, abandoned dump alongside TF-28, 11 Jan. 2017, obs. F. Verloove.

Santa Cruz de Tenerife, La Cuesta, 28°27'37.22"N, 16°16'57.61"W, 241 m a.s.l., a clone on the rocky slope of the road, probably escaped from a garden, 19 Apr. 2018, obs. E. Ojeda-Land.

La Victoria de Acentejo, Risco La Sardina at Urbanization La Palmita, 28°26'21.49"N, 16°28'55.28"W, 167 m a.s.l., hillside near abandoned farms, a clone with *Hylocereus undatus*, 25 Apr. 2018, obs. E. Ojeda-Land.

In the Canary Islands this ornamental from Central Mexico had previously been recorded from Fuerteventura, Gran Canaria and La Palma. In recent years it has been increasingly found on these islands and it is here reported for the first time from Tenerife as well. In most instances the occurrences consist of solitary individuals and *Agave attenuata* is definitely much less expansive than many of its congeners. In some places in Tenerife, however, small but apparently established populations were detected (including flowering individuals), for instance in a ravine in Candelaria (Barranco de Aroba) or in La Victoria de Acentejo where it grows on the cliff that is part of the Protected Natural Area of La Costa de Acentejo. A future naturalisation on a wider scale is not unlikely. Also, in Gran Canaria *A. attenuata* was detected in numerous additional localities in recent years. At least in some of these, for instance on the slopes of a ravine in Arucas (Santidad), small but apparently established populations were seen with flowering and fruiting individuals. Although very widespread in cultivation *A. attenuata* has a very limited native distribution range that remained unknown for quite a long time (Chazaro et al. 1998).

Agave attenuata is widely cultivated in warm-temperate regions of the world and increasingly reported as escaping, also in natural habitats. It is known, for instance, from the Kruger National Park in South Africa (Foxcroft et al. 2008), Italy, including Sardinia and Sicily (Podda et al. 2012; Galasso et al. 2018) and many parts of Australia (Randall 2017). In Macaronesia it is also known from Madeira (Vieira 2002; Borges et al. 2008) where it is locally naturalised.

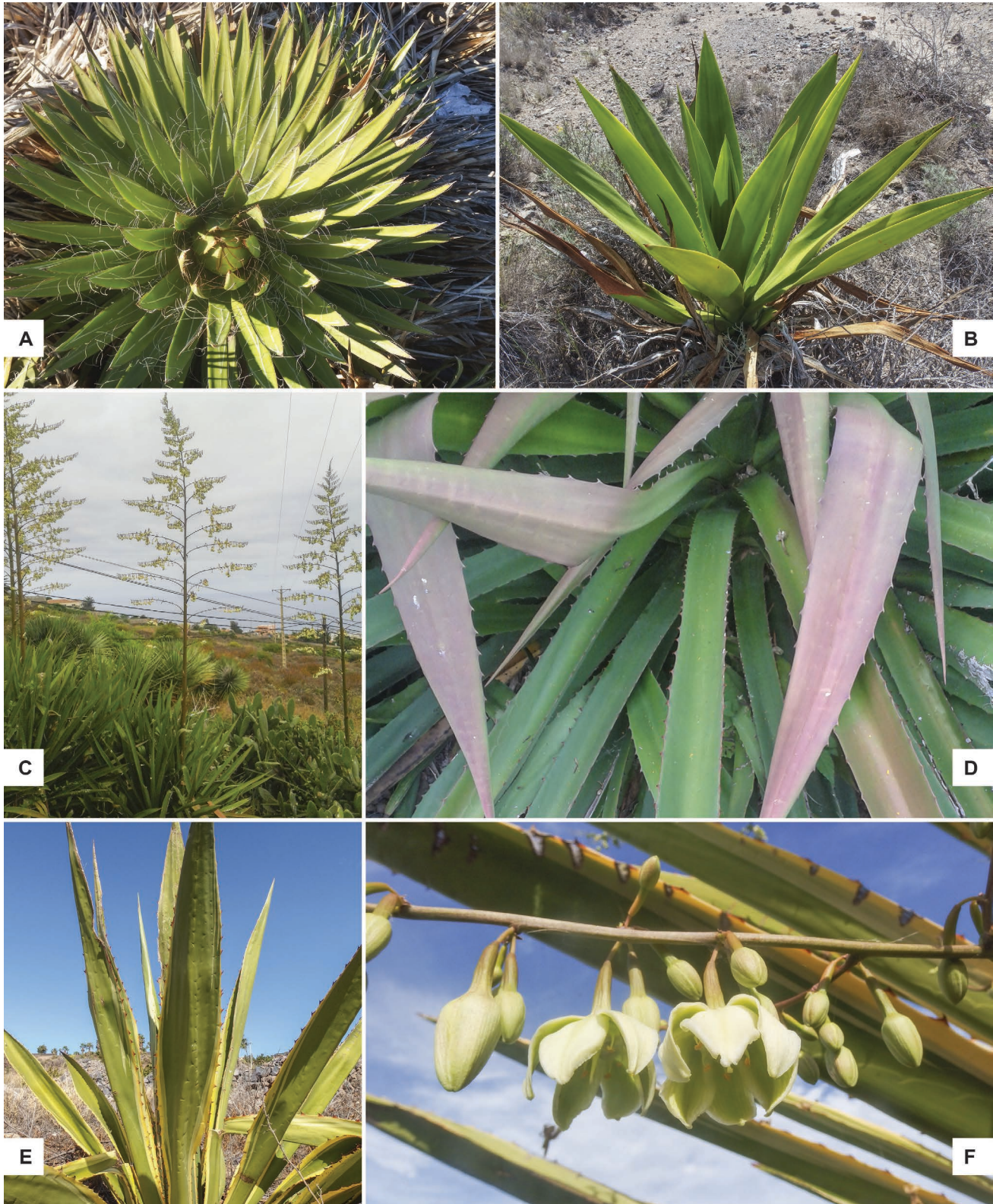


Figure 7 – **A.** *Agave filifera*, Güímar (T), December 2018. Leaf margins unroll as hair-like threads. **B.** *Furcraea foetida*, Adeje, Playa de las Americas (T), November 2016. Leaf margins are either smooth or prickly only in the lower half of the blade. **C.** *F. hexapetala*, San Cristóbal de La Laguna (Valle de Guerra) (T), August 2014. **D.** Idem. Detail of leaves. **E.** *F. selloana*, Adeje, Playa de las Américas (T), March 2016. Nearly all plants seen in the study area belong to a variegated form, var. *marginata*. Leaf margins are spiny throughout and the red spines contrast a lot with the pale greenish blade. **F.** Idem, Fasnía (T), December 2018. In *Furcraea*, contrary to *Agave*, flowers are pendent and tepals whitish. Photographs: A, B, E, F by F. Verloove; C, D by A. Reyes-Betancort.

Section *Littaea* (Tagl.) Bentham (= Group *Filiferae* Baker [“Gentry”])

This section includes species with unarmed, filiferous, white bud-printed leaves (Gentry 1982). Eight species are usually recognised and all are endemic to Mexico, mainly occurring in the Sierra Madre Occidental (Thiede in press). A single species has been observed in the study area.

Agave filifera Salm-Dyck (Salm-Dyck 1834: 309)

Fig. 7A

New to the flora of the Canary Islands – category C1 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild (i.e. outside of captivity or cultivation) in location where introduced, no reproduction).

Specimen collected
Tenerife

Güímar, Puertito de Güímar, 28°17'52.07"N, 16°22'31.43"W, 14 m a.s.l., long-abandoned plant nursery, now rough ground; persisting and clonally reproducing, 3 Dec. 2018, *F. Verloove 13430* (BR) (fig. 7A).

Agave filifera is an endemic of Mexico where it naturally occurs in the states of Aguascalientes, Jalisco, Guanajuato, Querétaro, Hidalgo and México. It grows on rocks, in desert scrub, thorn, oak and oak-juniper forests, at high altitudes ranging between 2,340 and 3,100 m (Thiede in press). It is well known in European horticulture as a clonal species, stemming from only few introductions (Gentry 1982).

In the area under study, it is the only species with leaf margins that unroll as hair-like threads (fig. 7A). The plants found in Tenerife grow in large clumps of small green dense rosettes with many thick, slightly curved leaves, resembling a cultivar named ‘Prolifera’. The species grows in several patches on the grounds of a long-abandoned plant nursery where it prolifically reproduces, although probably only clonally.

Agave filifera is much cultivated as ornamental but has rarely been reported as an escape so far. It is known as an alien species in Algeria (Randall 2017) and Italy in Calabria (Musarella et al. submitted).

Furcraea Vent. (Ventenat 1793: 65)

All species of *Furcraea* currently found in the wild in the study area belong to section *Furcraea*. Stems are either absent or short (0.7–1.5 m), leaf margins have conspicuous teeth or are smooth, bulbils are bracteate or foliose and seedlings have small cotyledons. Species of section *Serrulatae* Drumm. are mostly arborescent with conspicuous stems (1–9 m), leaf margins are closely minutely denticulate, bulbils foliose, with chartaceous outer leaves and seedlings have large cotyledons (Thiede in press).

1. Leaves linear-lanceolate, ca. 10–20 × as long as wide and of more or less uniform width (i.e., not pronouncedly sword-shaped), dull green in colour, very rigid and radiately spreading.....*F. hexapetala*

1'. Leaves wider, distinctly narrowed above base and with a lesser L/W ratio, usually paler in colour (often variegated).....2

2. Leaves with smooth margins or occasionally with a few hooked teeth towards the base, the lower surface smooth, green or variegated. Stem usually absent or very short ...

..... *F. foetida*
2'. Leaves with margins spiny throughout, the lower surface predominantly rough, nearly always variegated (in the study area). Stem distinct at maturity, up to 1.5 m long ..
..... *F. selloana*

Furcraea foetida (L.) Haw. (Haworth 1812: 73)

Fig. 7B

F. gigantea Vent. (Ventenat 1793: 65). Type – not designated (?).

[According to Wagenaar Hummelinck (1987) *Furcraea gigantea* is a synonym of *Agave scheuermaniana* Trel., a species related to and probably conspecific with *Agave karatto*. *Furcraea foetida* and *A. scheuermaniana* in fact look quite dissimilar.]

New to the flora of Gran Canaria. Previously reported from Fuerteventura, La Palma and Tenerife (Acebes Ginovés et al. 2010; Santos-Guerra et al. 2013) – category E *sensu* Blackburn et al. (2011) (Fully invasive species, with individuals dispersing, surviving and reproducing at multiple sites across a greater or lesser spectrum of habitats and extent of occurrence).

Observation records

Gran Canaria

Santa Brígida, El Tejar, 28°2'52.71"N, 15°29'40.05"W, 476 m a.s.l., 18 Dec. 2012, obs. M. Salas Pascual.

Valsequillo, Valle de San Roque, 28°0'27.29"N, 15°28'2.55"W, 349 m a.s.l., escaping from ornamental plantation, 26 May 2017, obs. M. Salas Pascual.

Agate, valle de Agate, Los Pasitos, 28°4'28.21"N, 15°39'59.55"W, 263 m a.s.l., dry riverbed, a single individual, 10 Dec. 2017, obs. F. Verloove.

Santa Brígida, cuesta Caraballo near Calle El Drago, 28°1'49.60"N, 15°28'14.09"W, 530 m a.s.l., alongside trail, a single individual, 17 Apr. 2018, obs. F. Verloove.

Santa Lucía de Tirajana, La Sorrueda, 27°53'32.39"N, 15°32'6.19"W, 549 m a.s.l., abandoned finca, 21 Apr. 2018, obs. F. Verloove.

Tenerife (invasive: see comments below)

Parque Rural de Anaga, between La Fortaleza (near to Catalanes) and la Hoya Las Colmenas (for instance at 28°31'10.17"N, 16°15'34.95"W; 28°31'10.12"N, 16°15'34.15"W; 28°31'12.29"N, 16°15'39.14"W; 28°31'15.08"N, 16°15'44.81"W), ranging in altitude between 600 and 700 m a.s.l., invading slopes of the basins that flow into El Tomadero and El Barranco of Tahodio, along with *Agave americana*, 20 Apr. 2010, obs. E. Ojeda-Land.

In the lower part of the Barranco de Tahodio, from Hoya de La Cantina, 28°30'30.40"N, 16°16'3.99"W, 250 m a.s.l., to 28°30'25.09"N, 16°15'58.14"W, 190 m a.s.l., dozens of

plants in the bed and on ravine slopes, 8 Oct. 2010, obs. E. Ojeda-Land.

Buenavista del Norte, Camino El Rincón, 28°22'6.05"N, 16°51'52.42"W, 65 m a.s.l., together with *Furcraea selloana*, *Agave sisalana* and *A. attenuata*, 1 Mar. 2017, obs. E. Ojeda-Land.

Furcraea foetida is a very variable species. Plants seen in the wild in the study area range from fairly small to massive, with either fresh bright green to creamy or variously variegated leaves. Compared with the similar *F. selloana* it is distinguished by its smooth (not rough) leaves with unarmed margins or at most with a few marginal teeth in the lower half (fig. 7B). The occasional presence of such marginal teeth is sometimes suggested to be the result of introgression or hybridisation (Fontaine 2016). Originally, *F. foetida* was described as having entirely smooth leaf margins (“foliis integerrimis”, sub *Agave foetida* L.) (Linnaeus 1753).

Furcraea foetida is widely cultivated and naturalised in climatologically suitable areas. It is considered an invasive species in many areas, often on islands (e.g. Hawaii, Madagascar, New Zealand, Réunion), but also in, for instance, South Africa (Crouch & Smith 2011) and Brazil (Barbosa et al. 2017). In Brazil it was shown that *F. foetida* may be favoured in a scenario of climate change, increasing its negative effects on biodiversity of coastal ecosystems (Barbosa et al. 2018).

In the Canary Islands it was previously reported from Fuerteventura, La Palma and Tenerife (Acebes Ginovés et al. 2010; Santos-Guerra et al. 2013), although at least some records probably refer to *F. selloana*. In Tenerife *F. foetida* is a locally invasive species. The largest populations are known in Parque Rural de Anaga, between La Fortaleza (near to Catalanes) and la Hoya Las Colmenas. In this area it invades slopes of the basins that flow into El Tomadero and El Barranco of Tahodio with hundreds of individuals, along with *Agave americana* (see obs. E. Ojeda-Land, 20 Apr. 2010). It is also found in the lower part of the Barranco de Tahodio (see obs. E. Ojeda-Land, 8 Oct. 2010). In similar circumstances it is also known from Buenavista del Norte, Camino El Rincón (see obs. E. Ojeda-Land, 1 Mar. 2017).

Elsewhere in Macaronesia *Furcraea foetida* is also known from Cabo Verde and Madeira (Vieira 2002; Sánchez-Pinto et al. 2005) where it is naturalised. In continental Europe it is surprisingly rare as an escape, perhaps for climatological reasons. It is reportedly known from Portugal (Almeida & Freitas 2006).

Furcraea hexapetala (Jacq.) Urb. (Urban 1903: 152)

Fig. 7C–D

Agave cubensis Jacq. (Jacquin 1763: 100). – *Furcraea cubensis* (Jacq.) Vent. (Ventenat 1793: 66). – **Type:** not designated (?).

New to the flora of the Canary Islands – category C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, and population self-sustaining).

Observation record

Tenerife

San Cristóbal de La Laguna, Valle de Guerra, Finca Isamar, 28°30'36.90"N, 16°23'11.66"W and 28°30'38.45"N, 16°23'18.14"W, initially cultivated as a curiosity, now locally spreading by bulbils, 3 Jun. 2018, obs. J.A. Reyes-Betancort (fig. 7 C–D).

Specimen collected

Tenerife

San Cristóbal de La Laguna, Valle de Guerra, Finca Isamar, 28°30'38.45"N, 16°23'18.14"W, 18 Jan. 2019, *F. Verloove & J.A. Reyes-Betancort 13456* (BR).

Furcraea hexapetala is a native species in Cuba with the type from La Havana. It probably also occurs as a native species elsewhere in the Caribbean and Antilles, for instance in Bahamas, Bermuda, Hispaniola and Jamaica (Álvarez de Zayas 1996).

This species is closely related to *F. selloana* yet morphologically quite different. It is acaulescent and has dull green and narrower leaves that are not markedly narrowed towards the base (fig. 7C–D). It is further characterised by large and remote teeth along the whole leaf margin, a very small terminal conical spine ca. 1 mm long, brown-reddish rhomboidal inflorescences with few partial inflorescences in the upper 3/4 to nearly the whole inflorescence, flowers with very narrow tepals and a very short ovary much shorter than the tepals (García-Mendoza 2001). Out of the species that are more or less widely grown as ornamentals, *F. tuberosa* (Mill.) Aiton is probably the most reminiscent of *F. hexapetala* and both are often confused. The latter has upcurved single teeth (vs. recurved double teeth) and scabrous lower leaf surfaces (vs. smooth). In the population from Tenerife young plants have rough lower leaf surfaces whereas at maturity leaves are almost completely smooth except for a small basal portion. Also, leaves tend to be a bit narrower in *F. hexapetala*: 8–10(–15) cm vs. 10–15(–17) in *F. tuberosa* and ovaries (and other floral characters) are slightly smaller as well (respectively 17–21 mm vs. 20–25 mm) (Thiede in press). *Furcraea tuberosa* is locally naturalised in South Africa (Smith & Figueiredo 2012b). *Furcraea guatemalensis* Trel. is also very similar and often confused with *F. hexapetala*. It has, however, a distinct stem (vs. acaulescent) and leaf marginal teeth are more numerous (60–90 per side vs. 20–50).

Furcraea hexapetala is here treated as understood nowadays in the horticultural trade (e.g. Huxley 1999; Irish & Irish 2000; Couper 2011). It is very similar to *F. cabuya* Trel., a species from southeastern Mexico and Central America with type from Costa Rica (Thiede in press). Both species are rather similar in their vegetative features and differ mainly in the larger flowers, fruits and seeds of *F. cabuya*: flowers (37–)40–55(–62) mm vs. 40–50(–55) mm, fruits 55–60(–75) × (35–)40–45 mm vs. 30–50 × 25–40 mm, seeds winged for 3 mm, 15–17 × 9–10 mm vs. winged for 2 mm, 11–13 × 6–7 mm (García-Mendoza 2001; Thiede in press). It is not impossible that some plants in cultivation as *F. hexapetala* in fact refer to *F. cabuya*. We were unable to check this possibility in the Canarian populations.

Furcraea hexapetala is known from a single locality in Tenerife where it is firmly established in two small populations. This species is considered invasive, especially on islands in the subtropics, for instance in New Caledonia, Galapagos and Pacific Islands and Samoa (Lundh 2006; Gardner et al. 2013; Randall 2017). It is one of the most aggressive invaders in Galapagos Islands (Tye et al. 2012).

***Furcraea selloana* K.Koch (Koch 1860: 22)**

Fig. 7E–F

New to the flora of the Canary Islands – category C3 *sensu* Blackburn et al. (2011) (Individuals surviving in the wild in location where introduced, reproduction occurring, and population self-sustaining).

Observation records

Tenerife (selection of records)

San Cristóbal de La Laguna, Bajamar, 28°33'21.80"N, 16°20'4.59"W, 60 m a.s.l., a single flowering individual on slope of ravine and others in a plot near the road, escaped from a garden, 2 May 2011, obs. E. Ojeda-Land.

San Cristóbal de La Laguna, Punta del Hidalgo, Barranco de la Hoya, 28°33'42.18"N, 16°19'53.54"W, 40 m a.s.l., a single flowering individual on slope of ravine, together with *Austrocylindropuntia subulata*, 2 May 2011, obs. E. Ojeda-Land. Arona, Valle de San Lorenzo, 28°5'30.88"N, 16°39'30.50"W, 409 m a.s.l., Barranco de Chija near TF-28 road, a single individual, 22 Jun. 2014, obs. F. Verloove.

Puerto de la Cruz, Malpaís, calle Chinyero, 28°24'38.21"N, 16°33'1.20"W, 81 m a.s.l., ruderalized slope, common (by the dozen), 4 Nov. 2014, obs. F. Verloove.

Arafo, La Hidalga, 28°20'11.94"N, 16°23'37.79"W, 190 m a.s.l., Barranco de la Madre at TF-28 road, a single individual, 10 Nov. 2014 and 19 Jan. 2017, obs. F. Verloove.

Tegueste, El Socorro, 28°31'7.80"N, 16°21'39.99"W, 292 m a.s.l., slope of ravine, relatively frequent (naturalised), 13 Jan. 2017, obs. F. Verloove.

Puerto de la Cruz, 28°24'19.79"N, 16°34'4.24"W, 79 m a.s.l., grassy slope, scattered individuals, 17 Jan. 2017, obs. F. Verloove.

La Matanza de Acentejo, auxiliary road of TF-5 near road down to El Caletón, scattered individuals from 28°27'11.29"N, 16°27'32.46"W, to 28°26'56.13"N, 16°27'44.09"W, 280 m a.s.l., 20–30 individuals, together with *Austrocylindropuntia subulata* and *Furcraea foetida*, 17 Apr. 2018, obs. E. Ojeda-Land.

La Victoria de Acentejo, Risco La Sardina, at Urbanization La Palmita, 28°26'21.09"N, 16°28'59.13"W, 150 m a.s.l., three naturalised plants (escaped from a nearby garden), 25 Apr. 2018, obs. E. Ojeda-Land.

Santa Úrsula, La Quinta, several points on the cliff, near Calle Codeso, 28°25'54.56"N, 16°29'50.89"W, 180 m a.s.l., five plants together with *Aloe arborescens*, from 28°25'58.59"N, 16°29'52.49"W to 28°26'0.23"N, 16°29'52.63"W, 170 m.a.s.l., 10–15 naturalised individuals, 25 Apr. 2018, obs. E. Ojeda-Land.

Santa Úrsula, La Quinta, near the roundabout of the TF-5, 28°25'35.62"N, 16°29'37.66"W and 28°25'37.55"N, 16°29'37.82"W, 255 m a.s.l., numerous naturalised plants and 28°25'34.43"N, 16°29'49.55"W, 71 m a.s.l., dozens of

individuals in roadside TF-5, 25 Apr. 2018, obs. E. Ojeda-Land.

La Quinta, Avenida Los Pesqueros, 28°25'44.40"N, 16°29'20.67"W, two individuals, 25 Apr. 2018, obs. E. Ojeda-Land.

Icod de Los Vinos, La Capellanía, 28°22'58.05"N, 16°40'36.54"W, 205 m a.s.l., several naturalised plants on the slope of a cliff and on the margins of a path, 25 Jun. 2018, obs. E. Ojeda-Land.

Barranco de las Ánimas, 28°22'56.80"N, 16°40'35.89"W, 205 m a.s.l., five large plants, 25 Jun. 2018, obs. E. Ojeda Land.

Icod de Los Vinos, Los Barbusanos, 28°22'54.48"N, 16°40'32.66"W, 225 m a.s.l., some individuals in roadside, 25 Jun. 2018, obs. E. Ojeda-Land.

Gran Canaria

Santa Brígida (La Atalaya, Los Veroles), 28°1'55.43"N, 15°29'6.78"W, 541 m a.s.l., roadside, slope of ravine, a few individuals, 5 Dec. 2017 and 17 Apr. 2018, obs. F. Verloove. San Bartolomé de Tirajana, Bahía Feliz, 27°47'5.86"N, 15°31'28.19"W, 41 m a.s.l., stony slope N of GC-1 motorway, several individuals in two distinct populations (probably long-abandoned plantation, with numerous *Agave sisalana*), 21 Apr. 2018, obs. F. Verloove.

Teror, La Molineta, 28°4'38.53"N, 15°31'10.73"W, 372 m a.s.l., on the verge of GC-21 road, 24 Apr. 2018, obs. F. Verloove, Á. Marrero Rodríguez & M. Salas Pascual.

Telde, Barranco de Telde, 27°59'56.27"N, 15°25'14.58"W, 367 m a.s.l., slope of ravine, two individuals, 26 Apr. 2018, obs. F. Verloove.

Arucas (Santidad), slope parallel to Calle Alhucemas, 28°6'45.19"N, 15°30'30.99"W, 238 m a.s.l., steep stony slope, sun-exposed, dozens escaped from plantation, 27 Apr. 2018, obs. F. Verloove.

Specimens collected

Tenerife

San Miguel de Abona, Golf del Sur, Barranco del Saltadero, 28°1'58.62"N, 16°36'46.06"W, 56 m a.s.l., rough ground adjacent to golf court, scattered young individuals, 30 Oct. 2014 and 12 Jun. 2015, *F. Verloove 11530* (BR).

Arona, La Camella, S of the village, 28°4'37.09"N, 16°40'54.53"W, 337 m a.s.l., dry rough ground, a single rosette, 11 Mar. 2016, *F. Verloove 12462* (BR).

Gran Canaria

Las Palmas de Gran Canaria, Tafira Baja, close to Finca La Palmita, 28°4'7.82"N, 15°27'26.47"W, 321 m a.s.l., rocky slope; scattered individuals (relic of former plantation?), 24 Apr. 2018, *F. Verloove 13203* (BR).

Tafira Baja, entornos del Campus, sobre el Guiniguada, 28°04'08.2"N, 15°27'26.8"W, 310–315 m a.s.l., laderas y antiguas terrazas de cultivo, subespontánea, estolonífera, 27 Jun. 2019, *Á. Marrero 37487-37489* (LPA).

Furcraea selloana is native to Mexico and parts of Central and South America. It is widely cultivated as an ornamental in dry warm-temperate and subtropical areas of the world. It is increasingly reported as a naturalised or even (potentially) invasive escape, for instance in Australia and New Zealand, South Africa and the U.S.A. (e.g. Forster 1996; Batiannoff & Butler 2002; Verhoek 2002; Smith & Figueiredo 2016; Randall 2017). In Europe, *F. selloana* has been reported from

Portugal (Aedo 2013; Silva et al. 2015) and Spain (Sánchez Gullón 2013; Guillot Ortiz et al. 2016) although it may have been widely neglected elsewhere. In Tenerife and Gran Canaria, it is widely cultivated as an ornamental and occurs on rough ground and in barrancos close to habitations. It reproduces prolifically from bulbils and is also sometimes introduced with garden waste. At least in some places it is firmly established, for instance in Arucas (Santidad) in Gran Canaria and in Tegueste (El Socorro) and Santa Úrsula (La Quinta) in Tenerife, where it reproduces from bulbils on the slopes of ravines and sea cliffs.

Furcraea selloana belongs into a group with *F. cabuya* and *F. hexapetala*. All share flowers with an ovary much shorter than the tepals and ovoid bulbils (fig. 7F). It is separated from both by its lanceolate leaves that are distinctly narrowed above base, 23–35(–50) teeth per leaf margin, a variably sized, oblong, lax inflorescence, and oblong bracts with denticles at their apex only (Thiede in press) (fig. 7E). *Furcraea foetida* is a similar species but *F. selloana* has teeth along the full length of the leaf margins (i.e., to the tips of the leaves) and nearly always rough lower leaf surfaces, whereas in *F. foetida* leaf margins are smooth or at most have a few teeth in the lower half of the blade and the surfaces are smooth. Sometimes, however, plants with more or less intermediate features have been observed, especially in Tenerife. Another similar cultivated species is *F. hexapetala*. Its leaves are a duller green colour, much narrower, and of more or less uniform width, i.e., they are not pronouncedly sword-shaped as in *F. selloana*.

Nearly all records of *Furcraea selloana* in the wild in Gran Canaria and Tenerife relate to a variegated form with creamy-yellow stripes along the leaf margin, var. *marginata* Trel. (syn.: *F. lindenii* Jacobi) (fig. 7E). It is much more common in cultivation than wild green forms. Only in Puerto de la Cruz (La Paz) in Tenerife plants with green leaves have been observed.

This species is widely known as ‘*Furcraea selloa*’ (e.g. Irish & Irish 2000; Thiede 2001; Couper 2011). Aedo (2013) explained why, in accordance with the International Code of Nomenclature, the correct spelling of the epithet is ‘*selloi*’. However, Figueiredo & Smith (2016) demonstrated that ‘*selloana*’ is in fact the only correct orthography according to Art. 60.8 of the ICN (Turland et al. 2018).

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