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New records of alien vascular plants from the island of Madeira (Portugal)

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With 31 figures

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ABSTRACT: As a result of recent fieldwork in the island of Madeira (Portugal), 32 non-native vascular plant taxa: *Aptenia* *x* *vascosilvae*, *Calystegia silvatica*, *Cardamine occulta*, *Casuarina cunninghamiana* and *C. glauca*, *Convolvulus farinosus*, *Cotoneaster pannosus*, *Diplotaxis tenuifolia*, *Epilobium ciliatum*, *Erigeron floribundus*, *Euphorbia hypericifolia*, *E. maculata*, *E. serpens*, *Hedychium coronarium*, *Kalanchoe xhoughtonii*, *Lemna minuta*, *Lepidium oblongum*, *Malephora purpureocrocea*, *Metrosideros excelsa*, *Oenothera glazioviana*, *Oxalis dillenii*, *Phytolacca icosandra*, *Pistia stratiotes*, *Rumex palustris*, *Schinus terebinthifolia*, *Sisyrinchium micranthum* (incl. *S. rosulatum*), *Soliva sessilis*, *Sphagneticola trilobata*, *Tithonia diversifolia*, *Verbena incompta*, *V. litoralis* and *Youngia japonica*, are reported as naturalized, xx of them for the first time. All these taxa are reportedly known as weeds or invasive, in climatologically comparable regions elsewhere in the world. In addition, records are provided for several taxa that are considered to be ephemerals at present, but for which a future naturalization is not unlikely. Finally, some miscellaneous notes are presented, on poorly known or recently reported aliens (for instance, the presence of *Solanum chenopodioides* is confirmed and in some habitats it even behaves as an invasive species). Identification keys for some species groups (*Erigeron*, *Euphorbia* subgenus *Chamaesyce*) are provided and many of the taxa are illustrated.

Key words: vascular plants, non-native, new records, Madeira Island.

RESUMO: Como resultado do trabalho de campo realizado recentemente na ilha da Madeira (Portugal), 32 taxa de plantas vasculares, não nativas, são aqui referidos, xx deles pela primeira vez, como naturalizados: *Aptenia xvascosilvae*, *Calystegia silvatica*, *Cardamine occulta*, *Casuarina cunninghamiana* e *C. glauca*, *Convolvulus farinosus*, *Cotoneaster pannosus*, *Diploaxis tenuifolia*, *Epilobium ciliatum*, *Erigeron floribundus*, *Euphorbia hypericifolia*, *E. maculata*, *E. serpens*, *Hedychium coronarium*, *Kalanchoe xhoughtonii*, *Lemna minuta*, *Lepidium oblongum*, *Malephora purpureocrocea*, *Metrosideros excelsa*, *Oenothera glazioviana*, *Oxalis dillenii*, *Phytolacca icosandra*, *Pistia stratiotes*, *Rumex palustris*, *Schinus terebinthifolia*, *Sisyrinchium micranthum* (incl. *S. rosulatum*), *Soliva sessilis*, *Sphagneticola trilobata*, *Tithonia diversifolia*, *Verbena incompta*, *V. litoralis* e *Youngia japonica*. Todos estes taxa são reconhecidos como sendo ervas daninhas ou espécies invasoras noutras partes do mundo, com um clima semelhante ao da ilha da Madeira. Na presente publicação, são assinalados registos de vários taxa, com uma presença considerada efémera, mas, para os quais, não se pode descartar a possibilidade de uma futura naturalização. Finalmente, são apresentadas algumas notas sobre espécies alienígenas pouco conhecidas ou assinaladas recentemente (como por exemplo, confirma-se a presença de *Solanum chenopodioides*; taxon com um comportamento local de espécie invasora). São fornecidas chaves de identificação para algumas espécies (*Erigeron*, *Euphorbia* subgénero *Chamaesyce*) e muitos dos taxa estão acompanhados por fotografia.

Palavras-chave: plantas vasculares, não nativas, novos assinalamentos, ilha da Madeira.

INTRODUCTION

Despite the long tradition of studies on the flora of the island of Madeira, native and introduced, there is a constant and almost uninterrupted amount of new taxonomic and distributional data. Particularly the non-native flora is still imperfectly known and the number of intentional as well as accidental, new introductions, still seems to continue to increase. According to MENEZES DE SEQUEIRA update (*pers. comm.*, 2018), the flora of the archipelagos of Madeira and Selvagens, comprises 1,268 taxa of vascular plants (species and subspecies). Of these, 402 to 442 taxa are 'introduced' and 29 taxa are 'possibly introduced'.

This paper reports some newly-detected alien vascular plants found in the island of Madeira, mostly in the autumn of 2021 and the spring of 2022. Thirty-two naturalized or invasive taxa, most of them new to Madeira, are presented herein. Several others are, at least at present, considered to be ephemerals. Some further observations are added for taxa that are otherwise of interest.

MATERIALS AND METHODS

Records presented here are the result of several weeks of fieldwork in the island of Madeira conducted by the first author, between 10th and 24th September 2021 and between 18th April and 2nd May 2022. Herbarium specimens were collected for most of the taxa and these are deposited in the herbaria BR and MADM (THIERS, 2022).

The actual presence or absence on the island of Madeira of the non-native taxa here presented was checked against data provided by e.g. PRESS & SHORT (1994), VIEIRA (2002), JARDIM & SEQUEIRA (2008); MENEZES DE SEQUEIRA *et al.* (2012), MUER *et al.* (2020) and the EURO+MED PLANTBASE (2022). For some recently introduced species, several additional papers were checked. Both authors searched for additional useful information in the herbarium MADM.

The present paper is divided in three parts:

1 – Naturalized and invasive taxa:

- a) First records from Madeira;
- b) Other previously recorded taxa.

Each entry includes: the scientific name of the taxon (if useful accompanied by one or more homo- or heterotypic synonyms), the family to which the taxon belongs, an enumeration of selected herbarium collections and/or personal observations, primary as well as secondary distribution range and the species' estimated degree of naturalization in Madeira. When relevant, some additional information is provided (nomenclatural or taxonomic comments, etc.).

2 – Ephemeral taxa.

3 – Miscellaneous records, for some critical alien taxa for which the degree of naturalization has changed

(e.g. taxa that were thought to be ephemerals but that are thoroughly naturalized instead or that were only recently reported for the first time from Madeira).

For convenience, within each of these parts, all taxa are presented in alphabetical order (families, then species). Familial and generic classifications are in accordance with APG IV (2016). For the taxa treated herein, this means that Malaceae are included in Rosaceae and Lemnaceae in Araceae.

All field observations, many further substantiated by photographs, were registered in the observation.org (<https://observation.org/>) online database that is also published through the Global Biodiversity Information Facility (GBIF; <https://www.gbif.org/>).

RESULTS

1 – Naturalized and invasive taxa:

a) First records from Madeira:

Aizoaceae

Aptenia xvascosilvae Gideon F. Sm., E. Laguna, F. Verloove & P. P. Ferrer, *Phytotaxa*, **441** (2): 221-224 (2020). (Fig. 1).

Syn.: *Mesembryanthemum xvascosilvae* (Gideon F. Sm., E. Laguna, F. Verloove & P. P. Ferrer) L. Sáez & Aymerich.

This hybrid of *Aptenia cordifolia* (L. f.) Schwantes x *haeckeliana* (Berger) Bittrich ex Gerbaulet parentage, both native to South Africa, is one of the most widely grown mesembs globally (SMITH *et al.*, 2019). It easily escapes from cultivation and is currently part of the exotic floras of several countries, especially in regions with a Mediterranean climate. For quite a long time, it was only known under its cultivar name 'Red Apple' but SMITH *et al.* (2020) formalized its nomenclature. The flowers of *A. xvascosilvae* are bright strawberry red and not bright pinkish purple as in *A. cordifolia* and its leaves are not cordate at base as in the latter species.

In the island of Madeira, both the hybrid and *A. cordifolia* are very commonly grown as ornamentals but only the latter has been reported as an escape (PRESS & SHORT, 1994; VIEIRA, 2002). In fact, both are probably fairly widespread and sometimes grow in close proximity, for instance on coastal cliffs in Funchal (Ponta da Cruz).

According to some authors (e.g. KLAK *et al.*, 2007; KLAK & BRUYNS, 2013), *Aptenia* N. E. Br. is better included in a

broadly circumscribed genus *Mesembryanthemum* L.; SÁEZ & AYMERICH (2020) proposed a combination under the latter genus.



Fig. 1 – *Aptenia xvascosilvae*, Funchal, coastal cliff, September 2021, F. Verloove.

Malephora purpureocrocea (Haw.) Schwantes, *Gartenflora*, **77**: 69 (1928).

This South African ornamental is much cultivated in Macaronesia and other regions with similar climatic conditions. In the Canary Islands, it is recorded as a naturalizing escape (PADRÓN-MEDEROS *et al.*, 2009) and the same applies to the Mediterranean area (e.g. SCIBERRAS & SCIBERRAS, 2010). The species was recently recorded for the first time in Argentina (JOCOUI *et al.*, 2019) and is also known from California (BLECK, 2003). It was not known from the archipelagos of Madeira, Selvagens, Azores and Cape Verde (SÁNCHEZ-PINTO *et al.*, 2005; JARDIM & SEQUEIRA, 2008; SILVA *et al.*, 2010).

A small, seemingly established population of *Malephora purpureocrocea* was discovered on a coastal cliff, in April 2022, in Caniço, where it grows together with *Carpobrotus edulis* (L.) N. E. Br.

Anacardiaceae

Schinus terebinthifolia Raddi, *Mem. Mat. Fis. Soc. Ital. Sci. Modena, Pt. Mem. Fis.*, **18**: 399 (1820).

This South American (Argentina, Brazil and Paraguay) ornamental shrub is much grown in the subtropics, including the islands of Madeira and Porto Santo. Frugivorous birds feed on its berries and play an important role in the species' dispersal in areas where it has been introduced (DLAMINI *et al.*, 2018). As a result, it is increasingly escaping and more and more regarded as an invasive exotic (*e.g.* WILLIAMS *et al.*, 2007).

From the island of Madeira and Porto Santo, it was, not reported, so far, in the wild (*e.g.* PRESS & SHORT, 1994; VIEIRA, 2002; JARDIM & SEQUEIRA, 2008; MENEZES DE SEQUEIRA *et al.*, 2012). Yet, it is frequently escaping and young, self-sown individuals are observed *e.g.* in drains, banana plantations, semi-dried out riverbeds, dunes (Porto Santo), etc. In some areas (*e.g.* Funchal, Ponta de São Lourenço, Caniçal) small, more or less established populations, with flowering and fruiting individuals, have been observed. Similar behavior was recently reported from the Canary Islands as well (VERLOOVE & REYES-BETANCORT, 2011; VERLOOVE, 2013; VERLOOVE, 2017).

Araceae

Lemna minuta Kunth in F. W. H. von Humboldt, A. J. A. Bonpland & C. S. Kunth, *Nov. Gen. Sp.*, **1**: 372 (1816).

This American weed is still poorly known in parts of Europe, where confusion with native *L. minor* L., lingers on. It is distinguished from the latter by its smaller, narrower fronds (ca. 0.8-3 mm long, up to twice as long as wide) with a single, raised vein. Despite being smaller in size, it is much more expansive and often considered to be an aggressive invader (CESCHIN *et al.*, 2016).

In Macaronesia, it was probably overlooked for quite a long time. As a result, this taxon was not reported before, for the archipelagos of Madeira, Selvagens, Azores and Cape Verde (PRESS & SHORT, 1994; VIEIRA, 2002; SÁNCHEZ-PINTO *et al.*, 2005; JARDIM & SEQUEIRA, 2008; ACEBES GINOVÉS *et al.*, 2010; SILVA *et al.*, 2010; MENEZES DE SEQUEIRA *et al.*, 2012). Its presence was recently detected in the Canary Islands, often in massive stands (Gran Canaria, La Palma, Tenerife: VERLOOVE, 2013; OTTO & VERLOOVE, 2020; VERLOOVE, 2021).

In September 2021, it was discovered in two localities in the island of Madeira, Machico (Matur) and Câmara

de Lobos (Ribeira dos Socorridos), although no special attention was paid to it. It is likely much more widespread but widely overlooked.

Pistia stratiotes L., *Sp. Pl.*, **963** (1753). (Fig. 2).

This species has a pantropical distribution. It is widely grown as an aquatic ornamental, water lettuce, and readily becomes an aggressive invader (*e.g.* BRUNDU *et al.*, 2012), although in some areas where it is considered as such, it may as well be native, for instance in Florida (EVANS, 2013).

Surprisingly, in Macaronesia it is only known, so far, from the Azores (Faial) where it is classified as casual (SILVA *et al.*, 2010) and Canary Islands (ACEBES GINOVÉS *et al.*, 2010), where it is known as an invasive species.

In September 2021, it was observed on several occasions in Madeira. In Câmara de Lobos it was repeatedly seen in temporary ponds and shallow water in the Ribeira dos Socorridos, between Ponte dos Socorridos and the beach, where it looks naturalized, with 100's of individuals over quite a distance. In Maroços, in the Ribeira de Machico, a small population in standing water was observed and in Ponta do Sol, at the mouth of the stream, at the beach, a monospecific stand of ca. 50 x 30 m, was observed.



Fig. 2 – *Pistia stratiotes*, Ponta do Sol, beach, September 2021, F. Verloove.

Asteraceae

Erigeron floribundus (Kunth) Sch. Bip., *Bull. Soc. Bot. Fr.*, **12**: 81 (1865).

Syn.: *Conyza floribunda* Kunth, incl. *C. bilbaoana* J. Rémy.

Herbarium: Santa Cruz, Santo António da Serra, ER 224 south of golf court, roadside, scattered individuals, also elsewhere in this area, 24 Sept. 2021, F. Verloove 14126 (BR).

Current-day authors accept three species from the genus *Conyza* Less. (now, usually included in *Erigeron* L.), all native to the New World, as occurring in Madeira: *E. bonariensis* L., *E. canadensis* L. and *E. sumatrensis* Retz. (e.g. PRESS & SHORT, 1994; VIEIRA, 2002; JARDIM & SEQUEIRA, 2008; MENEZES DE SEQUEIRA *et al.*, 2012). The latter is a relatively recent introduction, first reported by HANSEN (1973) under the erroneous name of *E. floribundus*.

Erigeron floribundus is a taxonomically critical taxon. PRUSKI & SANCHO (2006) subsumed it under *E. sumatrensis* (as var. *leiotheca* (S. F. Blake) Pruski et G. Sancho). STROTHER (2006) only accepted *E. floribundus* for North America, whereas NESOM (2018) demonstrated that both *E. floribundus* and *E. sumatrensis* are present in that area. *E. floribundus* is in fact, more or less intermediate between *E. sumatrensis* and *E. canadensis*. With the latter species, it shares the glabrous phyllaries, with the former the 5-lobed tubular corollas and the absence of ligules. It is more hirsute hairy than either species.

All these species are morphologically similar, yet easily distinguished:

1 – Leaves nearly glabrous above or with scattered hairs along midrib only, margins distinctly ciliate (at least in lower third, ciliae often 1 mm long). Involucral bracts nearly glabrous. Capitulae ca. 2-4 mm wide at anthesis --- 2
1' – Leaves densely shortly pubescent above, margins hardly ciliate (ciliae, if present, very short). Involucral bracts softly hairy. Capitulae ca. 4-10 mm wide at anthesis ----- 3
2 – Inner (tubular) florets mostly 4-lobbed. Ligules always present, white, distinctly exceeding involucre. Inflorescence often cylindric, much longer than wide. Plant annual, usually yellowish-green, stem not hirsute -----

----- *Erigeron canadensis*
2' – Inner (tubular) florets mostly 5-lobed. Ligules absent or rudimentary, not exceeding involucre. Inflorescence much broader, usually only slightly longer than wide. Plant annual or short-lived perennial, dull greyish-green, stem hirsute ----- *E. floribundus*

3 – Leaves narrow, less than 5 mm wide, the uppermost linear. Inflorescence often with greatly enlarged side branches overtopping the main axis. Apex of involucral bracts often purplish. Capitulae ca. 6-10 mm at anthesis. Pappus brownish ----- *E. bonariensis*

3' – Most leaves wider, 3-20 mm wide, never linear. Side branches of the inflorescence not overtopping the main axis. Apex of involucral bracts not purplish. Capitulae ca. 4-6 mm at anthesis. Pappus whitish ----- *E. sumatrensis*

In the island of Madeira, the presence of *E. floribundus* was recorded in the wide area of Santo António da Serra. In addition to the locality cited above, it was also observed, in relative abundance, in a roadside and alongside a stream, west of this village, near to the ER 110 road. Elsewhere in Macaronesia, this species is known from the Canary Islands, although many claims from there may refer to similar species (see, however, OTTO & VERLOOVE, 2016).

Soliva sessilis Ruiz et Pav., *Fl. Peruv. Prodr.*, **113** (1794). (Fig. 3).

(incl. *S. pterosperma* (Juss.) Less.).

Herbarium: Funchal, Pico de São Martinho, rotunda GAG2, lawn, common but overlooked weed, 19 Apr. 2022, F. Verloove 14279 (BR); Machico, Achada, track north of the village towards Portela, track in woodland, relatively remote, common, 22 Apr. 2022, F. Verloove 14270 (BR); dupl. MADM 7132.



Fig. 3 – *Soliva sessilis*, Palheiro Ferreiro, lawn, April 2022, F. Verloove.

This South American weed was already known from the Azores and continental Portugal (MENEZES DE SEQUEIRA *et al.*, 2012) but not yet from Madeira. However, given its current distribution on the island, it doubtlessly has been overlooked so far or – alternatively and perhaps less likely – must have spread very fast following a recent introduction. In fact, in April and May 2022, it was observed in numerous localities throughout the island (Arco de São Jorge, Calheta, Camacha, Funchal, Machico, Palheiro Ferreiro, Santa Cruz, Santo António da Serra). It is usually found in more or less disturbed lawns but also along tracks, between cobblestones, on the verge of golf courts, etc. It is often quite abundant.

Sphagneticola trilobata (L.) Pruski, *Mem. New York Bot. Gard.*, 78: **114** (1996). (Fig. 4).

Syn.: *Wedelia trilobata* (L.) Hitchc.

Herbarium: Santana, Faial, Praia do Faial, below steep rocks, close to the sea, a small established population, 15 Sept. 2021, F. Verloove 14148 (BR); Machico, Porto da Cruz, riverlet at Rua da Alagoa, semi-dried out riverbed, near to the sea, a small established population, 23 Sept. 2021, F. Verloove 14195 (BR).



Fig. 4 – *Sphagneticola trilobata*, Porto da Cruz, dried out riverbed, September 2021, F. Verloove.

This species is native to Mexico, Central America (Belize, Costa Rica, Guatemala, Honduras, Nicaragua and Panama), the Caribbean and tropical South America. It is widely grown as an ornamental (for ground cover), easily escapes and naturalizes and is classified as a noxious invader in several countries, for instance in China where it intergrades with the native congener *S. calendulacea* (L.) Pruski (Wu *et al.*, 2013). According to the IUCN, it is one of the world's 100 worst invasive species.

Although widely cultivated as an ornamental in Macaronesia, it has only recently been first reported as an escape and apparently only from the Canary Islands so far (Gran Canaria and La Palma: VERLOOVE, 2017; OTTO & VERLOOVE, 2018). In the island of Madeira, it was recently observed in two localities (see above) but it doubtlessly also occurs elsewhere: on observation.org a further record (<https://observation.org/observation/184740845/>) is available from the mountainous area near Calheta and in April 2022, we also observed it, as a lawn weed, *e.g.* in Machico.

Tithonia diversifolia (Hemsl.) A. Gray, *Proc. Amer. Acad. Arts*, **19**: 5 (1883). (Fig. 5).

This species is native to Mexico and Central America but has a nearly pantropical distribution as an introduced (ornamental) species. It has often been recorded as a harmful invasive plant that disturbs native plant communities (*e.g.* YANG *et al.*, 2012).



Fig. 5 – *Tithonia diversifolia*, Garajau, roadside slope, September 2021, F. Verloove.

Although widely grown as an ornamental, it apparently has not been recorded in the wild so far in Madeira (PRESS & SHORT, 1994; VIEIRA, 2002; JARDIM & SEQUEIRA, 2008; MENEZES DE SEQUEIRA *et al.*, 2012). In September 2021, it was observed on several occasions in the southern part of the island. It was found in the semi-dried out riverbed of the Machico stream (a few individuals only) and in the Ribeiro Seco riverbed, in Funchal, where it was more numerous (and already present in 2016; observation.org). It is, however, most common (and obviously naturalized) in the coastal area between Garajau and Funchal.

Elsewhere in Macaronesia, *T. diversifolia* has been reported from La Palma and Tenerife, in the Canary Islands (HANSEN, 1975; SANTOS *et al.*, 2014).

Brassicaceae

Cardamine occulta Hornem., *Hort. Bot. Hafn. Suppl.*, **71** (1819).

Herbarium: Machico, roundabout near Ribeira de Machico, north of Ponte de Machico, plantation weed, 11 Sept. 2021, F. Verloove 14125 (BR); Funchal, Levada dos Piornais, by small canal, 19 Apr. 2022, F. Verloove 14250 (BR).

This East Asian weed has been present in Europe since several decades but was initially referred to as 'Asian' *C. flexuosa* (BLEEKER *et al.*, 2008), then as *C. hamiltonii* (BOMBLE, 2014). MARHOLD *et al.* (2016) finally solved this issue and figured out that *C. occulta* is the correct name for it. It is distinguished from *C. flexuosa* by middle stem leaflets predominantly glabrous on the upper surface; basal leaves not rosulate; stem hairy or glabrous basally, glabrous or rarely sparsely hairy in the upper part; terminal leaflet of the middle stem leaf (one-) three- to five- (to seven-) lobed with deep and sharp sinuses (ŠLENKER *et al.*, 2018). *C. hirsuta* L., also known from Madeira, is also similar but this species is entirely glabrous (except for few hairs at the base of stem leaves), basal leaf rosette present and stamens are four (rarely five or six) in number.

This poorly known but quite widespread weed, of irrigated ornamental plantations, lawns, etc. was recently first reported from the Canary Islands (Gran Canaria and Tenerife: VERLOOVE & REYES-BETANCORT, 2011; VERLOOVE, 2013).

In September 2021 and April 2022, its presence was also confirmed in various localities in Madeira. In addition to the two localities cited above, it was also observed in Lugar de Baixo (Ponta do Sol; as a weed in a small banana

plantation), Câmara de Lobos, Faial, São Jorge (Fajã Alta) and Boaventura. It is probably more widespread but easily overlooked. It may turn out to be an invasive species in more natural habitats, for instance alongside *levadas*.

Lepidium oblongum Small, Fl. S. E., U. S.: **468** (1903). (Fig. 6).

Herbarium: Faial, Praia do Faial, parking lot near the sea, 24 Apr. 2022, F. Verloove 14314 (BR, MO).

This American weed is native to the southern U.S.A., Mexico and Central America. Since a few years, it is known from Europe as a naturalized and increasing alien along railway lines in Hungary and Romania (SÎRBU *et al.*, 2014; SCHMIDT *et al.*, 2022). ROLLINS (1986) further reported it from Hawaii.

Lepidium oblongum is much reminiscent of the South American weed *L. bonariense* L., both share pinnately lobed cauline leaves. The latter is a rare alien in Madeira (PRESS & SHORT, 1994; VIEIRA 2002; JARDIM & SEQUEIRA, 2008). *L. oblongum* often has several decumbent or ascending stems from base and fruits 2-3 mm wide. By contrast, *L. bonariense* has single erect stems from base and fruits 2.7-3.5 mm wide (AL-SHEHBAZ & GASKIN, 2010). In addition, leaves tend to be smaller, less hairy and with more or less rounded lobes.

In April 2022, this alien was observed on several occasions. It is relatively frequent on the sand beach of Ribeira Brava, between the river and the lighthouse, and also occurs in Funchal. It either has been overlooked so far (as a result of confusion with *L. bonariense*) or is a recent, fast spreading introduction.



Fig. 6 – *Lepidium oblongum*, Ribeira Brava, beach, April 2022, F. Verloove.

Casuarinaceae

Casuarina cunninghamiana Miq., *Nieuwe Verh. Eerste Kl. Kon. Ned. Inst. Wetensch. Amsterdam*, ser. 2, **13**: 56 (1848). (Fig. 7).

Herbarium: Machico, Ribeira de Machico, gravelly riverbed, two self-sown individuals, ca. 4-5 m tall, 11 Sept. 2021, *F. Verloove* 14164 (BR); Câmara de Lobos, Ribeira dos Socorridos, dried-out riverbed, a common escape, several hundreds, incl. fruit bearing individuals, 19 Apr. 2022, *F. Verloove* 14287 (BR); Machico, Matur, abandoned hotel complex, in cracks of concrete near the former swimming pool, ca. 50 individuals, the tallest ones 4-5 m, 1 May 2022, *F. Verloove* 14285 (BR).



Fig. 7 – *Casuarina cunninghamiana*, Machico, abandoned resort, May 2022, *F. Verloove*.

Casuarina glauca Sieber ex Spreng., *Syst. Veg.*, ed. 16, **3**: 803 (1826). (Fig. 8).

Herbarium: Caniçal, Rochinha, cliffs above the sea, rough ground, etc., abundantly reproducing from seed, 17 Sept. 2021, *F. Verloove* 14193 (BR).

This genus is poorly known in the island of Madeira. VIEIRA (2002) only mentioned *Casuarina equisetifolia* L. as

an ephemeral escape from cultivation. No species were reported by PRESS & SHORT (1994), JARDIM & SEQUEIRA (2008) and MENEZES DE SEQUEIRA *et al.* (2012). In fact, during our fieldwork in 2021 and 2022, *C. equisetifolia* was not observed as an escape. Instead, two other casuarinas were noticed, both at least locally naturalized. They are separated in the following simplified key:

- 1 – Leaf teeth > 12. Root suckers present -----
----- *Casuarina glauca*
1' – Leaf teeth < 12. Root suckers absent ----- 2
2 – Leaf teeth light brown to gray with a brown transverse band about halfway between the tip of the tooth and its base ----- *C. cunninghamiana*
2' – Leaf teeth light green to light yellow without any transverse banding ----- *C. equisetifolia*

Casuarina cunninghamiana is definitely naturalized in the semi-dried out riverbed of the Ribeira dos Socorridos, in Câmara de Lobos. It is present there with 100's of individuals, ranging in size from saplings to mature, fruit-bearing individuals. MUER *et al.* (2020) reported this species from Caniço (Santa Cruz). In similar circumstances, it was also seen, at least in two localities, in Machico.

Casuarina glauca is apparently rarer but, as a result of sucker-formation, escaped individuals can build relatively large stands as observed in Caniçal. Identical behavior was recently also reported from a locality in Gran Canaria (VERLOOVE, 2017).



Fig. 8 – *Casuarina glauca*, Caniçal, rough ground near the sea, September 2021, *F. Verloove*.

Convolvulaceae

Calystegia silvatica (Kit.) Griseb., *Spic. Fl. Rumel.*, **2**: 74 (1844). (Fig. 9).

Herbarium: Santa Cruz, Santo António da Serra, center of the village, rough ground, very common in this area, 17 Sept. 2021, F. Verloove 14140 (BR).

This native of southern Europe is much reminiscent of *C. sepium* (L.) R. Brown, only the latter being known from the island of Madeira (it is naturalized since at least the 19th century according to LOWE, 1872). Both are relatively easy to distinguish: in *C. silvatica* the margins of the bracts are overlapping at least half their length and bracts are distinctly inflated (saccate) at base, whereas in *C. sepium* the margins of the bracts do not or scarcely overlap (or only at the base) and bracts are flat (not or scarcely saccate). However, in areas where both species grow in close proximity, hybrids are very easily produced (*C. x lucana* (Tenore) G. Don), thus seriously blurring the boundaries between the two.

In September 2021, all flowering individuals of *Calystegia* R. Brown observed in Madeira clearly belonged to *C. silvatica*. Large naturalized populations were seen in the wide area of Santo António da Serra (see above). In addition, it was also observed in Monte, near to the Quinta “Jardins do Imperador”.

As a genus, *Calystegia* seems to have become rather common in Madeira (while it was still considered to be very rare, only a few decades ago; PRESS & SHORT, 1994). It will be worth checking whether indeed two species are still present on the island.



Fig. 9 – *Calystegia silvatica*, Santo António da Serra, rough ground, September 2021, F. Verloove.

Convolvulus farinosus L., *Mant. Pl.*, **2**: 203 (1771). (Fig. 10).

Herbarium: Ribeira Brava, Serra de Água, Ribeira da Serra de Água, track alongside riverlet, on the verge of sugarcane field, commonly naturalized, 14 Sept. 2021, F. Verloove 14154 (BR).

This East and South African weed somehow resembles *C. arvensis* L. but it is readily recognized by the triangular-ovate, shortly pubescent to farinose, very acute leaves and small, deeply lobed white corollas (WOOD *et al.*, 2015). In Macaronesia, it is known, according to ACEBES GINOVÉS *et al.* (2010), from the Canary Islands (Tenerife) where it is locally naturalized since several decades and from the Azores (São Miguel) where it is casual (SILVA *et al.*, 2010). VERLOOVE *et al.* (2019) presented an overview of its actual distribution in Europe.

In September 2021, it was recorded on several occasions and in widely scattered localities in Madeira, suggesting that – although still rare – it has recently naturalized on a relatively wide scale. In addition to the locality mentioned above, it was also observed in Boaventura (São Vicente), near Ribeira dos Moinhos, in Funchal (semi-dried out riverbed of Ribeira de Santa Luzia) and in Porto da Cruz, near Ribeira do Juncal. In all these localities, it looks quite well established. Even in its native area, this weed is hard to control (BROMILOW, 1995).



Fig. 10 – *Convolvulus farinosus*, Funchal, dried out riverbed September 2021, F. Verloove.

Crassulaceae

Kalanchoe xhoughtonii D. B. Ward, *Cact. Succ. J.* (Los Angeles), **78**: 94 (2006). (Fig. 11).

This hybrid doubtlessly has been overlooked so far in the island of Madeira. It is very reminiscent of *Kalanchoe daigremontiana* Raym.-Hamet & H. Perrier, one of its parent species, but distinguished by its narrowly deltoid leaves with cuneate to subpeltate bases (vs. broadly deltoid leaves with distinctly peltate leaf bases). SHTEIN *et al.* (2021) recently pointed out that it in fact includes several morphotypes, some artificial, others arisen naturally where both parent species occur sympatrically.

It was only recently described (WARD, 2006) but appears to be very widely dispersed, in cultivation as well as in the wild. Although exclusively reproducing clonally, it is very prolific and often regarded as a nuisance (WARD, 2008; WANG *et al.*, 2016; Herrando-Moraira *et al.*, 2020).

In September 2021 and April 2022, *Kalanchoe xhoughtonii* was observed on several occasions in the island of Madeira, for instance in São Vicente (on top of an old wall), Assomada – Caniço (by track), Câmara de Lobos (common on stone walls of Forno da Cal), Caniço de Baixo (sea cliffs), etc.



Fig. 11 – *Kalanchoe xhoughtonii*, Garajau, coastal cliff, April 2022, F. Verloove.

Euphorbiaceae

Euphorbia maculata L., *Sp. Pl.*, 1: 455 (1753). (Fig. 12).

Herbarium: Machico, Rua Infante Dom Henrique 23, sidewalk, foot of wall, 11 Sept. 2021, F. Verloove 14187 (BR); Santa Cruz, Santo António da Serra, center of the village, near the church, between cobblestones, frequent, 16 Sept. 2021, F. Verloove 14130 (BR).

Euphorbia maculata has become a widespread weed in temperate regions across the world. It is presumably native to eastern and central North America. In Macaronesia, it is commonly naturalized in the Canary Islands (as *Chamaesyce maculata*, ACEBES GINOVÉS *et al.* (2010) in Tenerife, Gran Canaria and, as *Euphorbia maculata* (OTTO & VERLOOVE, 2016), in La Palma). In the Azores, it occurs in all islands except Corvo (SILVA *et al.*, 2010; MENEZES DE SEQUEIRA *et al.*, 2012). Surprisingly, it had not been reported yet from the island of Madeira where it was noticed on several occasions, often in abundance. In addition to the localities mentioned above, it was also recorded between cobblestones in Funchal, at the Quinta “Jardins do Imperador” (at Casa Darlington).

This species superficially looks like the widespread weed *E. prostrata* but is distinguished by capsules with evenly distributed hairs (vs. hairy along keels only). Its leaves adaxially usually have an irregular reddish streak along midvein.



Fig. 12 – *Euphorbia maculata*, Santo António da Serra, between cobblestones, September 2021, F. Verloove.

Euphorbia serpens Kunth in F. W. H. von Humboldt, A. J. A. Bonpland & C. S. Kunth, *Nov. Gen. Sp.*, **2**: 52 (1817). (Fig. 13).

Herbarium: Câmara de Lobos, Passeio Marítimo, at the sea, cracks in concrete, scattered, 12 Sept. 2021, F. Verloove 14144 (BR); Ponta do Sol, Lugar de Baixo, abandoned harbour, on sand, several dozens, 21 Sept. 2021, F. Verloove 14220 (BR).

Euphorbia serpens is one of the most widespread species of the genus in the New World. It is weedy and has been introduced to and became widely distributed in the Old World. In Macaronesia, it is commonly naturalized in the Canary Islands (all islands) and as casual, in Santa Maria, in the Azores (SILVA *et al.*, 2010). Surprisingly, it had not yet been reported from Madeira where it was noticed on several occasions in September 2021 and April 2022, often in abundance. In addition to the localities mentioned above, it was also observed in São Vicente (ER 211, close to the sea), Funchal (Ponta da Cruz: Passeio Público Marítimo), Ponta do Sol (Madalena do Mar, rough ground near the sea), Ponta de São Lourenço (Quinta do Lorde) and Santa Cruz (common along the VR-1 motorway, at the airport).

This species is easily recognized by its glabrous branches that are rooting at the nodes, its connate, deltate stipules, orbicular leaves with entire margins, glabrous capsules and smooth seeds.

The species of *Euphorbia* subgenus *Chamaesyce* section *Anisophyllum* currently known from the island of Madeira are distinguished in the key below (newly reported species in bold):

- 1 – Capsules and stem hairy ----- 2
 1' – Capsules glabrous. Stem glabrous or hairy ----- 3
 2 – Capsules with all hairs appressed, uniformly distributed. Leaves usually with a central purplish spot -----
 ----- ***Euphorbia maculata***
 2' – Capsules with all hairs patent, hairy on angles only. Leaves not spotted ----- *E. prostrata*
 3 – Stem erect. Cyathia in clusters. Largest leaves > 15 mm long, much longer than wide ----- 4
 3' – Stem procumbent, rooting at the nodes. Cyathia solitary in leaf-axils. Leaves much smaller, nearly orbicular -
 ----- ***E. serpens***
 4 – Plant hairy (at least in upper part and young leaves). Capsule often > 1.9 mm long ----- *E. nutans*
 4' – Plant glabrous. Capsule always < 1.9 mm long -----
 ----- *E. hypericifolia*



Fig. 13 – *Euphorbia serpens*, São Vicente, gravelly area near the sea, September 2021, F. Verloove.

Myrtaceae

Metrosideros excelsa Sol. ex Gaertn., *Fruct. Sem. Pl.*, **1**: 172 (1788). (Fig. 14).

Herbarium: Ponta de São Lourenço, Quinta do Lorde, dried out riverbed (also seen as epiphyte on *Phoenix* trunks), scattered individuals, 22 Apr. 2022, F. Verloove 14256 (BR).



Fig. 14 – *Metrosideros excelsa*, Faial, rocky slope near the sea, April 2022, F. Verloove.

This ornamental shrub is native to New Zealand. It is much grown in the island of Madeira but was apparently not yet recorded in the wild (it was not mentioned by VIEIRA, 2002; JARDIM & SEQUEIRA, 2008 or MENEZES DE SEQUEIRA *et al.*, 2012). Spontaneous, escaped individuals were observed in April 2022. In Ponta de São Lourenço, it was observed in a dried out riverbed and as epiphyte on *Phoenix* trunks. Probably more disturbing is its presence on natural rocks at the coast in Faial. There, the species penetrates natural vegetation and could become a troublesome environmental weed, like in *e.g.* South Africa. It is also considered to be invasive in the Azores where it is present in the islands of Corvo, Flores, Faial, Pico, Graciosa and São Miguel (SILVA *et al.*, 2010).

Onagraceae

Epilobium ciliatum Raf., *Med. Repos.*, **2** (5): 361 (1808).

Herbarium: Santana, Faial, river south of bridge ER 101, sandy riverbank, near quarry, common, 15 Sept. 2021, *F. Verloove* 14156 (BR); Funchal, Estrada da Fundoa, gravelly dried-out riverbed, common, 22 Sept. 2021, *F. Verloove* 14196 (BR); Funchal, Ribeira de João Gomes N of VR1-motorway, riverside, 20 Apr. 2022, *F. Verloove* 14277 (BR); São Vicente, Boaventura, Ribeira dos Moinhos S of bridge VE-1 road, riverside and adjacent rough ground, common, 30 Apr. 2022, *F. Verloove* 14272 (BR); São Jorge, Fajã da Corsa, Ribeira de São Jorge, banana plantation, arable land along river, etc., a common weed, 30 Apr. 2022, *F. Verloove* 14281 (BR).

This American invasive weed was observed on several occasions in September 2021 and April 2022. In addition to the specimens cited above, it was also observed near Porto da Cruz and São Jorge, often in large numbers, suggesting that it is a recent, fast-spreading introduction or a long-overlooked species. Although superficially similar to congeneric species, already known from Madeira, it is quite characteristic in having a glandular hairy inflorescence, seeds with a distinctly striate pattern and a conspicuous appendage (see illustrations in KRAJSEK STRGULC & JOGAN, 2004).

Epilobium ciliatum itself is also quite variable and sometimes considered to represent a complex of morphologically similar species, rather than a single species, especially by Scandinavian and Russian authors (*e.g.* BYALT *et al.*, 2020). Contemporary North American

authors, however, tend to accept only a single species with two subspecies: subsp. *ciliatum* and subsp. *watsonii* (Barbey) Hoch & P. H. Raven (WAGNER *et al.*, 2007). The plants from the island of Madeira belong to subsp. *ciliatum*.

This species has become the most widespread and abundant species of *Epilobium* worldwide and is often considered to be an undesirable weed. As an alien species, it often grows in secondary habitats along roads and in settlements. However, it is also found, like in Madeira, in more natural, swampy habitats like along river shores and banks and in wet meadows.

Oenothera glazioviana Micheli in C. F. P. von Martius & auct. suc. (eds.), *Fl. Bras.*, **13** (2): 178 (1875). (Fig. 15).

Oenothera L. section *Oenothera* subsection *Oenothera* is a very complex assemblage that, depending on the authority, accommodates 14 (WAGNER *et al.*, 2007) or more than 100 species (ROSTAŃSKI *et al.*, 2010). In Madeira, it is only represented by a single species, *O. biennis* L. (VIEIRA, 2002; JARDIM & SEQUEIRA, 2008; MENEZES DE SEQUEIRA *et al.*, 2012). According to PRESS & SHORT (1994), however, records of *O. biennis* require confirmation.



Fig. 15 – *Oenothera glazioviana*, Porto da Cruz, roadside, September 2021, *F. Verloove*.

In September 2021 only a single species from this subsection was observed, *O. glazioviana*. It is easily distinguished from *O. biennis* by its much larger petals (30–55 mm long), its red-striped sepals, its stem with hairs with distinct red bulbous base and its stigma that is usually distinctly elevated above the anthers at anthesis.

O. glazioviana is relatively widespread throughout the island. It either is a fast-spreading recent introduction or it has been confused so far with *O. biennis*. It was observed for instance in Porto da Cruz (Referta), Santana (Ribeira do Faial) and São Jorge, often in abundance (river banks, roadsides, fallow fields, etc.).

Oxalidaceae

Oxalis dillenii Jacq., *Oxalis*, **28** (1794).

Herbarium: Câmara de Lobos, Ribeira dos Socorridos, dried-out gravelly riverbed, 12 Sept. 2021, F. Verloove 14145 (BR).

This weed is native to North America but widely naturalized in many parts of Europe. It is very reminiscent of *O. corniculata* L. and, as a result, often overlooked. It differs from the latter in having stems that are not rooting at nodes, a typical strigillose vestiture (hairs straight and antrorsely appressed), stipules lack apical auricles and its seeds have transverse ridges with more conspicuous grayish or white lines.

In September 2021, it was observed in relative abundance in the semi-dried out riverbed of Ribeira dos Socorridos, a typical habitat for this species, in Câmara de Lobos. It should be looked for, in similar habitats, elsewhere in Madeira. It has apparently not been recorded before in Macaronesia (SÁNCHEZ-PINTO *et al.*, 2005; ACEBES GINOVÉS *et al.*, 2010; SILVA *et al.*, 2010).

Phytolaccaceae

Phytolacca icosandra L., *Syst. Nat.*, ed. 10, **2**: 1040 (1759). (Fig. 16).

Herbarium: Santa Cruz, Ribeira de Santa Cruz, riverside, in several small populations, 22 Apr. 2022, F. Verloove 14257 (BR).

Phytolacca icosandra has its native range from Mexico to Venezuela and Bolivia, and the Caribbean. It

is sometimes used as a medicine and for food. It is very reminiscent of the widespread *P. octandra* L. and both are sometimes considered to be conspecific (e.g. RZEDOWSKI & CALDERÓN DE RZEDOWSKI, 2000). Yet, both species are genetically distinct (XIE *et al.*, 2017). The inflorescences that are longer than the subtending leaves and the stamens in two whorls, ca. 20 in number, distinguish it from *P. octandra* (NOWICKE, 1968; NIENABER & THIERET, 2003). Its completely united carpels (incl. apices), perfect flowers, very long and slender, spike-like inflorescences with sessile or very shortly pedicelled flowers distinguish it from e.g. *P. americana* L., a similar species already known from the island of Madeira (JARDIM & SEQUEIRA, 2008).

In April 2022, *P. icosandra* was discovered in several places in the valley of Ribeira de Santa Cruz, in Santa Cruz. It mainly grows on the margin of the stream but was also observed as a roadside weed and in an adjacent orchard. Although in small numbers, given the relatively wider distribution in this valley, the species is believed to be naturalized there.

Outside of its native distribution range, *P. icosandra* has been recorded in e.g. the U.S.A. and Taiwan (NIENABER & THIERET, 2003.; HSIEH *et al.*, 2012) although many records of *P. octandra* may (at least in part) also refer to this species. It was recently recorded for the first time in Europe, in the Balearic Islands (SÁEZ *et al.*, 2016).



Fig. 16 – *Phytolacca icosandra*, Santa Cruz, streamside, April 2022, F. Verloove.

Polygonaceae

Rumex palustris Sm., *Fl. Brit.*, **1**: 394 (1800). (Fig. 17).

Herbarium: Machico, Ribeira de Machico, close to the sea, semi-dried out gravelly riverbed, well established but only locally, 11 Sept. 2021, *F. Verloove* 14155 (BR).

Rumex palustris is native to most of Europe and western Asia and occasionally naturalized elsewhere in the world. It was recently reported for the first time from Macaronesia: it is found – in abundance and apparently well established – in a few places in dried-out water reservoirs in southern Tenerife (VERLOOVE, 2017).

In September 2021, numerous individuals were observed on an exposed stream bank in Machico, close to the beach.

This species is easily distinguished from its congeners in Madeira by its fruiting valves (all bearing a tubercle) with at each side subulate-filiform teeth that are usually as long as the width of the valve and its narrow, lanceolate leaves.



Fig. 17 – *Rumex palustris*, Machico, semi-dried out riverbed, September 2021, *F. Verloove*.

Rosaceae

Cotoneaster pannosus Franch., *Pl. Delavay.*, 223 (1890). (Fig. 18).

Herbarium: Machico, Matur, abandoned holiday complex, grass- and shrubland, a frequent, naturalized escape in this area, 1 May 2022, *F. Verloove* 14306 (BR).

This shrub is native to south central China but it has been introduced as an ornamental to other areas of the world, including southern Africa, the Mediterranean area and Australia. It is dispersed by berry-eating birds and easily becomes naturalized wherever planted. In some areas it has become a troublesome noxious weed, for example in parts of Australia, California and Hawaii.

In the locality known as Matur (Machico), this species was formerly planted at the (now abandoned) Atlantis holiday complex. It is reproducing from seed in the surrounding grass- and shrubland, along with, among others, *Lantana spec.* It looks perfectly established.

Verbenaceae

Verbena incompta P. W. Michael, *Telopea*, **6**: 181 (1995). (Fig. 19).

Herbarium: Machico, Ribeira de Machico, gravelly dried-out riverbed, rather frequent, 11 Sept. 2021, *F. Verloove* 14142 (BR).

This is a poorly known but invasive weed. Although described from Australia (MICHAEL, 1995), it certainly is native to South America, like the other members of this group, viz *V. bonariensis* L., *V. brasiliensis* Vell. and *V. litoralis* Kunth. In the island of Madeira, it is quite widespread and doubtlessly corresponds – at least for the most part – with what has been called *V. bonariensis* up to the present (compare with PRESS & SHORT, 1994; VIEIRA, 2002). In fact, *V. incompta* rather looks like *V. brasiliensis* in general appearance, except for the sessile, almost clasping leaf bases. For that reason, YEO (1990) considered this species to be an individual variation of the latter, without formally describing it. True *V. bonariensis* is, outside its native distribution range, an ornamental rather than a weed, with much more conspicuous corollas (longer and with a wider limb) and a more congested, capitate inflorescence. In addition, in *V. incompta* stems, peduncles and calyces



Fig. 18 – *Cotoneaster pannosus*, Machico, grass- and shrubland, a) shows an inflorescence and b) an infructescence, May 2022, F. Verloove.

are eglandular, spikes much longer (up to 55 mm in fruit), floral bracts longer (3-4 mm) and nutlets smaller (1-1.2 (-1.4) mm) (NESOM, 2010).

It should be noted that, not all contemporary authors accept the species status of *V. incompta*. According to MUNIR (2002) and O'LEARY *et al.* (2007), it is conspecific with *V. bonariensis*, because of a different interpretation of the Linnaean type of the latter species. In fact, var. *conglomerata* Briq. of the latter, as accepted by these authors, corresponds with Linnaeus' concept of *V. bonariensis*.

Although only relatively recently described, *V. incompta* has been reported from rather numerous countries in the past two decades. It is weedy and invasive in seasonally wet places, creek and river sides, mesic disturbed woods, fields, clearing, swales, ditches, borrow pits and disturbed sites and has been known from North and Central America, Europe (naturalized in Italy and Spain, casual elsewhere), Asia, Africa, Pacific Islands (Fiji, New Zealand, Norfolk Island, Papua New Guinea) and Australia (MICHAEL, 1995; NESOM, 2010; VERLOOVE, 2011).

In September 2021, *V. incompta* was observed on numerous occasions and in widely scattered localities throughout the island. In addition to the documented herbarium record mentioned above, it was also noticed in Funchal (Vitória, São Gonçalo), Machico (Fajã dos Rolos, Lameirão), Porto da Cruz, Ribeira Brava, Serra de Água, Câmara de Lobos, Faial, Caniço, Santo António da Serra, Caniçal (Rochinha), Vargem (São Vicente) and Madalena do Mar). Interestingly, although already known from the Funchal area more than a century ago (MENEZES, 1914, sub *V. bonariensis*), this species long remained quite localized.

According to PRESS & SHORT (1994), it only occurred in two discrete areas: the Funchal area and the area between Prazeres and Calheta in the southwest of the island. VIEIRA (2002), provided a similar distribution pattern. Barely twenty years later, it has become quite widespread almost throughout the island. It is often seen in relatively remote areas and is fast spreading; it can be considered as an invasive species in the sense of RICHARDSON *et al.* (2000).



Fig. 19 – *Verbena incompta*, Machico, gravelly dried-out riverbed, September 2021, F. Verloove.

Verbena littoralis Kunth in F. W. H. von Humboldt, A. J. A. Bonpland & C. S. Kunth, *Nov. Gen. Sp.*, **2**: 276 (1818). (Fig. 20).

Herbarium: Funchal, 6 Aug. 1996, J. G. Quinn s.n. (MADM 4771; sub *V. officinalis*); Machico, Ribeira de Machico, semi-dried out riverbed, scattered individuals, 11 Sept. 2021, F. Verloove 14227 (BR); Câmara de Lobos, Praia de Vigário, riverlet, near the beach, 4 individuals, 19 Apr. 2022, F. Verloove 14252 (BR); Funchal, Ribeira de João Gomes N of VR1-motorway, riverside, four individuals, 20 Apr. 2022, F. Verloove 14263 (BR); Machico, Ribeira de Machico, gravelly riverside, few plants, 22 Apr. 2022, F. Verloove 14264 (BR, MADM); Ribeira Brava, Meia Légua, arable land along river, a single tall individual, 30 Apr. 2022, F. Verloove 14273 (BR).

Like the preceding species, *Verbena littoralis* is a native of South America. Both belong to serie *Pachystachyae* (O'LEARY *et al.*, 2007). Its leaves are basally attenuate to short-petiolate, a character shared with *V. brasiliensis* Vell. Compared with the latter it has an open and loosely paniculate inflorescence with narrower and longer fruiting spikes (2-3 mm wide and up to 150 mm long), with fruits usually becoming remote at maturity, at least in the proximal portion (NESOM, 2010). In fact, in general appearance (and even more so in the absence of lower leaves), this species can resemble *V. officinalis* L. a lot and these species have often been confused in herbaria (MUNIR, 2002). The latter is distinguished by variously incised lower leaves and densely glandular inflorescence branches (at least in var. *officinalis*). Its stems are also less sharply quadrangular.

Interestingly, MENEZES (1914) already reported a "*V. littoralis* var. *pyncnostachya*" from the Funchal area. This is an invalid name but indeed refers to the species here concerned, *V. littoralis* s. str. (O'LEARY *et al.*, 2007; NESOM, 2010). However, according to PRESS & SHORT (1994), these findings were erroneous and referable to *V. bonariensis* L., which is rather unlikely since Menezes l.c. also mentioned the latter from Madeira. Unfortunately, in the absence of herbarium vouchers, it is impossible to assess the identity of these plants.

In September 2021, a small population of *V. littoralis* was found in the semi-dried out river bed of Ribeira de Machico, in Machico. In addition, in April 2022, the species was found in several additional localities (Câmara de Lobos, Funchal, Ribeira Brava), although always in small numbers. Moreover, in MADM a further specimen was detected, collected in 1996, in Funchal, but erroneously ascribed to *V. officinalis*.

Verbena littoralis is obviously naturalized in the island of Madeira but apparently rare. All records are from dried-out riverbeds. As a weed, it is likely to occur elsewhere in Madeira where it may have passed unnoticed so far. To our knowledge, this species has not been reported before from Macaronesia (SANCHEZ-PINTO *et al.*, 2005; ACEBES GINOVÉS *et al.*, 2010; SILVA *et al.*, 2010), nor from Europe. Outside South America, it has naturalized in the West Indies, South Africa, Indian Ocean Islands (Reunion, Mauritius), Pacific Islands and Australia (MUNIR, 2002; NESOM, 2010). It is often considered to be a weed or invasive species.



Fig. 20 – *Verbena littoralis*, Machico, semi-dried out riverbed, September 2021, F. Verloove.

Zingiberaceae

Hedychium coronarium J. Koenig in A. J. Retzius, *Observ. Bot.*, **3**: 73 (1783). (Fig. 21).

This showy species is probably native to the Himalayas but it has been widely cultivated in warm-temperate and subtropical regions around the world. It differs from *Hedychium gardnerianum* Sheppard ex Ker-Gawl., a very noxious invader in the island of Madeira, by its white flowers and broad and overlapping bracts that hide the main axis.

In September 2021, a well-established population of *H. coronarium* was observed in São Jorge (Santana), on a steep damp slope alongside the ER101 road, next to the Ribeira de São Jorge. These plants were already discernible on Google Streetview images from 2009. In similar circumstances, a few plants were noticed on the steep rocks bordering the Ribeira Brava river, close to the Repsol petrol station, in April 2022.

In Macaronesia, this species was already known from the Azores (islands of Flores and São Miguel) where it is considered to be invasive (SILVA *et al.*, 2010; MENEZES DE SEQUEIRA *et al.*, 2012) and it was recently first found in La Palma, in the Canary Islands (OTTO & VERLOOVE, 2016).

This species is readily escaping wherever introduced and often found to be invasive, for instance in Brazil (COSTA *et al.*, 2019), but also in Hawaii, South Africa and New Caledonia.



Fig. 21 – *Hedychium coronarium*, São Jorge, damp roadside slope, September 2021, F. Verloove.

- 1 – Naturalized and invasive taxa:
 - b) Other previously recorded taxa:

Asteraceae

Youngia japonica (L.) DC., *Prodr.*, **7** (1): 194 (1838).

Herbarium: Funchal, near crossing of Rua da Praia Formosa and Estrada Monumental, border of lawn, 12 Sept. 2021, F. Verloove 14136 (BR); Funchal, Estrada de São João, lawn, several dozens, 12 Sept. 2021, F. Verloove 14175 (BR); Funchal, Rua do Gorgulho, foot of wall, a common weed, 19 Apr. 2022, F. Verloove 14251 (BR).

This weed is a native of temperate and tropical East Asia. It now has become a nearly pantropical and invasive species (*e.g.* NAKAMURA *et al.*, 2013) that is probably dispersed through the horticultural trade. It is remarkably often observed as a weed in turf lawns and in ornamental plantings. It is a very diminutive species with tiny corollas, which are only open for a few hours a day and thus easily overlooked.

During the preparation of this manuscript, JARDIM & MENEZES DE SEQUEIRA (2021) also published some records from the island of Madeira, all from the area of Funchal. In September 2021 and April 2022, it was observed on numerous occasions, often in abundance; it is clearly naturalized and surely has been present for quite some time. In addition to Funchal, it was also recorded in Calheta, Câmara de Lobos, Faial, São Jorge, Porto Moniz, Ponta do Sol, Ribeira Brava and Santa Cruz. It was mostly seen as a lawn weed but also in ornamental plantations, on sidewalks or at the foot of walls. In 2018, it was already observed at the Reis Magos beach in Caniço (*observation.org*).

In Macaronesia, it was recently reported, in identical circumstances, for the first time in the Canary Islands, from Gran Canaria, La Palma and Tenerife (SIVERIO NÚÑEZ *et al.*, 2013; VERLOOVE, 2017; OTTO & VERLOOVE, 2018).

Brassicaceae

Diplotaxis tenuifolia DC., *Syst. Nat.*, **2**: 632-633 (1821).

Herbarium: Santa Cruz, Caniço (Caniço de Baixo), at Hotel Riu Palace, gravelly riverbed close to the sea, 15 Sept. 2021, F. Verloove 14131 (BR); Funchal, Rua do Gorgulho, at

Hotel Allegro Madeira, 26 Apr. 2022, F. Verloove s.n.; dupl. MADM 7133.

This common weed is native in the southern half of Europe, West Asia and North Africa but very widely introduced and naturalized elsewhere in the world. Yet, until recently, it had not been reported from Macaronesia (SÁNCHEZ-PINTO *et al.*, 2005; SILVA *et al.*, 2010). Since about ten years it has been known from the Canary Islands (Gran Canaria, La Palma and Tenerife: VERLOOVE, 2013; VERLOOVE, 2017, OTTO & VERLOOVE, 2020). In 2013, it was collected for the first time in the island of Porto Santo and reported by JARDIM & MENEZES DE SEQUEIRA (2014). During the preparation of this manuscript, JARDIM & MENEZES DE SEQUEIRA (2021) published a collection made in Funchal, in 2017.

In September 2021, its presence was also detected in several localities in Caniço (Madeira). In addition to the locality mentioned above, it was also observed in Rua do Miradouro da Falésia, Rua D. Francisco Santana (as a common garden weed) and Estrada do Cristo Rei (a few dozen along the road). In April 2022, several additional specimens were observed, all in the Funchal area (Rua dos Ilhéus, Levada dos Piornais, São Pedro, Gorgulho). This species will likely further naturalize in the southern coastal areas of Madeira.

Euphorbiaceae

Euphorbia hypericifolia L., *Sp. Pl.*, **2**: 454 (1753). (Fig. 22).

(incl. *E. glomerifera* (Millsp.) L. C. Wheeler).

Herbarium: Funchal, Passeio Público Marítimo, 23 June 2021, J. Silva 7131 (MADM); Funchal, below Casino, roadside, foot of rocks, ca. 50 individuals, 18 Sept. 2021, F. Verloove 14163 (BR); Funchal, Ponta da Cruz, Passeio Público Marítimo, by track, frequent, 20 Sept. 2021, F. Verloove 14197 (BR); Ribeira Brava, VE-3 road leaving the village, next to the river, roadside, ca. 30 individuals, 25 Apr. 2022, F. Verloove 14259 (BR).

Euphorbia hypericifolia is a weed native to the southernmost parts of the U.S.A., Mexico, the West Indies, Central America and South America. It is widely naturalized elsewhere in warm-temperate and subtropical regions of the world. In Macaronesia, it has been known from the Canary Islands (as *Chamaesyce hypericifolia*, PADRÓN *et al.* (2007) from El Hierro, Tenerife, Gran Canaria

and Fuerteventura and (as *Euphorbia hypericifolia*, OTTO & VERLOOVE (2016)) from La Palma, where it is naturalized. It is also known from Cape Verde Islands (ARECHAULETA *et al.*, 2005, as *E. glomerifera*).

In the island of Madeira, it was repeatedly observed in the area of Funchal, in September 2021, especially in Ponta da Cruz, where it is relatively common. During the preparation of this manuscript, JARDIM & MENEZES DE SEQUEIRA (2021) published, as *Chamaesyce hypericifolia*, a record from the same area.

In April 2022, a second area of local naturalization was detected in Ribeira Brava.

This species is very reminiscent of *E. hyssopifolia* L. (reported from Cape Verde Islands) and *E. nutans* Lag. (previously reported from Madeira where it has been known, at least, since the 19th century according to VIEIRA, 2002). All are robust, erect (often arched at tips) and weedy annuals. *E. hypericifolia* is completely glabrous and cyathia are in dense, axillary and terminal, capitate glomerules with reduced, bract-like leaves subtending cyathia. It has rather large stipules, 1.5-2.2 mm long. The other two species are sparsely to densely hairy, at least proximally, and have shorter stipules. *E. nutans* has relatively large capsules (1.6-2.3 x 1.5-2.4 mm) as compared with *E. hyssopifolia* (1.5-1.6 x 1.7-1.8 mm).

It is unknown if *E. nutans* is still present on the island of Madeira and one might even wonder whether the species has not been confused with *E. hypericifolia*. However, *E. nutans* has also been reliably documented from Madeira. In BR and MADM, the following collections are instead of.



Fig. 22 – *Euphorbia hypericifolia*, Funchal, roadside, September 2021, F. Verloove.

Ribero Seco, Ribero S. Juan, in cultis, 08.1866, *G. Mandon* (Pl. Maderenses, 1865-1866, no. 222) (BR 0000030162099); Funchal, ad vias, 07.1900, *J. Bornmüller* (Plantae exsiccatae Maderenses, no. 1220) (BR 0000030162105); Funchal, in Park Sta. Catarina, Unkraut in Blumenbeeten, 5-10 m, 13 Oct. 1978, *C. Simon* 78-7 (MADM 6381).

Iridaceae

Sisyrinchium micranthum Cav., *Diss.*, **6**: 345 (1788). (Fig. 23).

(incl.: *Sisyrinchium rosulatum* E. P. Bicknell).

Herbarium: Funchal, Pico de São Martinho, rotunda GAG2, lawn, common but overlooked weed, 19 Apr. 2022, *F. Verloove* 14337 (BR); Machico, park area next to the river, lawn, a very common weed in lawns, 22 Apr. 2022, *F. Verloove* 14274 (BR); São Jorge, Arco de São Jorge, near viewpoint, between cobble stones, 30 Apr. 2022, *F. Verloove* 14404 (BR).

Sisyrinchium rosulatum is a North American weedy species. It is widely introduced and naturalized beyond its natural distribution range, often as a lawn weed. It is known from various European countries (France, Italy, Spain, etc.; PARENT, 1977; VERLOOVE & GULLÓN, 2012; NICOLELLA & ARDENGHI, 2013) but has apparently not yet been recorded in Macaronesia (SÁNCHEZ-PINTO *et al.*, 2005; JARDIM & SEQUEIRA, 2008; ACEBES GINOVÉS *et al.*, 2010; SILVA *et al.*, 2010). In Madeira it was probably first documented in 2008, from the area between Machico and Porto da Cruz and in 2015, it was also observed in Porto Moniz (<https://observation.org/>). Back then and in both localities, this species was found in abundance, suggesting that it was probably introduced some time ago already. In April and May 2022, it was indeed found throughout the island, often in large numbers. In addition to the municipalities mentioned above, it was also observed in Boaventura, Calheta, Faial, Fajã Alta, Porto da Cruz and Santa Cruz. It was most frequently seen in irrigated, regularly mown lawns but also in other anthropogenic habitats such as between cobblestones, in quarries, etc.

Compared with other weedy species from this genus, e.g. *S. montanum* Greene, *S. rosulatum* is annual or short-lived perennial (vs. perennial), with a paler (pink to lavender-rose with purple stripes vs. blue), rather campanulate perianth.

Sisyrinchium rosulatum belongs to a taxonomically complex group of closely related species. It is not always easily separated from the South and Central American weed *S. micranthum* Cav. (SHIN *et al.*, 2016) and sometimes even considered to be conspecific with it although *S. rosulatum* is tetraploid whereas *S. micranthum*, the species with the widest geographical distribution among *Sisyrinchium* species, is polyploid. Plant material from Madeira is not unambiguously assigned to either of these two taxa. Recent multidisciplinary studies indeed indicate that *S. rosulatum* (and *S. laxum* Otto ex Sims, another member of the complex) are in fact the same species as *S. micranthum* (CHAUVEAU *et al.*, 2011). All the variation found in DNA C value and number of 35S rDNA sites are not restricted to a species (*S. micranthum* or *S. rosulatum*), a ploidy level (tetraploid or polyploid), a morphological type or a geographical distribution (North or Central and South America) (TACUATIA *et al.*, 2016; comm. Camila Inácio; July 2022). Therefore, all records are here assigned to *S. micranthum*, the binomial that has nomenclatural priority.



Fig. 23 – *Sisyrinchium micranthum*, Funchal, lawn, April 2022, F. Verloove.

2 – Ephemeral taxa:

Comparably less information is provided for the taxa below since they are, based on recent field observations by the authors, at least at present, thought to be merely ephemerals in the island of Madeira. Several of them,

however, are classified as invasive species elsewhere in the world and might become so, in the future, in Madeira as well. From that perspective, it is important to document their first occurrence in the wild, either as weeds or as escapes from cultivation.

Aethusa cynapium L., *Sp. Pl.*, **256** (1753).

(Apiaceae).

Herbarium: Santa Cruz, Santo António da Serra, near Estr. Doutor João de Gouveia, roadside, a single individual, 17 Sept. 2021, F. Verloove 14114 (BR).

Commelina erecta L., *Sp. Pl.*, **41** (1753). (Fig. 24).

(Commelinaceae).

Herbarium: Machico (Matur), rough ground, a single clone, 12 Sept. 2021, F. Verloove 14226 (BR).

This is a noxious, almost pantropical weed that might naturalize in the near future. In the past years, it has increasingly been reported from southern Europe (see VERLOOVE & AYMERICH, 2020 and references therein). In the island of Madeira, it may have been overlooked since it is morphologically similar to *C. benghalensis* L., a naturalized weed there. Both have a basally fused spathe but *C. erecta* is separated by its white (not blue) proximal petal, its perennial (not annual) lifeform and smooth (not slightly reticulate) seeds.



Fig. 24 – *Commelina erecta*, Machico, rough ground, September 2021, F. Verloove.

Erythrina crista-galli L., *Mant. Pl.*, **1**: 99 (1767). (Fig. 25).

(Fabaceae).

Herbarium: Porto da Cruz, riverlet at Rua da Alagoa, semi-dried out riverbed, near to the sea, four subsynchronous shrubs ca. 2 m tall, 23 Sept. 2021, F. Verloove 14147 (BR).

A few flowering and fruiting individuals were observed in the absence of mature parent trees. The plants were identified using the keys in McCLINTOCK (1953) and NESOM (2015). In this particular type of habitat, *E. crista-galli* is often invasive, for instance in New South Wales, in Australia (SMITH, 1996).



Fig. 25 – *Erythrina crista-galli*, Porto da Cruz, semi-dried out riverbed, September 2021, F. Verloove.

Ficus microcarpa L.f., *Suppl. Pl.*, **442** (1782).

(Moraceae).

Observed on several occasions as an escape, germinating in the crevices of trees, rock outcrops or walls from bird droppings, often in abundance (Machico, Funchal, Câmara de Lobos). Birds are believed to be the primary dispersal vector since they continually defecate fig seeds consumed from cultivated trees. The escape of *F. microcarpa* follows the introduction of its host-specific pollinating wasp, *Eupristina verticillata* Waterston, known from Madeira since the 1990's (KOPONEN & ASKEW, 2002). A future naturalization and invasive behavior is almost inevitable (compare with RIEFNER, 2016).

Ficus rubiginosa Desf. ex Vent., *Jard. Malmaison*, **2**: t. 114 (1805).

(Moraceae).

Scattered self-sown individuals were observed in crevices of the wall bordering a ravine next to the Jardim de Santa Luzia, in Funchal.

Heptapleurum actinophyllum (Endl.) Lowry & G. M. Plunkett, *Novon*, **28**: 146 (2020). (Fig. 26).

(Syn.: *Schefflera actinophylla* (Endl.) Harms).

(Araliaceae).

A single young plant, apparently self-sown, was observed on the sea cliffs at Caniço de Baixo.



Fig. 26 – *Heptapleurum actinophyllum*, Caniço de Baixo, sea cliff, September 2021, F. Verloove.

Heptapleurum arboricola Hayata, *Icon. Pl. Formosan.*, **6**: 23 (1916).

(Syn.: *Schefflera arboricola* (Hayata) Merr.).

(Araliaceae).

A self-sown individual was observed in crevices of the wall bordering a ravine next to the Jardim de Santa Luzia, in Funchal.

Ipomoea batatas (L.) Lam., *Tabl. Encycl.*, **1**: 465 (1793). (Fig. 27).

(Convolvulaceae).

Several individuals were observed on the verge of the Ribeira do Caniço, in Reis Magos, and along the road in Calheta. A future naturalization is not unlikely, as has been the case in the Azores (SILVA *et al.*, 2010; MENEZES DE SEQUEIRA *et al.*, 2012) and Cape Verde (ARECHAULETA *et al.*, 2005).



Fig. 27 – *Ipomoea batatas*, Reis Magos, streamside, September 2021, F. Verloove.

Lippia alba (Mill.) N. E. Br. ex Britton & P. Wilson, *Bot. Porto Rico*, **6**: 141 (1925). (Fig. 28).

(Verbenaceae).

Herbarium: Machico, Ribeira de Machico, gravelly riverbed, a single shrub (self-sown), 11 Sept. 2021, F. Verloove 14118 (BR).



Fig. 28 – *Lippia alba*, Machico, gravelly riverbed, September 2021, F. Verloove.

Nerium oleander L., *Sp. Pl.*, **209** (1753).

(Apocynaceae).

Single subsynchronous individuals were observed on the verge of water courses in Funchal, Machico and Ribeira Brava.

Petunia xatkinsiana (Sweet) D. Don ex W. H. Baxter, *Paxton's Mag. Bot.*, **11**: 7 (1842). (Fig. 29).

(Solanaceae).

Scattered individuals were observed in the gravelly riverbeds of Ribeira dos Socorridos, in Câmara de Lobos and Ribeira de Santa Luzia, in Funchal.



Fig. 29 – *Petunia xatkinsiana*, Câmara de Lobos, dried out riverbed September 2021, F. Verloove.

Platanus xhispanica Mill. ex Münchh., *Hausvater*, **5**: 229 (1770).

(Platanaceae).

Scattered saplings were observed on the gravelly banks of Ribeira da Ribeira Brava.

Psilotum nudum (L.) P. Beauv., *Prodr. Aethéogam.*, **112** (1805).

(Psilotaceae).

Herbarium: Câmara de Lobos, Bairro do Espírito Santo, common weed in pots, 19 Apr. 2022, F. Verloove 14276 (BR).

In identical circumstances also observed in Funchal, near the Bom Sucesso trail (Rua Doutor António Costa).

Salvia hispanica L., *Sp. Pl.*, **25** (1753). (Fig. 30).

(Lamiaceae).

Herbarium: Ribeira Brava, beach near the lighthouse, from sewage water, ca. 20 individuals, 25 Apr. 2022, F. Verloove 14258 (BR).



Fig. 30 – *Salvia hispanica*, Ribeira Brava, beach, April 2022, F. Verloove.

3 – Miscellaneous records:

Alternanthera pubiflora (Benth.) Kunth, *Revis. Gen. Pl.*, **2**: 538 (1891). (Fig. 31).

MUER *et al.* (2020) cited *A. flavescens* Kunth from the island of Madeira, a South American species not previously

mentioned from the island. It was found in Praia Formosa in March 2016 (comm. T. MUEER, 08.2021). JARDIM & MENEZES DE SEQUEIRA (2021) reported *A. pubiflora* from the very same area, a species with main distribution in Central America and western South America. A few years ago, the same species was already detected on Porto Santo as well (JARDIM & MENEZES DE SEQUEIRA, 2015). Both belong to the *A. brasiliensis* complex and are morphological similar: procumbent, shrub-like plants with distinctly pedunculate flower heads. They are best separated on flower characters: in *A. flavescens* flowers are pedicellate with pedicels (0,2-) 0,3-0,5 mm long, whereas in *A. pubiflora* flowers are sessile or with very short pedicels up to 0,1 mm long (SOUSA, 2015).

The plants found in Praia Formosa have sessile flowers and indeed belong to *A. pubiflora*, not to *A. flavescens*.

Herbarium: Funchal, Praia Formosa, coastal path towards Câmara de Lobos, on rocks, small population, 12 Sept. 2021, F. Verloove 14194 (BR).



Fig. 31 – *Alternanthera pubiflora*, Praia Formosa, on rocks at the beach, September 2021, F. Verloove.

Oenothera rosea L'Hér. ex Aiton, *Hort. Kew.*, **2**: 3 (1789).

This American weed was recently reported for the first time from the island of Madeira (GONÇALVES SILVA & FERREIRA, 2019). It was mentioned from Porto da Cruz, São Vicente and Santana. In September 2021 and April 2022, it was observed in additional localities: Faial, Santo António da Serra, Lugar de Baixo (Ponta do Sol), São Jorge, Machico, Campanário (Ribeira Brava) and Funchal. It is obviously well-established and spreading.

Solanum chenopodioides Lam., *Tabl. Encycl.*, **2**: 18 (1794).

According to PRESS & SHORT (1994) this South American weed had been reported from Funchal without further data, suggesting that little was known about its current status and distribution. VIEIRA (2002), also considered it to be very rare and MENEZES DE SEQUEIRA *et al.* (2012) no longer reported it from Madeira.

Yet, *S. chenopodioides* is, in fact, not rare at all but probably widely overlooked. In September 2021 and April 2022, it was observed in Machico, Referta, Porto da Cruz (Ribeira do Juncal, Praia da Maiata, etc.), Faial, Caniço (Reis Magos), Santo António da Serra, São Vicente (Barros, Ribeira Grande), Monte and Funchal (São Gonçalo, São Roque, Palheiro Ferreiro). It is often seen in large numbers and in various kinds of habitats, including natural ones (e.g. rock crevices). In fact, it is commonly naturalized and locally even invasive.

In a recent monograph of Old World black nightshades, SÄRKINEN *et al.* (2018) also confirmed its presence in Madeira, citing a specimen preserved in BM that was collected between Funchal and Monte, in 1984.

Herbarium: Machico, Ribeira de Machico, gravelly riverbed, common, 11 Sept. 2021, F. Verloove 14121 (BR).

Tipuana tipu (Benth.) Kuntze, *Revis. Gen. Pl.*, **3** (2): 72 (1898).

This South American ornamental tree was known to occasionally escape near gardens in Madeira (VIEIRA, 2002). Locally, however, it seems to be in the process of an incipient naturalization, for instance in Câmara de Lobos where adult subspontaneous trees are currently found along Ribeira dos Socorridos, along with *Casuarina cunninghamiana* Miq., *Melia azedarach* L., *Schinus terebinthifolia* Raddi and *Washingtonia robusta* H. Wendl.

It is locally naturalized in Cape Verde (ARECHAVALETA *et al.*, 2005) and similar behavior has been observed lately in the Canary Islands as well (VERLOOVE, 2017).

Veronica peregrina L., *Sp. Pl.*, **14** (1753).

The status of this New World weed in Madeira was unknown. PRESS & SHORT (1994) and MENEZES DE SEQUEIRA *et al.* (2012) did not report it from the island and JARDIM & SEQUEIRA (2008) included this taxon in the list of problematic species. VIEIRA (2002) says it is a recent and probably ephemeral introduction. In reality, it is probably not rare at all, more or less widely naturalized but easily overlooked. In April

2022 it was recorded on several occasions, especially in the northeastern part of the island (Arco de São Jorge, Fajã Alta, Santana, São Vicente). It was found in cracks of pavement, between cobblestones, along tracks, as a weed in a banana plantation, etc.

Herbarium: Funchal, Rua Nova do Vale da Ajuda, lawn weed, 19 Apr. 2022, *F. Verloove* 14278 (BR); Faial, Cabeço, weed in quarry, 24 Apr. 2022, *F. Verloove* 14266 (BR); São Jorge, Fajã Alta, Ribeira de São Jorge, banana plantation and track along the river, commonly naturalized, 30 Apr. 2022, *F. Verloove* 14246 (BR); dupl. MADM 7134; Santana, Rua de Santa Ana (city center), between cobble stones, more than 100 individuals, 30 Apr. 2022, *F. Verloove* 14248 (BR); dupl. MADM 7135.

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