

## New records of alien vascular plants in Catalonia (NE Iberian Peninsula)

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### Abstract

NEW RECORDS OF ALIEN VASCULAR PLANTS IN CATALONIA (NE IBERIAN PENINSULA).— We provide the first records of five non-native vascular plants for Europe—*Commelina erecta*, *Cylindropuntia fulgida*, *Dasyllirion serratifolium*, ×*Graptosedum* and *Senecio crassissimus*, two for the Iberian Peninsula—*Lobelia laxiflora* subsp. *angustifolia* and *Pennisetum flaccidum*, and four for Catalonia—*Dimorphotheca fruticosa*, ×*Gasteraloe beguinii*, *Opuntia elatior* and *Tradescantia sillamontana*. In addition, new local records are provided for ten taxa scarcely reported for Catalonia. During the last decades, ornamental horticulture constitutes the most important source of alien plants, and some of them are potentially invasive species at a worldwide level. Most of the plants listed in this study are escaped from gardens or established as a consequence of dumping green waste. Some species are locally naturalized and in some cases they could behave as invasive.

Key words: Catalonia; introduced plants; naturalized; non-native.

### Resumen

NUEVAS CITAS DE PLANTAS VASCULARES ALÓCTONAS EN CATALUÑA (NE DE LA PENÍNSULA IBÉRICA).— Aportamos citas de cinco plantas alóctonas nuevas para Europa —*Commelina erecta*, *Cylindropuntia fulgida*, *Dasyllirion serratifolium*, ×*Graptosedum* y *Senecio crassissimus*—, dos nuevas para la península ibérica —*Lobelia laxiflora* subsp. *angustifolia* y *Pennisetum flaccidum*— y cuatro nuevas para Cataluña —*Dimorphotheca fruticosa*, ×*Gasteraloe beguinii*, *Opuntia elatior* y *Tradescantia sillamontana*—. También presentamos nuevos datos sobre diez plantas poco citadas en Cataluña. En las últimas décadas el cultivo de plantas ornamentales constituye la principal causa de introducción de especies alóctonas a escala mundial, algunas de las cuales son potencialmente invasoras. La mayoría de las plantas que constan en este trabajo son escapadas de cultivos o provienen de vertidos de restos de jardinería. Algunas especies se encuentran localmente naturalizadas y en algún caso podrían presentar un comportamiento invasor.

Palabras clave: Cataluña; flora alóctona; plantas introducidas; plantas naturalizadas.

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## INTRODUCTION

Catalonia, located to the west of the Mediterranean Basin, is a region with a remarkable biological biodiversity, but also where plant invasions are particularly significant (Bresch *et al.*, 2013). These introductions are caused by human action, either intentionally or accidentally. Mainly during the last decades, ornamental horticulture constitutes the most important source of alien and potentially invasive species at a worldwide level (Groves *et al.*, 2005; Dehnen-Schmutz & Touza, 2008; Pergl *et al.*, 2016; Mayer *et al.*, 2017), particularly in the face of a warming climate perspective (Dullinger *et al.*, 2017). Today, cities are considered hotspots of biological invasions, not only points of entry for many non-native species, but also foci for secondary release or escape into surrounding landscapes (Lososová *et al.*, 2012; Gaertner *et al.*, 2017). This concept is illustrated in the present work; most of the plants that we provide are escaped from gardens or established as a consequence of dumping green waste and found in areas near large human populations.

It is generally accepted that an early detection of new xenophytes is essential. However, this requires a prospecting effort to detect overlooked non-native plants in a given territory and their accurate determination (Verloove, 2010). The decline in taxonomic expertise substantially compromises rigorous studies in all fields of biodiversity or biogeography, including invasion biology (Pyšek *et al.*, 2013). Intensive fieldwork and an accurate knowledge of the identity of these species are fundamental to ascertain their real distribution and behaviour within the ecosystems. Likewise, monographs and more general studies that provide taxonomic and biological information of the new or scarcely known non-native plants are key tools for plant invasions research and management purposes (Smith *et al.*, 2008).

## MATERIALS AND METHODS

The records presented here are the result of recent years' fieldwork in Catalonia, within a project to survey and catalogue its alien flora, especially on coastal areas. At least one voucher specimen is preserved in BC or BCN herbaria except for *Clerodendrum bungei* Steud., *Crocus sativus* L., *Echinopsis spachiana* (Lem.) H. Friedrich & G. D. Rowley, ×*Graptoedum* G. D. Rowley, *Haworthiopsis attenuata* (Haw.) Rowley and *Opuntia leucotricha* DC. Photographs were taken for all the species. Acronyms follow *Index Herbariorum* (Thiers, 2013). The names of families are based on the APG IV (APG, 2016).

Plants are arranged following alphabetical order of genera. We used the standardized terminology to define the status of the alien plants proposed by Pyšek *et al.* (2004) and Gassó (2008); a given plant species can be 'casual' (it can reproduce occasionally outside cultivation but does not form self-replacing populations for at least 10 years) or 'naturalized' (that sustain self-replacing populations without direct human intervention, capable of independent growth). All the taxa presented here can be considered casual; only *Opuntia leucotricha* is sometimes locally naturalized. Among the species reported here, we did not find any case of 'invasive' plant within our territory, but a few of them could behave as invasive species in the near future; this is likely the case of *Cylindropuntia fulgida* (Engelm.) F. M. Knuth. For each species we provide the sort of novelty, main details of the records and some comments about the native range, and its distribution in our territory. A brief morphological description is also provided in those cases we consider it proper.

Each record includes province, county (in Catalonia known as *comarca*) and locality, according to the names published in ICGC (<http://www.icc.cat/vis-sir3/>). For the geographic reference we used the 100 × 100 m UTM square grid (31T zone), ETRS89 datum.

## RESULTS

### *Asclepias curassavica* L. (Fig. 1A) (Apocynaceae).

Second record for Catalonia.

Barcelona, el Baix Llobregat: Santa Coloma de Cervelló, Can Julià, wasteland near the road, in a shady and fresh ditch, two separate individuals in blossom, approximately 60 cm in length, DF183796, 40 m, 30.X.2016, *H. Álvarez* (BC 990387, BCN 134530, BCN 134531). Although this species was found near some houses with gardens, we have verified that it is not planted.

Herb or sub-shrub native to the American tropics that grows up to 1 m (Juárez-Jaimes & Lozada, 2003), commonly used as an ornamental plant because of its showy red flowers. We provide the second report for Catalonia. It was formerly reported from Barcelonès county (Bolòs & Vigo, 1996). It is also known as subpontaneous or naturalized for the rest of the east coast and the south of the Iberian Peninsula (Arista & Ortiz, 2012—without any indication as to whether the plants were cultivated or not; Sanz-Elorza *et al.*, 2004a). It is considered an invasive plant in Australia, New Zealand, United States, Chile, the Pacific Islands (Sanz-Elorza *et al.*, 2004a) and South Africa (Foxcroft *et al.*, 2007).

### *Clerodendrum bungei* Steud. (Fig. 1B) (Lamiaceae).

Third record for Catalonia.

Tarragona, el Baix Ebre: Tortosa, Vinallop, several plants, in bloom, in a wayside next to an old house, BF900167, 31 m, 19.VII.2016, *J. Altimira* (no voucher available).

Deciduous shrub, native to southern China and northern India. It has recently been reported for Catalonia by Aymerich (2016) in Girona Province, as casual, perhaps as a result of dirt disposal, and in Tarragona Province, in a ruderal community near a house.

### *Commelina erecta* L. (Fig. 1C) (Commelinaceae).

New to Europe.

Barcelona, el Baix Llobregat: Santa Coloma de Cervelló, Ca n'Isbert, small group in a ruderal grassland on sandy soil, near a railway, DF186800, 18 m, 07.X.2016, *H. Álvarez* (BC 990389, BCN 134535, BCN 134536); *ibid.*, 30.X.2016, *H. Álvarez* (BC 990390, BCN 134534). El Maresme: Vilassar de Mar, riera de Cabrils, a crowded population of large specimens in an area of *ca.* 10 m<sup>2</sup> in nitrophilous

grassland on sandy soil, close to some flower nurseries, DF486952, 33 m, 18.VIII.2017, *H. Álvarez* (BC 990549, BCN 143480). All specimens were found growing in bloom and producing seeds.

Perennial herbaceous plant, very variable (Brashier, 1966), native to America (from southern United States to Argentina; Hunt, 1994), and used for medicinal, food and ornamental purposes. It is regarded as a crop weed, and it has been introduced in other South American countries, in a considerable part of central and southern Africa—including the north of Madagascar, and in the south of the Arabian Peninsula (GBIF, 2017a). It has also been reported from Japan (Nakamura, 2017) and, in the east of the Mediterranean Basin, in Israel (Raab-Straube & Raus, 2015). In Catalonia, another alien congeneric species, *C. communis* L., was reported from northern Girona (Font & Vilar, 2000). It is an annual herb with similar inflorescences in appearance, but enclosed in spathes with free margins, unlike *C. erecta* in which spathes are partially connate towards the apex.

We provide the first record for Europe of this plant, and most likely the second for the Mediterranean Basin. Its global distribution, as well as its tolerance to glyphosate treatment (De la Vega *et al.*, 2000), make this species a potential invasive plant in our area.

### *Crocus sativus* L. (Fig. 1D) (Iridaceae).

New for the province of Barcelona.

Barcelona, el Baix Llobregat: Sant Feliu del Llobregat, riera de Santa Creu, two specimens in full bloom, in a ruderalized meadow on the banks of the stream, DF213834, 90 m, 12.XI.2016, *H. Álvarez* (no voucher available). Presumably, a recent wild boar feeding activity did not allow us to subsequently locate the plants for the purpose of collecting them.

This bulbous geophyte is highly regarded as a spice for its dried stigmas and styles, the saffron. It is a triploid species ( $2n = 24$ ) and a sterile plant. Its cultivation is very old, dating back to 2500–1500 BC, probably originated in Iran, Asia Minor or Greece and later became widespread in India, China, the Mediterranean basin and Eastern Europe (Ghaffari & Bagheri, 2009; Martín, 2014).

The cultivation of saffron in Catalonia was quite common from the late 19th until the late 20th century, and since then the plant is considered as persistent in abandoned crops, or escaped from them. As reported in Casasayas (1989), it has already been observed in Girona, Lleida and Tarragona



**Figure 1.** (A), *Asclepias curassavica*, Santa Coloma de Cervelló; (B), *Clerodendrum bungei*, Tortosa; (C), *Commelina erecta*, Vilassar de Mar; (D), *Crocus sativus*, Sant Feliu del Llobregat (photographs A, C, D: H. Álvarez; B: J. Altimira).

provinces. The species had not been recorded for the last 33 years so far, probably because the populations of this archaeophyte have been declining for decades due to the cessation of its production.

***Cylindropuntia fulgida*** (Engelm.) F. M. Knuth (Fig. 2A) (Cactaceae).

New to Europe.

Tarragona, el Montsià: Alcanar, at the town's entrance, a group of numerous plants up to 30 cm in height, ca. 3 m along the roadside, BE865916, 95 m, 18.VII.2016, C. Gómez-Bellver, J. López-Pujol & N. Nualart (BC 956117).

The native range of *C. fulgida* extends from the desert of Sonora in Arizona, to Sinaloa and Baja California in Mexico (Anderson, 2001). There are several species of *Cylindropuntia* in the centre and north of the Iberian Mediterranean coast; the three species with the largest distribution are *C. imbricata* (Haw.) F. M. Knuth, *C. tunicata* (Lehm.) F. M. Knuth and *C. pallida* (Rose) F. M. Knuth (Deltoro *et al.*, 2014), from which *C. fulgida* can be distinguished by its fruits proliferating in chains (Walters *et al.*, 2011). The specimens collected correspond to the 'mamilata' variety, smaller, more compact and tuberculated than the typical, and to the 'monstrous' form, one of

the two that are known in gardening, together with ‘*crinata*’. We noticed that the terminal parts easily disarticulate, forming propagules that stick to the clothes or the skin thanks to long and fine spines. We presume that these forms lack fertile seeds.

*Cylindropuntia fulgida* is treated as an invasive species in Australia (where the ‘*mamillata*’ variety is considered the most rapidly spreading opuntoid cactus in the country), South Africa (where the typical variety is one of the most invasive cacti) and Pacific Islands (Lloyd & Reeves, 2014; Walters *et al.*, 2011). Deltoro *et al.* (2014) already warned that this plant, in the case of its arrival to Europe, could be even more invasive than other described cacti of the same genus.

***Dasyliirion serratifolium*** (Karw. ex Schult. f.) Zucc. (Fig. 2B) (Asparagaceae).

New to Europe.

Girona, l’Alt Empordà: Darnius, el Mirador, a couple of large individuals in a relatively human-disturbed area near the Boadella Dam, perhaps persisting after cultivation (although there are no signs of management), DG862874, 180 m, 10.III.2018, *J. López-Pujol* (BC 971857). Tarragona, el Tarragonès: Tarragona, Cala Romana, only one plant in a ruderal road margin, CF560540, 23 m, 20.II.2017, *S. Her-rando* & *N. Nualart* (BC 958020).

Mexican plant similar in appearance to yucca, with very narrow and long leaves, with marginal hooked prickles and ending in a fibrous tip (Walker, 2001). In Catalonia and nearby regions several species of *Dasyliirion* Zucc. are commonly grown in gardens and also sold by nurseries and garden centres. Among those, *D. serratifolium* is the most well-known species, but others should also be mentioned: *Dasyliirion longissimum* Lemaire with quadrangular leaves, which appears in the European list of wild fauna and flora species with regulating trade therein (EU, 2013), *D. glaucophyllum* Hook., with glaucous leaves and pointed apex (or almost) and *D. wheeleri* S. Watson, with long and thick stem.

***Dimorphotheca fruticosa*** (L.) DC. (Fig. 2C) (Asteraceae).

First record for Catalonia.

Girona, l’Alt Empordà: l’Escala, northwest part of the municipality, in a neighborhood of terraced houses, close to the road GI-623, a prostrate dense formation covering *ca.* 5 m<sup>2</sup>, on rocky sandy soil,

EG102629, 26 m, 22.II.2018, *C. Gómez-Bellver*, *J. López-Pujol* & *N. Ibáñez* (BC 990589).

Shortly hairy, sprawling to prostrate, soft woody shrublet native to South Africa’s coastal dunes and rocks (Manning & Goldblatt, 2012). Leaves are obovate, fleshy, minutely toothed and the flowers purple. In the Iberian Peninsula, it has been reported as casual for the Valencia Province (Peña *et al.*, 2017).

***Echinopsis spachiana*** (Lem.) H. Friedrich & G. D. Rowley (Fig. 2D–E) (Cactaceae).

Third record for Catalonia.

Tarragona, el Baix Ebre: Roquetes, Mas d’en Sedó, near the ravine of Sant Antoni, west of Tortosa, group of 6–7 adult plants with withered flowers, and two juveniles, on one side of the road, on the top of the slope, presumably coming from green waste, BF878185, 45 m, 18.VII.2016, *C. Gómez-Bellver*, *J. López-Pujol* & *N. Nualart* (no voucher available).

Columnar cactus native to western Argentina, quite used in gardening. Plant with a central trunk up to 2 m tall, branching basally, with 10–15 ribs, and a central spine in each areola noticeably longer than the rest (Britton & Rose, 1920; Anderson, 2001; Hunt, 2011). When young it can be confused with *E. schickendantzii* F. A. C. Weber, which does not exceed 15–25 cm, and has 14–18 ribs. Our plants reach a height of 1.50 m, display few branches, 13 ribs, and a central spine longer than the rest in each areola.

This species was reported for Catalonia by Aymerich (2015, 2017) from the province of Barcelona—in similar conditions to our finding: a group of established plants in a slope resulting from a dumping of yard trimmings—and Girona.

×***Gasteraloe beguinii*** (Radl) Guillaumin (Fig. 2F–G) (Asphodelaceae).

New to Catalonia.

Tarragona, el Baix Penedès: Bellvei, in the roadside (road N-340), near habitation, a dense colony of about 2 m<sup>2</sup> and a few individuals 1–2 m away, several carrying inflorescences, growing with other non-native plants including *Opuntia leucotricha* DC. and *O. monacantha* Haw., CF808661, 95 m, 23.XII.2017, *J. López-Pujol* (BC 953811, BCN 143481).

Intergeneric hybrid between *Aloe aristata* Haw. and *Gasteria carinata* (Mill.) Duval var. *verrucosa* (Mill.) van Jaarsv., both native to South Africa

and nearby territories. Larger and coarser than *A. aristata*, the leaves of this hybrid are 10 × 2.5 cm (noticeably bigger in some nothovarieties, reaching 16 cm long), dark green, with prominent scattered white pearly tubercles; the inflorescence is a terminal lax and simple raceme up to 60 cm (Newton, 2001). The individuals observed display the upper range of leaf and inflorescence size, presumably due to optimal local growing conditions.

Despite the fact that most nothospecies in ×*Gasteraloe* were artificially created, it is likely that this phenomenon could happen naturally or accidentally, e.g. within a nursery. In this sense, *A. aristata* can interbreed readily with species of *Gasteria*, and the resulting bigeneric hybrids produce fertile pollen, but of poor quality (Brandham, 1981).

It has only been previously reported from the Iberian Peninsula from Huesca by Sanz-Elorza (2006) and from Valencia by Guillot *et al.* (2014a). We recently collected a specimen voucher (BC 947266) from the population reported by Aymerich (2017) as *Haworthiopsis attenuata* (Haw.) Rowley from Piera (Barcelona Province). We think that it should be regarded as ×*Gasteraloe beguinii*, given that it is a larger plant with wider leaves possessing tubercles forming laxer and more separate lines.

×*Graptosedum* G. D. Rowley (Fig. 2H) (Crassulaceae).

New to Europe.

Girona, el Baix Empordà: Palamós, Punta des Molí, next to the path to the harbor, below the lighthouse, on a slope close to the sea, growing with other spontaneous or naturalized succulent plants, such as *Aeonium haworthii* Webb & Berthel., *Carpobrotus edulis* (L.) N. E. Br. and *Cotyledon macrantha* A. Berger, EG106322, 5 m, 30.V.2016, C. Gómez-Bellver, J. López-Pujol & N. Nualart (no voucher available).

Intergeneric hybrid between *Graptopetalum paraguayense* (N. E. Br.) E. Walther, from Mexico, and a representative of the *Pachysedum* H. Jacobsen group, probably some species of yellow flowers of *Sedum* or *Echeveria* (Guillot *et al.*, 2009; Cristini, 2016). Presumably, this hybridization happened spontaneously in a European nursery or garden, between the early 1920s and the late 1970s (Cristini, 2016). Our plants are very similar to *G. paraguayense*, but with more intense yellow flowers and obovate to oblanceolate leaves, gray-green in color (but if growing in a sunny spot they can be tinged with

red near the apex). No species has been described for this nothogenus, only some cultivars are known. The report provided here is referred to the cultivar ‘Francesco Baldi’, cited only as a cultivation escape from Nelson, New Zealand (Heenan *et al.*, 2008) in 1986.

*Haworthiopsis attenuata* (Haw.) Rowley (Fig. 3A–B) (Asphodelaceae).

Second record for Catalonia.

Tarragona, el Baix Ebre: l’Ametlla de Mar, Calafat, in an open ground between Avda. de l’Ametlla de Mar and carrer del Garbí, tiny specimen growing at the foot of a small group of *Aloe perfoliata* L., CF187334, 23 m, 19.VII.2016, C. Gómez-Bellver, J. López-Pujol & N. Nualart (no voucher available).

A little stemless succulent plant native to the Eastern Cape Province in South Africa. It forms rosettes of 6–10 cm in diameter, with short leaves with white tubercles on both faces, arranged roughly in bands (Bayer & van Jaarsveld, 2001). This species bears resemblance with another plant also used as an ornamental, *H. fasciata* (Willd.) Haworth, with white tubercles only on the lower face. It was first reported for Catalonia by Royo (2006), and later, mistakenly, by Aymerich (2017) from Piera (see the text for ×*Gasteraloe beguinii*).

*Leucaena leucocephala* (Lam.) de Wit (Fig. 3C) (Fabaceae).

Second record for Catalonia.

Tarragona, el Tarragonès: Roda de Berà, Costa Daurada neighborhood, in vacant lots, a few mature individuals (including a tree of 4–5 m) and many juveniles and seedlings around, CF724596, ca. 30 m, 01.II.2018, J. López-Pujol (BC 969044).

A small to medium size fast-growing mimosoid tree native to southern Mexico and northern Central America (Belize and Guatemala). Our plant can be regarded as the subspecies *glabrata* (Rose) Zárte, because of the larger leaves, leaflets, and pods, and being almost entirely glabrous, compared to the smaller leaves, leaflets, pods and densely puberulent, canescent shoots of subsp. *leucocephala* (Zárte, 1994; Hughes, 1998). *Leucaena leucocephala* has been cultivated since ancient times for pods in human and animal food production, and more recently also as a tropical tree for fodder, wood and soil conservation. It is spreading naturally and has been reported as a weed in more than 20 countries across all continents except Europe and Antarctica (GISD, 2015).



**Figure 2.** (A), *Cylindropuntia fulgida*, Alcanar; (B), *Dasylium serratifolium*, Darnius; (C), *Dimorphotheca fruticosa*, l'Es-cala; (D, E), *Echinopsis spachiana*, Roquetes; (F, G), *Gasteraloe beguinii*, Bellvei; (H), *Graptosedum*, Palamós (photographs A, C–E, H: C. Gómez-Bellver; B, F, G: J. López-Pujol).

The species was first reported for the province of Tarragona by Casasayas (1989). We provide the second record for Catalonia, located approximately 20 km northeast of the former record.

***Lobelia laxiflora*** Kunth subsp. ***angustifolia*** (A. DC.) Eakes & Lammers (Fig. 3D) (Campanulaceae).

New to the Iberian Peninsula.

Barcelona, el Barcelonès: Barcelona, Parc del Guinardó, one plant growing in fissures in a tiny wall of a small channel of water, in blossom five years ago, and revisited in 11.II.2018 when another individual was located 30 m apart in a stone flower bed, growing as subsponaneous at the foot of a cultivated *Nerium oleander* L., DF305856, 134 m, 07.IV.2013, C. Gómez-Bellver & N. Marqués (BC 990563, BCN 144513).

This perennial herb is native to northeastern Mexico and southern Arizona. The subspecies *angustifolia* has linear-lanceolate leaves, with lamina more than 10 times longer than wide (Rzedowski & Rzedowski, 1997; Lammers, 2004).

In Europe *Lobelia laxiflora* has only been reported from Italy (Celesti-Grappo *et al.*, 2010) and the archipelago of Madeira (Vieira, 2002), where it was considered as a casual plant.

***Opuntia elatior*** Mill. (Fig. 3E) (Cactaceae).

First record for Catalonia.

Barcelona, el Barcelonès: Esplugues de Llobregat, Ciutat Diagonal, near to Can Moragues, a group of ca. 10 big clonal plants presumably persistent as an abandoned cultivation for some decades, up to 3.5 m height, occupying an area of 25–30 m<sup>2</sup>, flowering and fruiting, and three dispersed plants no more than 1.2 m tall, relatively close to the main group, in a shrubby slope, DF244820, 172 m, 12.I.2018, H. Álvarez & C. Gómez-Bellver (BC 990588); Barcelona, Montjuïc Mountain on the Miramar side, few adults cultivated for many years besides the road, and a big subsponaneous plant, ca. 5–6 m wide, growing on a rocky slope, accompanied by *Aloe ferox* Mill., all flowering, DF306796, 34 m, 24.I.2018, C. Gómez-Bellver (no voucher available).

This prickly pear is native to the Antilles and part of tropical South America—Colombia and Venezuela (Bravo-Hollis & Arias, 2011; Majure *et al.*, 2017). It has been reported for South Europe in Spain in the Balearic Islands (Serapio *et al.*, 2016) and Valencia (Guillot *et al.*, 2008, 2014b)—both *O. bergeriana*

Weber, based on the indications of Britton & Rose (1920)—and in Italy (Guiggi, 2008). Despite some differences between the cactus seen in Europe (bright red flowers and yellowish spines, grayish when old—Berger, 1904) and in America (flowers yellow or reddish-orange with red or rose stripes and dark brown spines, turning to gray when aged—Anderson, 2001; Bravo-Hollis & Arias, 2014), we consider that both plants could possibly correspond to different forms of the same species. We should take into account that *O. bergeriana* was described from cultivated plants and, thus, the differential traits might be result of selection by gardeners. Recently, F. Verloove and A. Guiggi (pers. comm.) confirmed the identity of our plant as *O. elatior*.

The cladodes of the plants observed were 12–16(18) × 25–30(35) cm, with uneven spines yellow to pale brown-red, usually the older whitish to gray, 0–4(5) per areole and 3–5(6) cm long. Areoles are 2–4 cm apart. Flowers have scarlet-reddish tepals, stamens with yellow anthers and scarlet-pink filaments, and pistil with white style and green stigma. Fruits are red.

*Opuntia elatior* was introduced in different countries and it became an important invasive weed in South and Southeast Asia and Australia. Later, these populations were eradicated or reduced to non-pest level by means of biological agents (Singh, 2004; Lloyd & Reeves, 2014).

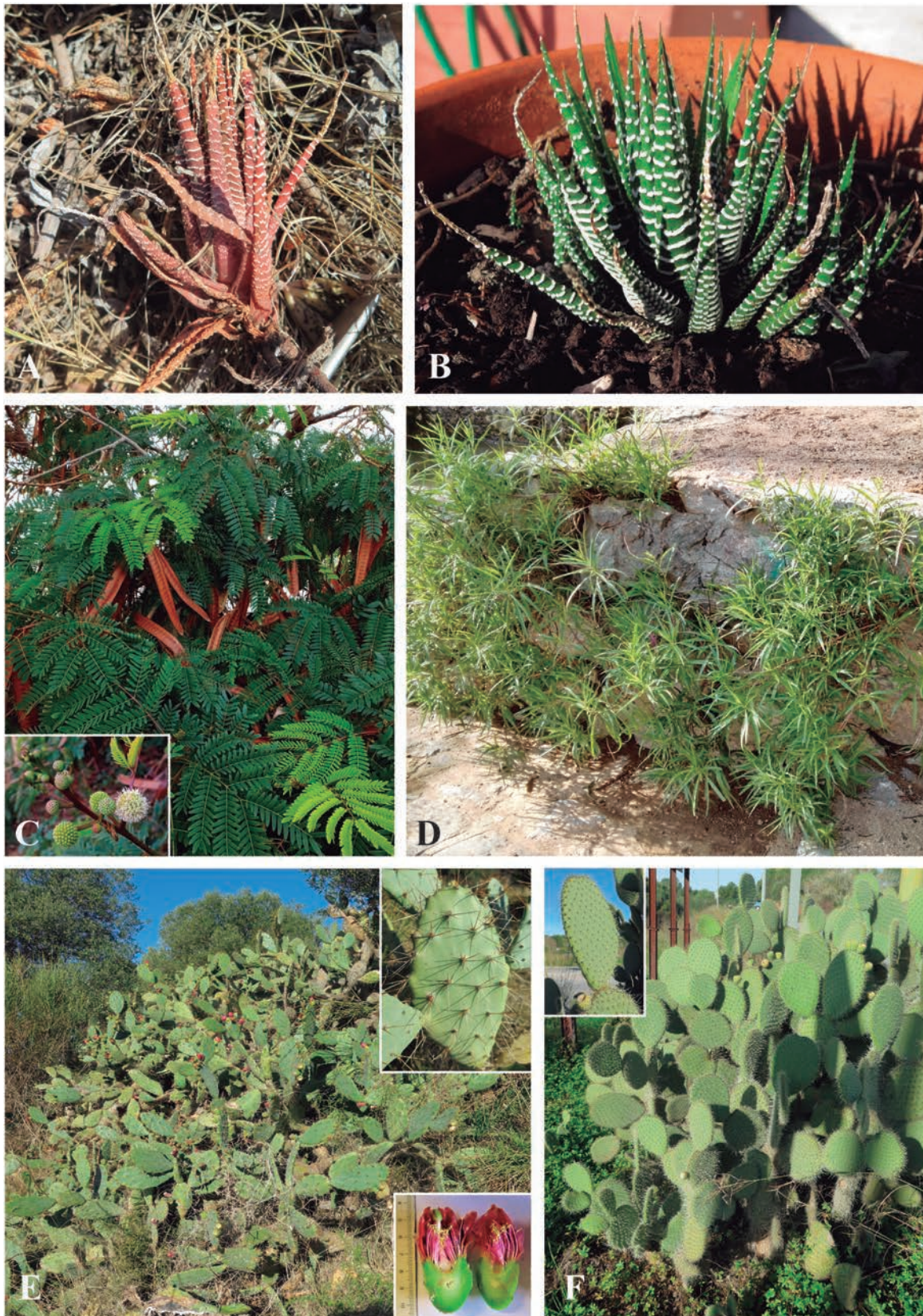
All observed specimens have a vigorous appearance, unlike the widely spread neighbor *O. maxima* Mill., whose populations are in decline due to a cochineal attack.

***Opuntia leucotricha*** DC. (Fig. 3F) (Cactaceae).

New to the north of Catalonia.

Barcelona, el Baix Llobregat: Gavà, C-245 road, by the sideway of the road crossing the roundabout, six adult specimens up to 1.8 m tall, set apart few meters each other, with an early stage of plant recruitment in some of them, DF162620, 6 m, 22.XII.2016, H. Álvarez & C. Gómez-Bellver (no voucher available). El Barcelonès: Barcelona, Turó de la Rovira, three young plants on gravelly and sandy slope, ca. 10 m apart, DF301855, 212 m, 11.II.2018, C. Gómez-Bellver & N. Marqués (no voucher available). Girona, l'Alt Empordà: Castelló d'Empúries, slope between the path to the camp site and the road C-260, near Mas Barceló, two young plants set apart ca. 5–7 m, EG069777, 7 m, 26.X.2017, P. Farelo, C.





**Figure 3.** (A), *Haworthiopsis attenuata*, l'Ametlla de Mar; (B), translocated specimen of *H. attenuata*; (C), *Leucaena leucocephala*, Roda de Berà; (D), *Lobelia laxiflora* subsp. *angustifolia*, Barcelona; (E), *Opuntia elatior*, Esplugues de Llobregat; (F), *Opuntia leucotricha*, Gavà (photographs A, B, D–F: C. Gómez-Bellver; C: J. López-Pujol).

*Gómez-Bellver & N. Ibáñez* (no voucher available); Palau-Saverdera, in abandoned crops and wastelands, close to some houses, some individuals scattered on an area of about two hectares, with some other non-native plants, mainly *Agave americana* L. subsp. *americana*, *Opuntia maxima* Mill., *O. engelmannii* Salm-Dyck ex Engelm. ssp. *lindheimeri* (Engelm.) U. Guzmán & Mandujano var. *linguiformis* (Griffiths) B. D. Parfitt & Pinkava and *Senecio angulatus* L. f., EG123843, ca. 140 m, 10.XII.2017, *J. López-Pujol* (no voucher available). Tarragona, el Baix Camp: l'Aleixar, Mas del Cobrador, several specimens (including some adult ones) at the edge of a trail, growing together with other *Opuntia* taxa and *Agave americana* L. subsp. *americana*, CF355637, 290 m, 10.X.2014, *J. López-Pujol* (no voucher available); l'Ametlla de Mar, between cala Vidre and Cala Forn, 8 m, 01.III.2014, *N. Girbau & L. Sáez* (no voucher available); Cambrils, riera d'Alforja, CF355500, 43 m, 19.VII.2016, *C. Gómez-Bellver, J. López-Pujol & N. Nualart* (no voucher available); Mont-roig del Camp, riera de Riudecanyes, on the trail parallel to the dry river bed, a very large individual (about 2 m) and some small ones, CF307520, 98 m, 21.VII.2014, *J. López-Pujol* (no voucher available). El Baix Penedès: Bellvei, by the roadside (road N-340), near habitation, a large individual and some small ones, growing with other non-native plants including *Opuntia monacantha* Haw., and *Gasteraloe beguinii* (Radl) Guillaumin, CF808661, 95 m, 23.XII.2017, *J. López-Pujol* (no voucher available); el Vendrell, by the roadside (road N-340), next to the junction with road C-31, a single mature individual, CF777633, 62 m, 12.IX.2014, *J. López-Pujol* (no voucher available).

This cactus is endemic to the center of Mexico (Bravo, 1978; Anderson, 2001). It was first reported for Catalonia by Sanz-Elorza *et al.* (2004b) for the Tarragona Province, and by Pyke (2008) for the Barcelona Province, both as *O. huajuapensis* Bravo—also a Central Mexican cactus, but that grows further to the south (Arias *et al.*, 2012).

*Opuntia leucotricha* has whitish spines borne on the lower parts of the areoles; in contrast, *O. huajuapensis* has yellow spines awl-like, ascending to bent backward (Anderson, 2001). Samuel Pyke told us recently that the plant he cited (Pyke, 2008) is actually referable to *O. leucotricha*. All the specimens we saw in Catalonia always displayed seedless fruits smaller in size than normal, as occurs in the former reports.

The same results were observed for some prickly cactus under artificially induced parthenocarpy (Mejía & Cantwell, 2003). We consider that the lack of seeds—and the existence of some other fuzzy characters that could lead us to misunderstand the identity of the species—can be attributed either to hybridization or to successive generations of clonal growth. This process could have occurred spontaneously—not very common in this group (Lenzi & Orth, 2012)—or as a product of selection by growers.

***Parthenocissus tricuspidata*** (Siebold & Zucc.) Planch. (Fig. 4A) (Vitaceae).

Casual, naturalized locally. Second record for Catalonia.

Barcelona, el Garraf: Garraf, on a rocky wall next to the stairs that lead down to the Puerto de Garraf Avenue, several plants, accompanied by *Kalanchoe ×houghtonii* D. B. Ward and *Anredera cordifolia* (Ten.) Steenis, DF080673, 11 m, 29.IX.2016, *H. Álvarez & C. Gómez-Bellver* (BC 955827, BCN 133401). Girona, el Baix Empordà: Palafrugell, beach of Tamariu, with *Pittosporum tobira* (Thunb.) W. T. Aiton, a dense group in the rear slope of the beach, covering an area of ca. 12–15 m<sup>2</sup> that reaches the sand, EG171405, 3 m, 18.VIII.2016, *C. Gómez-Bellver & N. Marqués* (no voucher available).

One of the three main *Parthenocissus* species used as ornamental for the covering of walls and fences. While two American species—*P. inserta* (A. Kern.) Fritsch and *P. quinquefolia* (L.) Planch—have palmately compound leaves, those of the Asian *P. tricuspidata* are simple, palmately three-lobed. All plants display numerous tendrils that allow them to grasp and climb vertical surfaces.

*Parthenocissus tricuspidata* has been reported for many central and southeast European countries (DAISIE, 2017; GBIF, 2017b). In Catalonia, it has only been reported from Barcelona Province (Casasayas, 1989). Although *P. tricuspidata* probably does not have the same invasive capacity as the aforementioned congeners, its future spread in the territory is quite plausible.

***Pennisetum flaccidum*** Griseb. (Fig. 4B) (Poaceae).

New to the Iberian Peninsula.

Barcelona, el Baix Llobregat: el Papiol, riera de Rubí, a compact group of plants accompanied by other neophytes, covering an area of ca. 2 m<sup>2</sup> with

numerous reproductive stems, at the end of flowering, in nitrophilous grasslands in the riverbank next to some roads crossing an industrial facility, DF161877, 27 m, 23.IX.2016, *H. Álvarez* (BC 990386, BCN 134532, BCN 134533).

Perennial grass native to Central Asia, with tough spreading rhizomes, resistant to frost and dryness, which grows from 800 to 5000 m. It is used as a forage grass, for recovery or protection of soils in degraded areas, and also as ornamental plant (Chen & Phillips, 2006; Szczesniak, 2011; Verloove, 2017).

It has been reported for Europe in (1) Belgium (Natuurpunt, 2017; Verloove, 2017), (2) the Netherlands, without specific location and a limited distribution in nature that makes it amenable to eradication (Matthews *et al.*, 2014), (3) Germany, as *P. centrasiaticum* Tzvelev (Greuter & Raab-Straube, 2009) but confirmed by Verloove (2017) as *P. flaccidum*, and (4) Poland (Szczesniak, 2011). Some agricultural experiments performed in the United States evaluated the forage capacity of this grass, but we have only found a clear reference to this plant as escaped from cultivation in Texas (Barkworth *et al.*, 2007). In case of new introductions, it could become invasive.

***Podranea ricasoliana*** (Tanfani) Sprague (Fig. 4C) (Bignoniaceae).

Second record for Catalonia.

Barcelona, el Barcelonès: Esplugues de Llobregat, la Miranda neighborhood, a population in blossom of ca. 40 m<sup>2</sup>, thriving on the mountain slope, towards the end of a residential area, DF239822, 227 m, 12.I.2018, *C. Gómez-Bellver* & *H. Álvarez* (BC 990553, BCN 143488). Girona, el Baix Empordà: Torroella de Montgrí, in Pedrosa's little bay, 2 km towards the south of Tamariu, on a rocky slope, in blossom, with *Vitis riparia* Michx., EG171395, 4 m, 18.VII.2016, *C. Gómez-Bellver* & *N. Marqués* (no voucher available).

Ornamental creeper, with South Africa generally accepted as native area, although some South African authors think that it was introduced by slave merchants (Lee *et al.*, 2016).

In Catalonia it has only been reported from the northeast, from the Baix Empordà county, by Mallol & Maynés (2008). The vigorous growth observed in Barcelona's population makes us believe that this plant could behave as a locally invasive species if more propagule pressure takes place in the future.

***Rudbeckia hirta*** L. (Fig. 4D) (Asteraceae).

Second record for Catalonia.

Barcelona, el Barcelonès: Barcelona, Besòs River Park, la Trinitat Vella, near Baró de Viver, right river bank, a few individuals scattered in a nitrophilous grassland, accompanied mainly by *Anacyclus valentinus* L., *Bromus catharticus* Vahl, *Sonchus oleraceus* L. and *Trifolium repens* L. as well as ornamental plants like *Eschscholzia californica* Cham. and *Linum grandiflorum* Desf., along ca. 700 m, presumably as a result of a former local city council urban action, DF336884, 13 m, 05.V.2017, *C. Gómez-Bellver* (BC 990558, BCN 143186); Barcelona, Can Tunis, in some road-banks of the Avda. Zona Franca in the junction with the harbor, as a cultivated plant [originally cultivated as an ornamental plant, now it is persisting from cultivation, *C. Gómez-Bellver et al.*, pers. obs., May 2018], DF2978, 5 m, 07.VII.2015, *S. Pyke* (BC 998211).

This ornamental coneflower is native to North America. Blade leaves are elliptic, lanceolate, or ovate (not lobed), and the center disc brown-purple to dark brown (Urbatsch & Cox, 2005).

We are aware of the active cultivation of this species in gardens, road banks and artificial slopes in Catalonia, mainly in the city of Barcelona and nearby villages. We provide here the report of a population probably persistent of cultivated origin in the Besòs River Park.

It was previously reported for Catalonia by Viñas (1993) from the province of Girona. Another alien congeneric species reported for Catalonia by Bolòs (1998), *R. laciniata* L., differs by the basal and midstem leaves being usually 1–2 pinnatifid or pinnately lobed, and the yellowish green disc florets.

***Senecio crassissimus*** Humbert (Fig. 4E) (Asteraceae).

New to Europe.

Tarragona, el Tarragonès: Tarragona, l'Escorpi neighborhood, in a margin of an Aleppo pine forest, two patches separated by a few dozen metres, near habitation, CF590559, ca. 60 m, 11.II.2017, *J. López-Pujol* (BC 958002).

The vertical leaf senecio is a dwarf shrub (up to 80 cm) with succulent stems native to Madagascar (Rowley, 2002). It is easily distinguishable by its leaves, ovate, laterally compressed, glaucous green with vivid purple margins. Inflorescences are loose corymbs that carry over 30 bright yellow daisy-like heads.



**Figure 4.** (A), *Parthenocissus tricuspidata*, Palafrugell; (B), *Pennisetum flaccidum*, el Papiol; (C), *Podranea ricasoliana*, Esplugues de Llobregat; (D), *Rudbeckia hirta*, Barcelona; (E), *Senecio crassissimus*, Tarragona; (F), *Tradescantia sillamontana*, Barcelona (photographs A, C, D: C. Gómez-Bellver; B: H. Álvarez; E, F: J. López-Pujol).

Despite being widely used as an ornamental, we are not aware of any occurrence as escaped or naturalized apart from our observation. The individuals of *S. crassissimus* from Tarragona are likely to have escaped from the nearby private gardens, as we also found other common escapes from cultivation, such as *Aeonium arboreum* Webb & Berthel., *Crassula muticava* Lem. and *C. ovata* (Mill.) Druce.

***Tradescantia sillamontana*** Matuda (Fig. 4F) (Commelinaceae).

New to Catalonia.

Barcelona, el Barcelonès: Barcelona, Sants District, on a channel in the roof of 47 Blanco street, accompanied by *Kalanchoe ×houghtonii*, DF275808, 27 m, 07.XI.2017, J. López-Pujol (BC-HV-967107).

Native to northeastern Mexico (Alanís-Flores *et al.*, 2011), it is a small perennial herbaceous plant with densely hairy stems and leaves that give the plant a recognizable velvety appearance, with terminal more or less intense pink flowers. As with many other ornamental plants, its vegetative propagation by means of cuttings is easy.

It has been reported for the Iberian Peninsula in the city of Valencia (Talavera *et al.*, 2010). Regarding the rest of Europe, there is only one specific report from southern Italy (Stinca *et al.*, 2012) as casual. In the Iberian Peninsula, three species within this genus are mentioned as subsponaneous: *T. pallida* (Rose) D. R. Hunt and *T. zebrina* Heynh. in Andalusia and the Valencian Community, and *T. virginiana* L. in the Valencian Community (Talavera *et al.*, 2010).

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