

Contribution to the flora of the Selvagens archipelago (Portugal) (I)

Miguel Menezes de Sequeira¹; Carlos A. Góis-Marques²; Manuela Gouveia³; Francis Zino⁴; Célia Bairos; Sandra Mesquita⁵; Jorge Capelo⁶

Abstract. Plant specimens obtained by the authors from several expeditions to the Selvagens Islands (2004-2021), complemented by the study of herbarium specimens, led to the identification of several new species records for the Selvagens archipelago, namely the taxa currently considered as Canary Islands endemics *Trisetaria lapalmae* and *Polycarpha divaricata*. Other new taxa records for the Selvagens Islands include *Convolvulus siculus* subsp. *elongatus* and the grasses *Bromus rigidus* and *Phalaris minor*. Notes on *Misopates salvagense*, *Asplenium marinum*, *Spergularia diandra* and *Rostraria pumila* are also included. Comments on taxa include distribution, ecology, taxonomy, nomenclature, conservation, and historical data. Results are discussed in the light of habitat restoration, following *Nicotiana glauca* near eradication and rodent eradication. These aspects are also discussed considering the historical evolution of knowledge on the Selvagens vascular flora.

Keywords: *Trisetaria*; *Polycarpha*; *Misopates*; *Convolvulus*; *Rostraria*; *Spergularia*; Macaronesia.

Resumen. Los ejemplares de plantas obtenidos por los autores en varias expediciones a las Islas Salvajes (2004-2021), complementados con el estudio de ejemplares de herbario, permitieron identificar varios registros de nuevas especies para el archipiélago de las Salvajes, concretamente los taxones considerados actualmente como endémicos del archipiélago Canario *Trisetaria lapalmae* y *Polycarpha divaricata*. Otros nuevos registros son *Convolvulus siculus* subsp. *elongatus* y las gramíneas *Bromus rigidus* y *Phalaris minor*. También se incluyen notas sobre *Misopates salvagense*, *Asplenium marinum*, *Spergularia diandra* y *Rostraria pumila*. Los comentarios sobre los taxones incluyen distribución, ecología, taxonomía, nomenclatura, conservación y datos históricos. Los resultados se discuten a la luz de la restauración del hábitat, consecuencia de la casi erradicación de *Nicotiana glauca* y de la erradicación de roedores. Estos aspectos también se discuten considerando la evolución histórica del conocimiento sobre la flora vascular salvaje.

Palabras clave: *Trisetaria*, *Polycarpha*, *Misopates*, *Convolvulus*, *Rostraria*, *Spergularia*, Macaronesia

Introduction

The Selvagens archipelago corresponds to two highly eroded volcanic edifices with 24-27 Ma (Oligocene), volcanically related to the Canary Islands (Geldmacher et al. 2001; Mata et al. 2013). It is situated at about 300 km South of Madeira and 180 km North of the Canary Islands (30°00' to 30°10' N and 15°50' to 16°05' W) (Fig. 1, A & B). It is comprised of the islands Selvagem Grande (2,46 Km²; Fig. 1C), Selvagem Pequena (0,16 km²), Ilhéu de Fora (0,071 km²) and several islets; the highest altitude is 153 m a.s.l. (Pico da Atalaia, Selvagem Grande).

The first notice on the Selvagens flora was published by Richard Thomas Lowe (1802-1874) under the title “Florulae Salvagicae tentamen; or a List of Plants collected in The Salvages or Salvage Islands by Sr Constantino Cabral de Noronha and communicated by the Barão do Castello de Paiva”

(Lowe 1869). In the full title, seldom used by later authors, Lowe fully acknowledged the authorship of the collections he based his book on Constantino Cabral de Noronha, a collector whose work in Madeira archipelago has been so far overlooked. According to Lowe, the plants he used were collected by Cabral de Noronha from 1860 to 1868.

Francis Masson (1741–1805), an earlier collector on Madeira archipelago, may have been the first botanist to travel to the Selvagens. As emphasized by Francisco-Ortega et al. (2008) some of Masson’s Madeiran collections were sent to Linnaeus filius, who further studied and described them (Linnaeus, 1781). Significantly, Linnaeus filius (1781) included Selvagens on the distribution range of *Crithmum latifolium* L.f. [≡ *Astydamia latifolia* (L.f.) Baill.] based on Masson, according to Francisco-Ortega (pers. com.), the original letter from Masson to Linnaeus filius contains the reference “Hab in tenerife et Salvages. Maritimis”, although no specimens

¹ ORCID: <https://orcid.org/0000-0001-9728-465X>

² ORCID: <https://orcid.org/0000-0002-0255-7641>

³ ORCID: <https://orcid.org/0000-0001-5758-2230>

⁴ ORCID: <https://orcid.org/0000-0001-9309-0786>

⁵ ORCID: <https://orcid.org/0000-0001-7522-3493>

⁶ ORCID: <https://orcid.org/0000-0002-7634-6927>

collected by Masson in the Selvagens could be found among his Madeiran material in the Natural History Museum herbarium or in other herbaria with Masson's specimens (Carine, pers. com.).

Several other authors subsequently collected on these islands and published lists of the Selvagens Islands vascular plants, as detailed in Monod (1990). According to Press & Short (1994) and Jardim & Menezes de Sequeira (2008), there are 105 vascular plant taxa represented in Selvagens, within 35 families. As to endemism and naturalness, these taxa are currently computed as follows: 5 Macaronesian endemics shared with other Madeiran islands [*Autonoe maderensis* (Menezes) Speta (\equiv *Scilla maderensis* Menezes), *Crepis divaricata* (Lowe) Sch.Bip., *Erysimum arbuscula* (Lowe) Snogerup, *Monizia edulis* Lowe, *Urtica portosanctana* Press]; 6 Macaronesian endemics not shared with Madeira [*Limonium papillatum* (Webb & Berthel.) Kuntze, *Misopates salvagensis* D.A. Sutton, *Pelletiera wildpretii* Valdés (\equiv *Lysimachia wildpretii* (Valdés) U.Manns & Anderb.), *Periploca laevigata* Balansa, *Polycarpha divaricata* Poir. ex Steud., *Schizogyne sericea* (L.fil.) DC.]; 7 exclusive Selvagens endemics [*Lobularia canariensis* subsp. *rosula-venti* (Svent.) L. Borgen, *Lobularia canariensis* subsp. *succulenta* L. Borgen, *Monanthes lowei* (A. Paiva) P. Pérez & Acebes, *Euphorbia anachoreta* Svent., *Argyranthemum thalassophilum* (Svent.) Humphries, *Asparagus nesiotis* Svent. subsp. *nesiotis*, *Lotus glaucus* subsp. *salvagensis* (R.P.Murray) Sandral & D.D.Sokoloff]; 54 native, 7 possible native, 2 probably introduced and 15 introduced taxa.

From 1996, efforts were made to free the island of the many exotic species of anthropic origin, targeting the shrub *Nicotiana glauca* Graham, rabbits (*Oryctolagus cuniculus*) and house mice (*Mus musculus*). In 2002/3, Selvagem Grande was considered free from these invaders and the native flora, has been since then slowly recovering were removed from Selvagem Grande during 2002/3. The native flora has been slowly recovering ever since.

In this work we present and comment on some floristic novelties to Selvagens archipelago (Selvagem Grande) based on fieldwork performed between 2004 and 2021, complemented with analysis of herbarium specimens.

Material and methods

This study relies on field work performed in Selvagem Grande (Selvagens archipelago) between 2004 and 2021. Collected specimens were deposited at UMAC herbarium. Specimens obtained on loan from the MADM, MA, BM and B herbaria were also examined.

The taxonomical treatment follows Jardim and Menezes de Sequeira (2008), Flora iberica (Castroviejo 1986-2021) as well as several monographic publications. All images of live plants,

including both habitat and details (Figure 3, 5, 6, 9, 10, 13, 15, 16, 19 and 21), correspond to collected specimens, with herbarium references included in the captions.

Results and discussion

Asplenium marinum L.

According to Christenhusz (2013), *Asplenium marinum* has a western Mediterranean distribution, including Tunisia, Algeria and Morocco, and reaching Northern Europe (Norway) to the North and Macaronesia (Azores, Madeira and Canary Islands) to the South. Jardim & Menezes de Sequeira (2008) refer to the presence of this fern on all islands of the Madeira and Selvagens archipelagos. However, Gibby et al. (1994) detail that the presence of *Asplenium marinum* in the Selvagens archipelago was "recorded only once from the Salvages (c. 120 years ago), not found since and perhaps no longer present."

In fact, a single specimen collected by Constantino Cabral de Noronha, in 1863, is deposited in the BM herbarium, and the reference by Lowe (1869) is based on that same collection. Therefore, observations by Francis Zino of the same population in 2008, 2011 and 2016 (when a specimen was collected) are paramount. A single population composed of a few individuals was still present in 2016 (Fig. 2 and Fig. 3), and in 2021 a sole individual was detected.

Studied material:

Portugal, Selvagem Grande: Baía das Pardelas, 2016, Francis Zino [UMAD s/n].

Bromus rigidus Roth

According to Cope (1994) *Bromus diandrus* Roth and *Bromus rigidus* Roth are morphologically indistinguishable taxa, but Acedo & Llamas (2021) consider both as separate taxa, a criterion also followed by POWO (2023).

Bromus diandrus (\equiv *Anisantha diandra* (Roth) Tutin) is a largely distributed grass, mostly circum-Mediterranean and Macaronesian (Valdés & Scholz 2009) (Fig. 4). Referred by Jardim & Menezes de Sequeira (2008) as native for both Madeira and Porto Santo, and by Acebes Ginovés et al. (2004) as also native for all the Canary Islands, it is considered an introduced species for the Cape Verde and the Azores archipelagos (Silva et al. 2005; Sánchez-Pinto et al. 2005). *Bromus rigidus* is also considered as native for all Canary Islands by Acebes Ginovés et al. (2004), but otherwise included in *Bromus diandrus* in the Azores and Cape Verde lists (Silva et al. 2005; Sánchez-Pinto et al. 2005). According to the description given by Acedo & Llamas (2021), collected plants clearly correspond to *B. rigidus* and not to *B. diandrus*. Distinctive characters include the

branches length and number (2-3) and the spikelet structure, namely arista length (less than 4 cm) and callus shape (narrow oblong) and rachilla (Fig. 5).

Bromus rigidus is an annual grass not previously recorded on Selvagem Grande. Since *B. rigidus* is quite conspicuous and very easily identified, its presence would most probably have been noticed earlier, had it been present (e.g. Monod 1990). However, considering possible overgrazing by rabbits (*Oryctolagus cuniculus*) and mice (*Mus musculus*), and outcompetition by the plant invader *Nicotiana glauca*, this new reference could also correspond to the expansion of a native plant after the removal of invasive species and consequent disappearance of ecological disturbance. Although it is arguable that it could be a native taxon, the lack of biocontrol protocols for the Selvagens islands also increases the chances of accidental introduction by visitors and staff.

Studied material:

Portugal, Selvagem Grande: No topo da Selvagem Grande, 12-II-2005, I. Silva [UMAD 13985]; No topo da ilha [Selvagem Grande], virada a Nordeste, solo com terra, 30-IV-2005, I. Silva [UMAD 13986]; Selvagem Grande: subida do desembarcadouro, 12-IV-2006, M. Sequeira, M. Silva & L. Carvalho, MS4778 [UMAD 1275]; Selvagem Grande: Espanhóis, 4-IV-2006, L. Carvalho, M. Silva, G. Pereira & S. Teixeira, LC643 [UMAD 1258]; Selvagem Grande: junto ao muro da Cisterna Velha, 21-III-2021, M. Sequeira, M. Gouveia & C. Góis Marques, MS10064 [UMAD 13987].

Convolvulus siculus subsp. *elongatus* Willd. ex Batt

Convolvulus siculus subsp. *elongatus* is a short-lived annual plant with Macaronesian, Mediterranean and North African distribution, including continental Portugal (localized in Estremadura and Algarve), Spain, Sardinia, Morocco, Algeria and Egypt (Raab-Straube 2018). The finding of such *Convolvulus* plants in Selvagem Grande corresponds to a new reference, in fact there were, so far, no records of any *Convolvulus* species there (Lowe 1869; Monod 1990; Jardim & Menezes de Sequeira 2008). These plants (Fig. 6, A-D) have the characters which, according to Silvestre (2012), can clearly be used to distinguish *Convolvulus siculus* from *Convolvulus farinosus* L., a closely related taxon often prone to confusion with the former. Unlike *Convolvulus farinosus*, *C. siculus* subsp. *elongatus* is an annual plant (*C. farinosus* is a perennial) with indumentum composed of both short adpressed and large hairs (to 1.5 mm) (in *C. farinosum* the indumentum is composed of short adpressed hairs up to 0.5 mm). Moreover, *C. siculus* subsp. *elongatus* can be distinguished from the typical subspecies (Fig. 6, E-G) by its light blue corollae (which is dark blue in the typical subspecies) (Fig. 6, C & F), and the pedicel size (Fig. 6, D & G), closely matching the description given by Silvestre (2012): floriferous

pedicels measuring close to 3.5-4 mm and pedicels in mature fruits measuring 5.7 to 6.4 mm (limit values in the typical subspecies being 1.5 mm and 2.5 mm, respectively). Finally, the capsule size also differs between 4 and 6 mm in *C. siculus* subsp. *elongatus* (4 to 5.5 mm in the collected specimens), subequaling the calix or slightly larger than it (in *C. farinosus* (6)7-8(8.5) mm and larger than the calix).

This plant can correspond to a recent introduction or, eventually, to a so far unnoticed native plant whose population is expanding as result of the eradication of mice, rabbits and *Nicotiana glauca*, becoming sufficiently abundant to be detected during our 2021 expedition. A photographic record by Francis Zino from the 1990s apparently corresponds to the same plant.

Convolvulus siculus subsp. *elongatus* is found in the Canary Islands, often named *Convolvulus siculus* subsp. *agrestis* (Schweinf.) Verdc., a heterotypic synonym, occurring in the islands of Gran Canaria and Lanzarote (Acebes Ginovés et al. 2004). In Madeira archipelago only *Convolvulus siculus* subsp. *siculus* occurs (Turland 1994; Jardim & Menezes de Sequeira 2008) (Fig. 6, E-G).

Convolvulus siculus subsp. *elongatus* (Fig. 6, A-D) was found in Selvagem Grande south of Pico da Atalaia in therophytic communities, together with *Lobularia canariensis* subsp. *rosula-venti* and *Fumaria montana*, in mosaic with *Suaeda vera* shrubs (Fig. 7).

Studied material:

Convolvulus siculus L. subsp. *siculus*
Portugal, Madeira: Junto ao mar na estrada Ribeira Brava para Ponta do Sol. Taludes com escorrências de água, 10 m, 29-IV-1999, M. Sequeira, MS3549 [UMAD 13632]; Funchal: Monte, Comunidade de plantas herbáceas e trepadoras, 2-III-2000, J. Gomes, 32 [UMAD 2521]; Este do Jardim do Mar (poio abandonado), 10-20 m, 13-IV-2009, M. Sequeira, M. Benedito & D. Henriques, MS5916 [UMAD 13989]; Madeira: Paul do Mar. Vereda da Rib^a das Galinhas. 32°46'2.5"N, 17°14'8.4"W, 154 m., 7-IV-2011, M. Sequeira & A. Pupo, MS6848 [UMAD 13990]; Madeira: Madalena do Mar, na borda da estrada, 16-IV-2015, M. Sequeira & C. Bairos, MS8218 [UMAD 13991]; Caminho Real do Paul do Mar, Local aberto, bastante seco, com uma elevada exposição solar, alt. 381m, exp. W, 1-IV-2017, A. Brazão & P. Nascimento, PN3 [UMAD 5529]; Portugal (Madeira): Subida do Espigão, Ribeira Brava, 18-VI-2020, M. Sequeira & C. Bairos, MS9649 [UMAD s/n].

Portugal, Porto Santo: Pico de Ana Ferreira, vertente NW, em disjunções colunares, 7-IV-2012, R. Jardim, RJ2533 [UMAD 13138].

Convolvulus siculus L. subsp. *elongatus* Willd. Ex Batt.

Portugal, Estremadura: Sesimbra, rochedos litorais hacia o Cabo de Ares, 38°26'22.83"N 09°05'13.09"W (WGS84), 110 m, base do rochedo

calcário, 24-IV-2022, *C. Bairos, C.A. Góis Marques, M. Gouveia, L. Medina & M. Sequeira, LM11580* [UMAD 13992].

Portugal, Selvagem Grande: A Sul do Pico Atalaia, comunidade de *Suaeda vera* em mosaico com comunidade de terófitos nitrófilos, 19-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10030* [UMAD 13993]; Selvagem Grande: NW do Pico dos Tornozeiros, junto a um muro de correção (erosão) a jusante da escorrência, 28-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10164* [UMAD 13936].

Misopates salvagense D.A.Sutton

The original description of *Misopates salvagense* by Sutton (1988), was based on a single plant without leaves or mature flowers, therefore it does not include any leaf or corolla characters; collecting information is also scarce, lacking exact location and date (Fig. 8). The type specimen was collected by Constantino Cabral de Noronha [“Type: Salvage Islands: Gr. Salvage; [1860-1868 Cabral de Noronha s.n. herb. Lowe (holo, BM!).”]. However, this plant was not included in Lowe (1869), which suggests it may have been collected later than 1868—, possibly in 1869, together with other Cabral de Noronha’s dated specimens currently at K and BM.

Plants collected already in the 20th century by Biscoito and Zino (Press et al. 1986) were identified as “*Misopates cf. orontium*” (Fig. 9), with a short description acknowledging that plants included both flowers (white) and capsule, but recognizing the specimens were poor and grazed. The authors further refer the seed size (about half the size of that in *Misopates orontium* (L.) Raf.), stating that further collections would be fundamental to eventually recognize a new taxon. *M. salvagense* was formally described three years later by Sutton (1988), who, apparently, had no access to the specimen collected by Biscoito and Zino (MADM 561). Later, Short (1994) refers to *Misopates salvagense* for the Selvagens islands, but also to specimens identified as *Misopates cf. orontium*. Nevertheless, it is clear, both from herbarium specimens study and from field collections, that only *Misopates salvagense* occurs on Selvagem Grande. Our collections include several fully flowering plants (Figure 10).

Padrón-Mederos et al. (2009) refer the presence of *Misopates salvagense* in the Canary Islands (Lanzarote, Fuerteventura and El Hierro, Fig. 11), confirmed from fully flowering plants, although the authors do not present images or a description of the characters missing from the original publication.

Misopates salvagense occurs in therophyte plant communities dominated by *Spergula fallax* E.H.L.Krause and *Lobularia canariensis* (DC.) L.Borgen subsp. *rosula-venti* (Svent.) L.Borgen, in the clearings of *Suaeda vera* Forssk. ex J.F.Gmel. perennial communities (Fig. 10A).

Studied material:

Portugal, Selvagens: Salvagem Grande – Selvagem Grande. Near a wall, on base of Pico dos Tornozeiros, in the middle of *Suaeda vera* (white flower), 16-III-1985, *M. Biscoito & F. Zino* [MADM 561] (sub *Misopates* sp.); Selvagem Grande: subida do desembarcadouro, 12-IV-2006, *M. Sequeira, M. Silva & L. Carvalho, MS4781* [UMAD 1278]; Selvagem Grande: circa Risco, 18-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10012* [UMAD 13939]; Selvagem Grande: A Sul do Pico Atalaia, comunidade de terófitos, 19-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10022* [UMAD 13940]; Selvagem Grande: A Sul do Pico Atalaia, 28-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10161* [UMAD 13941 & 13942].

Phalaris minor Retz.

The genus *Phalaris* is represented in the Madeira archipelago by 7 taxa, the Macaronesian endemic *Phalaris maderensis* (Menezes) Menezes, shared with the Canary Islands (Acebes Ginovés et al. 2004) and the native (stated as “probable natives” by Jardim & Menezes de Sequeira (2008)) *Phalaris aquatica* L., *Phalaris brachystachys* Link, *Phalaris canariensis* L., *Phalaris coerulescens* Desf., *Phalaris minor* Retz. and *Phalaris paradoxa* L.

The first record of *Phalaris minor* in Selvagem Grande, according to studied material, dates from 2005 (see list of studied material below), and subsequent collections are all from the same or nearby localities (Fig. 12). This suggests a non-native status, consequent to human activities on the island or, contrarywise, the recovery of an unnoticed population due to habitat recovery, following the removal of *Nicotina glauca* and the eradication of rodents.

Plants studied (Fig. 13) show the characters of *Phalaris minor*. It is an annual, not tuberous, plant (Fig. 13D) with a small panicle (Fig. 13, A & C) and glumes with a toothed wing narrowing to the apex (Fig. 13E). *Phalaris minor* is a largely distributed grass with a natural range which includes the Mediterranean region and Macaronesia (Valdés & Scholz 2009), expanding Eastwards to Eritrea and the Himalaya (POWO 2023) (Fig. 12).

Studied material:

Portugal, Selvagens: Selvagem Grande, no topo da ilha, exposição Oeste, solo pedregoso e com muita erosão, 30-IV-2005, *I. Silva* [UMAD 13994]; Selvagem Grande, no topo da Selvagem Grande, local exposto a Oeste, vertente virada a Oeste, no solo pedregoso, vários exemplares verdes sem frutificação, 6-II-2005, *I. Silva* [UMAD 13995]; Selvagem Grande (Pico do Inferno), 3-IV-2006, *L. Carvalho, M. Silva, G. Pereira & S. Teixeira, LC637* [UMAD 1252]; Selvagem Grande: subida do desembarcadouro, 12-IV-2006, *M. Sequeira, C. Quintal, M. Silva & L. Carvalho, MS4764* [UMAD 1262]; Selvagem

Grande: Junto ao talude rochoso com exp. E, aprox. na projecção do “marco Astronómico”, 30 8 33N, 15 52 2W, alt. 104 m, 25-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10126* [UMAD 13928].

***Polycarpaea divaricata* (Aiton) Poir. ex Steud.**

Plants collected in Selvagem Grande and identified as *Polycarpaea divaricata* are the first reference of the genus *Polycarpaea* Lam. to Selvagens archipelago (Jardim & Menezes de Sequeira 2008) and to the Portuguese flora (Franco 1971; Lainz & Muñoz Garmendia 1990; Menezes de Sequeira et al. 2012).

The genus *Polycarpaea* (Caryophyllaceae) was first described by Lamarck (1792), who separated *Polycarpaea* from *Illecebrum* L. According to Thullin (1996) and Mabberley (2008) the genus includes about 50 species mostly tropical (Neo- and Paleotropical and subtropical). Macaronesian *Polycarpaea* include 10 species, 8 of them endemic to the Canary Islands [*Polycarpaea aristata* (Ait.) DC., *P. carnososa* C. Sm. ex Buch., *P. divaricata* (Aiton) Poir. ex Steud., *P. filifolia* Webb ex Christ., *P. latifolia* Willd., *P. robusta* (Pit.) G. Kunkel, *P. smithii* Link and *P. tenuis* Webb ex Christ.], *P. gayi* Webb, endemic to Cape Verde, and *P. nivea* (Aiton) Webb, native to the Canary Islands, Cape Verde and North Africa (Acebes Ginovés et al. 2004; Sánchez-Pinto et al. 2005; Marhold 2011).

Specimens found in Selvagens were identified as *Polycarpaea divaricata*, so far considered a Canary Islands endemic present in all islands (Acebes-Ginovés et al. 2004). They correspond to the xeric forms which have been named ‘*Polycarpaea teneriffae* Lam.’, currently included in *P. divaricata* s.l.

The Selvagens Caryophyllaceae included so far 8 taxa, being the third most represented family (Tab. 1).

Polycarpaea divaricata are small plants, easily overlooked. Nonetheless, a small population of *Polycarpaea divaricata* (less than 30 individuals) was detected (Fig. 14), including fully flowering or fructifying individuals (Fig. 15). Some are young plants, less than one-year-old, while others show a clear thickening of the stem, therefore with a putative age of over one year. A short description is presented below:

Biannual (perennial), prostrate plant (Fig. 15A). Stems branched, terete, up to 10 cm, hairy. Leaves appearing whorled, succulent, ca. 8 x 2 mm, long spatulate (Fig. 15B), acute mucronate, long tapering below, densely hairy to glabrescent; stipules white scarious, hairy, triangular, long acuminate, tapering into a hairlike apex (Fig. 15B), up to 2.1 mm. Inflorescences terminal, composed by ramified compact cymes, bracteate (Fig. 15B). Flowers subtended by scarious bracts, broadly ovate, up to 1.6 x 1 mm; sepals 5 unequal (Fig. 15C), with broad whitish scarious margins and brown midrib,

pubescent, ovate-lanceolate, 2.1-2.6 x 0.8-1.1 mm, apex acute; petals 5, white hyaline, oblong-ovate, apex inflate emarginate (Fig. 15D), 1.0-1.12 x 0.37-0.40 mm, inner base papillose; nectaries 5 between filament bases, round forming a corona around the ovary; stamens 5, 0.75-0.84 mm, filaments ca. 0.4 mm, anther 0.33-0.36 mm; ovary ovoid trigonous ca. 0.6 mm; style 1, filiform, ca. 0.47 mm; stigmas capitate, ca. 42 µm. Capsules ca. 1 mm, trigonous, opening by 3 valves. Seeds ca. 4, about 0.3 mm (Fig. 15E).

We may hypothesize that the finding of this new population of *Polycarpaea divaricata* can be due to its growth following habitat recovery, after the removal of *Nicotiana glauca* and the eradication of rodents. The population of *Polycarpaea divaricata* in Selvagem Grande should be closely monitored to fully understand its dynamic and conservation status. Studied material:

Polycarpaea divaricata (Aiton) Poir. ex Steud.

Spain, Canary Islands: Canarias, C. [MA s/n] (ex herb. C. Pau) (sub *Polycarpaea*); Insulae Canarienses. Tenerife. Orotava. Pico de Oro, 30-XII-1912, *H.V. Rosendahl* [MA 37267] (sub *P. teneriffae*); Teneriffa: Puerto Orotava, in arenosis maritimis, 12-III-1855, *E. Bourgeau* [MA 160796] (sub *P. teneriffae*); Teneriffa: in ruderatis, Guimar, 8-IV-1855, *E. Bourgeau* [MA 160794] (sub *P. teneriffae*); Isla de Tenerife. Anaga (Canarias), VII-1905, *C. Sobrado* [MA 37269] (sub *P. teneriffae*); Isla de Tenerife. Monte del Pozo (Canarias), VII-1905, *C. Sobrado* [MA 37264] (sub *P. teneriffae* var. *latifolia* Poir.); Tenerife, Valle de Santiago del Teide, entre peñascos de lava, 24-IV-1935, *Cuetrecasas, 246* [MA 190994] (sub *P. teneriffae* Lam.); Canarias, Gomera, Las Rosas, 14-IX-2022, *M. Sequeira, J. Capelo, M. Gouveia, S. Mesquita & C. Bairos, MS11908* [UMAD s/n].

Portugal, Selvagens Islands: Selvagem Grande, perto do Pico da Atalaia, 2-XII-2003, *I. Silva* [UMAD s/n]; Selvagem Grande, perto da Casa do Topo, 31-III-2006, *L. Carvalho, M. Silva, G. Pereira & S. Teixeira, 631* [UMAD 1246] (sub *Polycarpon tetraphyllum*); Selvagem Grande: perto da Casa do Topo, LS50, 18-III-2019, *M. Sequeira & C. Góis Marques, MS8691* [UMAD s/n]; Selvagem Grande: a NE da casa dos Vigilantes, Cisterna Velha, taludes e fendas rochosas, como comófito em pequenos acúmulos de terra, 27-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10151* [UMAD 13892].

Polycarpaea latifolia Willd.

Spain, Canary Islands: Isla de Tenerife, in rupestribus silvaticis, Sierra de Anaga “El Pijaral”, 27-VI-1947, *L. Ceballos & F. Ortuño* [MA 207729] (sub *P. teneriffae* var. *latifolia* Kuntze).

Polycarpaea gayi Webb

Cape Verde: Ilha de Santiago: Malagueta, 5-XI-2017, *M. Sequeira, MS8499* [UMAD s/n]; Ilha do Fogo, Leste, Cova Figueira, caminho a Norte, Cova Matinho, 10-XI-2017, *M. Sequeira, MS8501* [UMAD s/n].

Spergularia diandra (Guss.) Heldr.

The genus *Spergularia* includes 60 taxa, all cosmopolitan halophiles (Mabberley 2008). According to Jardim & Menezes de Sequeira (2008), both *Spergularia bocconeii* (Scheele) Graebn. and *Spergularia marina* (L.) Besser occur in Madeira archipelago, but not in Selvagens. In fact, no reference could be found to *Spergularia* for the Selvagens archipelago in previous works (Lowe 1869; Monod 1990; Short 1994).

Plants collected present variable indumentum, although the great majority are glandular-pubescent, at least in the inflorescence, sepals and pedicels being densely glandular pubescent (Fig. 16). Stipules are triangular, entire to bi- or tri-dentate. The inflorescence is capilar, apparently with no bracts: lower flowers present very small bracts and upper flowers present no more than vestigial bracts. Sepals (2-2.4 mm) are obtuse with a broad scarious margin, and petals are whitish pink, broadly elliptical, shorter than the sepals. Flowers have 3 stamens (at least one flower presenting only 2). Seeds are shiny black, smooth. The identity of the collected *Spergularia* specimens was confirmed as *Spergularia diandra* (Guss.) Boiss. Although *S. diandra* seeds can be rugulose or bristling with rigid papillae, as stated by Monnier & Ratter (1964), Ratter (1990) states that seeds can be papillose-tuberculated with claviform papillae, bacilliform-tuberculated or smooth. Seeds of studied specimens are all smooth. Sepals shape and dimension segregate the collected specimens from *Spergularia heldreichii* Foucaud ex E.Simon & Monnier. According to Ratter (1990) *S. heldreichii* flowers present larger sepals (2.5-3.5 mm) although Monnier & Ratter (1964) and Ratter (1990) refer to acute sepals with nearly mucronate apex, in contrast with the obtuse sepals observed on the collected specimens.

Spergularia diandra is referred by Marhold (2011) as a widely distributed Mediterranean species, occurring from Turkey to Spain and from Lebanon to Morocco (Algeria, Albania, Balearic Islands, Crete and Karpathos, Cyprus, Egypt, France, Greece, Spain, Israel and Jordan, Italy, Libya, Lebanon and Syria, Morocco, Malta, Sardinia, Sicily, Sinai, Tunisia and Turkey) (Fig. 17).

References to its presence in continental Portugal by Monnier & Ratter (1964) and in the adaptation to Portugal of *Flora Europaea* by Franco (1971) are an error, as confirmed by Ratter (1990). Menezes de Sequeira et al. (2012) also exclude *Spergularia diandra* from the Portuguese flora, therefore its presence in Selvagem Grande island corresponds to the species's first reference for Selvagens, and simultaneously to the Portuguese flora.

Spergularia diandra is also present in the Canary Islands, as stated by Acebes Ginóves et al. (2004), on the islands of Gran Canaria, Fuerteventura and Lanzarote.

The fact that *S. diandra* is a very short lived therophyte, with specimens ranging from 5 cm to 15

cm in height, possibly explains why this plant has eluded for so long the attention of botanists visiting the Selvagens, who possibly mistook it for *Spergula fallax* Lowe (= *Spergularia flaccida* (Madden) I. M. Turner).

Studied material:

Portugal, Selvagem Grande: a NE do Cabeço do Inferno, comunidades de terófitos, 27-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10155* [UMAD 13934]; Selvagem Grande: a NE do Cabeço do Inferno, comunidades de terófitos, 27-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10156* [UMAD 13929].

Rostraria pumila (Desf.) Tzvelev and *Trisetaria lapalmae* H.Scholz

The study of grass specimens closely resembling *Rostraria*, growing in the same annual plant communities, allowed for the identification of two distinct taxa and the disentangling of historical references to *Rostraria pumila*. The specimens at MADM herbarium previously identified as *Rostraria pumila* were cited by Press et al. (1986), and presumably also by Cope (1994), to justify the presence of such taxon on the Selvagens archipelago. However, all specimens collected by Biscoito and collaborators (Press et al. 1986) were mistakenly identified as *R. pumila* and correspond, in fact, to *Trisetaria lapalmae*. Thus, the specimens now identified as *R. pumila* correspond to the actual first references of this taxon for the Selvagens archipelago (Fig. 18).

Studied material:

Rostraria pumila (Desf.) Tzvelev

Portugal, Selvagem Grande: no topo da Selvagem Grande, no Chão dos Caramujos, 12-II-2005, *I. Silva* [UMAD 13996]; Selvagem Grande: no topo da Selvagem Grande, no solo no meio do planalto da ilha sobre o solo com terra, 30-IV-2005, *I. Silva* [UMAD 13997]; Selvagem Grande: Pico dos Tornozelos, 4-IV-2006, *L. Carvalho, M. Silva, G. Pereira & S. Teixeira, LC640* [UMAD 1255]; Selvagens: subida do desembarcadouro, 12-IV-2006, *M. Sequeira, M. Silva & L. Carvalho, MS4771* [UMAD 1268]; Selvagem Grande, 18-III-2019, *M. Sequeira & C. Góis Marques, MS8697* [UMAD 13998]; Pico da Atalaia, face N., 17-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS9991* [UMAD 13907]; Selvagem Grande: Atalaia à Ponta do Risco, 17-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS9994* [UMAD 13908]; Selvagem Grande: subida pelo trilho para o Pico da Atalaia, 17-III-2021, *M. Sequeira, M. Gouveia, C. Góis Marques & C. Clemente Abreu, MS9984* [UMAD s/n]; Selvagem Grande: circa Risco, 18-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10016* [UMAD 13910]; Selvagem Grande, ca. Ponta do Corgo da Areia, 20-III-2021, *M. Sequeira,*

M. Gouveia & C. Góis Marques, MS10042A [UMAD 13925]; Selvagem Grande: junto ao muro da Cisterna Velha, 21-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10071* [UMAD 13909]; Selvagem Grande, Norte da casa dos Vigilantes, taludes e fendas rochosas, comunidades de terófitos, 27-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10153* [UMAD 13999].

Portugal, Porto Santo: Vereda na Rocha de N. Sra. Pela crista até à Capela, início da vereda, junto a casas, fortemente antropizado e dominado por invasoras, 9-IV-2022, *M. Sequeira & C. Bairos, MS11078* [UMAD 14000].

Rostraria pumila and *Trisetaria lapalmae* co-occur in the same communities of small annual grasses (Fig. 19A & Fig. 21A). Until now there were no records of *Trisetaria lapalmae* outside the Canary Islands, where it was considered an endemic (Acebes Ginovés et al. 2004). With regard to the Madeira and Selvagens archipelagos, Jardim & Menezes de Sequeira (2008) list *Rostraria cristata* (L.) Tzvelev as native to Madeira, Porto Santo and Desertas (\equiv *Lophochloa cristata* (L.) Hyl.), and *Rostraria pumila* (Desf.) Tzvelev as native to Porto Santo and Selvagens. The reference to Selvagens in Press et al. (1986) and in Cope (1994) was based on a misidentification, as *Rostaria pumila*, of a specimen of *Trisetaria lapalmae* and should therefore be discarded (see Studied Material, specimen MADM 1736).

For the Canary Islands, Acebes Ginovés et al. (2004) list *Rostraria pumila* and *Rostraria cristata* as probable natives and, as already mentioned, *Trisetaria lapalmae* as an endemic species present at Hierro, La Palma, Fuerteventura and Lanzarote.

According to Sánchez-Pinto et al. (2005), *Lophochloa cristata* (L.) H. Hyl. (\equiv *Rostraria cristata* (L.) Tzvelev) occurs in the Cape Verde archipelago as an introduced species. However, Henderson & Schäfer (2003) also refer *Rostraria pumila* as present in Cape Verde. The later authors clarified the taxonomy and nomenclature of the Azorean *Rostraria* by describing a new species, *Rostraria azorica* S. Hend., endemic to the Azores. The same authors also identify *Rostraria cristata* as present in the Azores.

The specimens collected by Biscoito and Zino and deposited in MADM (see list of *Trisetaria lapalmae* studied material), although clearly corresponding to a *Trisetaria*, were wrongly identified under genus *Rostraria* by Press et al. (1986). Actually, *Trisetaria lapalmae* was only described as new ten years after Biscoito & Zino's collections in Selvagens (Scholz & Böcker 1996).

Specimens collected during the expeditions carried out from 2004 to 2021 and deposited at UMAD herbarium, as well as specimens collected by Biscoito and Zino in 1985 and deposited at MADM herbarium were studied. Such material allowed for the identification of plants with contrasting

morphologies when compared to *Rostraria pumila* (Fig. 19 & Fig. 21), with larger and less hairy glumes (Fig. 19, D-F versus Figure 21, C-E), rachis with longer hairs, lemma with bifid apex and larger awns. These specimens clearly match the morphology of genus *Trisetaria* Forssk., with the following distinctive characters: number of glume veins (3 in both glumes), number of flowers (5), lemma shape (with two aristulas), insertion of the arista below the sinus between 1/2 and 2/3 of the total lemma length.

Although the generic diagnostic characters referred by Jonsell (1980) and Romero Zarco (1987) (see also Paunero 1950) for the genus *Trisetaria* closely match the observed specimens, these are very distinct from *Trisetaria dufourei* (Boiss.) Paunero, namely by the morphology of the spikelets, glumes, rachis and callus. Selvagens specimens fully correspond to the description of *Trisetaria lapalmae* H.Scholz given by Scholz & Böcker (1996). Furthermore, type material was also studied, and the resemblance between Canary Islands plants and those collected in Selvagens (Fig. 20) confirmed the Selvagens specimens as *Trisetaria lapalmae*. A short description of the Selvagem Grande specimens of *Trisetaria lapalmae* H.Scholz is presented below:

Small caespitose annual plant, up to 15 cm, with reduced culms, largely covered by the leaf sheaths (Fig. 21, A & B). Leaf sheaths enlarged, the upper partially enclosing the panicle (Fig. 21C), pubescent. Ligule membranous, lamina linear. Panicles short, usually partially enclosed by the upper sheath. Spikelets 5-flowered. Glumes up to 4.1 mm, acuminate, unequal, the lower slightly larger, pubescent to villous, the upper ca. 3.7 mm, pubescent (Fig. 21, D & E). Inferior rachis ca. 0.9 mm, densely hairy with hairs up to 1.5 mm. Flowers unequal, the lower ones with shorter awns. Callus pubescent, with hairs 0.3-0.4 mm. Lemma with ca. 4.7 mm, acuminate, bifid (above 3.9 mm) with lobes aristulate (0.7-0.9 mm), awn twisted geniculate up to 5 mm (lower flowers with much shorter awns), inserted ca. 2/3 of the lemma, below the sinus (Fig. 21E). Palea ca. 1.8 mm.

Studied material:

Trisetaria lapalmae H.Scholz

Portugal, Selvagem Grande: no topo da Selvagem Grande, exposta a Nordeste, no solo, local com feno [*Hyparrhenia hirta*], 30-IV-2005, *I. Silva* [UMAD s/n]; Salvage Islands – Selvagem Grande: Pico da Atalaia, near light House, 14-III-1985, *M. Biscoito, 419A* [MADM 1736] (sub *Rostraria pumila*); Selvagem Grande: Pico dos Tornozelos, 4-IV-2006, *L. Carvalho, M. Silva, G. Pereira & S. Teixeira, LC639* [UMAD 1254]; Selvagens: subida do desembarcadouro, 12-IV-2006, *M. Sequeira, L. Carvalho, M. Silva & C. Quintal, MS4768* [UMAD 1266]; Selvagem Grande: subida do desembarcadouro, 12-IV-2006, *M. Sequeira, L. Carvalho, M. Silva & C. Quintal, MS4771* [UMAD 1268]; Selvagens: subida do desembarcadouro, 12-IV-2006, *M. Sequeira, M.*

Silva & L. Carvalho, MS4768 [UMAD 1266] (sub *Trisetaria pumila*); Selvagem Grande: 18-III-2019, *M. Sequeira, C. Góis Marques, MS8698* [UMAD s/n]; Selvagem Grande: Pico da Atalaia, face N., 17-III-2021, *M. Sequeira, M. Gouveia, C. Góis Marques & C. Clemente Abreu, MS9990* [UMAD 13924]; Selvagem Grande: Atalaia à Ponta do Risco, 17-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS9996* [UMAD 13911]; Selvagem Grande: Cisterna Velha à Ponta do Corgo da Areia e um pouco a Este, 21-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10053* [UMAD 13906]; Selvagem Grande: Norte do Pico dos Tornozeiros, 22-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10082* [UMAD 13905]; Selvagem Grande: Norte do Pico dos Tornozeiros, 22-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10083* [UMAD 13904]; Selvagem Grande: Pico Atalaia, subida N ao Pico. Alt. 143 m s.m. 30 08 709 N 15 52.250W, 23-III-2021, *M. Sequeira, M. Gouveia & C. Góis Marques, MS10095* [UMAD 13923].

Spain, Canary Islands: Kanaren (Spanien): La Palma südöstlich Puerto Naos, Falshang, ca. 100 m, 13-III-1993, *H. Scholz* [B100168881, Paratypus]; El Hierro, UTM km2: 3070/192, 650 m ü. NN, südl. Mna. de la Virgen, 22-III-2000, *Ch. Stierstorfer* [B100007008].

Conclusions

The Selvagens archipelago was never the subject of a thorough botanical survey, probably due to its isolation and a depleted vegetation cover, consequent to a long history of zooanthropic disturbance. The historical presence of alien herbivores is shared with all islands of the Madeira archipelago, and the consequences of recent mismanagement of herbivores, namely rabbits and goats (*Capra hircus*) was discussed in Rocha et al. (2017) and Menezes de Sequeira et al. (2021).

However, the removal of the invasive alien *Nicotiana glauca* and the successful eradication of rabbits and mice led, in the last decades, to an astonishing recovery of Selvagens's flora and vegetation. Therefore, plants reduced to small inconspicuous populations in inaccessible refuges thrived in large open areas. Intense and repeated fieldwork, followed by lab and herbarium analysis, resulted in the identification of several new taxa records for Selvagem Grande Island with implications on the number of plant taxa present in this archipelago. The assessment of endemism and conservation status offered new insight as to floristic biogeographical affinities among the Madeira, Selvagens and Canary archipelagos.

Identification of *Trisetaria lapalmae* and *Polycarpaea divaricata*, former Canary Island endemics, further strengthens the biogeographic proximity of the Selvagens to the Canary Islands, reinforcing the idea proposed by Rivas-Martínez

et al. (2009) of including Selvagens in the Canary Province, under the Canary and Madeiran Subregion, part of the Mediterranean Region. Other new taxa for the Selvagens Islands include *Convolvulus siculus* subsp. *elongatus* and *Spergularia diandra*, both possible overlooked natives, also linking the Selvagens flora to the Canary Islands flora. In fact, both taxa are native to the Canary Islands but not to Madeira archipelago.

Observations regarding *Asplenium marinum*, *Misopates salvagense*, *Rostraria pumila* and *Spergularia diandra* show these taxa thriving on the island—some had never been detected before, others were hardly known on Selvagens. *Misopates salvagense* despite being a clear case of a biogeographic link to the Canary Islands, seems to be still a rare plant in the Selvagens. The history of knowledge about this plant reinforces the role of herbaria as sources of taxonomical novelties and biodiversity (Bebber et al. 2010).

Other newly found species are the grasses *Bromus rigidus* and *Phalaris minor*. The discovery of these plants may be the result of accidental introduction by humans or, otherwise, a result of the general recovery of the plant cover after ecological restoration measures.

Significantly, our results confirm an overwhelming recovery of native flora after the removal of invasive species, emphasizing the importance of implementing eradication actions such as the ones carried out in Selvagens since 1996. As observed by one of us (F. Zino since 1963), plants which were exceptionally rare in the past (e.g., *Schizogyne sericea*) are now very common shrubs in Selvagem Grande. Moreover, the flora recovery created new and thrilling opportunities to survey the genetic diversity of several taxa, that were in fact collected in all islands and islets in the 2021 expedition (e.g. *Monanthes lowei*, *Euphorbia anachoreta*, *Autonoe maderensis*, *Lotus glaucus* subsp. *salvagensis*), and are currently being studied.

Finally, as stated previously, some of the new records can be the result of recent accidental introductions. The recovery of the island's flora and vegetation must be accompanied by restrict biocontrol measures, to avoid further introduction of alien taxa that can undermine the efforts of almost 30 years of invasive species eradication. In the Selvagens archipelago there is no biosafe protocol for visitors and regular staff working on the islands, nor for building materials taken to the islands, in order to prevent further introductions. Recently, in 2018, access was granted to tourists who do not undergo any biodiversity-safe protocol, making the islands ever more prone to accidental introductions of exotic taxa.

Acknowledgements

We are grateful to the herbarium curators of Berlin (B), Madrid (MA) and Museu Municipal do Funchal (MADM) for the loans of critical plant specimens.

We are in debt to Isamberto Silva who almost 20 years ago brought several specimens from Selvagem Grande that only recently were included in the UMAD herbarium. Artur Silva, Jéssica Uchôa and Rafaela Tiengo (cE3c - Grupo da Biodiversidade dos Açores (Azores University, Portugal) prepared the composed image of Selvagem Grande based on our complete drone image coverage of Selvagem Grande (available under request to M. Menezes de Sequeira). We are also grateful for the collecting permits and support for several expeditions to Selvagem Grande by the IFCN-IP.RAM (Instituto das Florestas e Conservação da Natureza) specially to Manuel Madama Filipe that as President of the IFCN was always supportive of GBM (Madeira Botanical Group) research activities. We also acknowledge the support of the Portuguese Navy, without their help we would not be able to collect specimens from Selvagem Grande, Selvagem Pequena and Ilhéu de Fora. This work was partially funded by MACFLOR (MAC/4.6d/190) Project under the Cooperation Programme INTERREG MAC 2014-20.

We dedicate this publication to the memory of Santiago Castroviejo Bolivar, firstly of all because he was the organizer of an expedition to the Selvagens Islands in March 2007, although the expedition failed due to the extremely rough sea conditions. Santiago Castroviejo was tireless in the pursuit of botanical knowledge, a collaborator in the initial steps of the GBM and specifically helped with the identification of *Polycarpaea teneriffae*, i.e. *Polycarpaea divaricata*.

References

- Acebes Ginovés, J.R., Del Arco Aguilar, M., García Gallo, A., León Arencibia, M.C., Pérez De Paz, P.L., Rodríguez Delgado, O., Wildpret De La Torre, W., Martín Osorio, V.E., Marrero Gómez, M.C. & Rodríguez Navarro, M.L. 2004. Pteridophyta & Spermatophyta. In: Izquierdo, I., Martín, J.L., Zurita, N. & Arechavaleta, M. (eds.), Lista de especies silvestres de Canarias (hongos, plantas y animales terrestres): 96-143. Consejería de Medio Ambiente y Ordenación Territorial. Gobierno de Canarias.
- Acedo, C. & Llamas, F. 2021. *Bromus* L. In: Romero Zarco, C., Rico, E., Crespo, M.B., Devesa, J.A., Buiira, A. & Aedo, C. (eds.), Flora Iberica. Plantas vasculares de la Península Iberica e Islas Baleares. Vol. XIX (II) Gramineae (partim): 995-1046. Real Jardín Botánico, CSIC. Madrid.
- Bebber, D.P., Carine, M.A., Wood, J.R.I., Wortley, A.H., Harris, D.J., Prance, G.T., Davidse, G., Paige, J., Pennington, T.D., Robson, N.K.B. & Scotland, R.W. 2010. Herbaria are a major frontier for species discovery. *Proc. Natl. Acad. Sci. U.S.A.* 107(51): 22169–22171. <https://doi.org/10.1073/pnas.1011841108>
- Christenhusz, M. & Raab-Straube, E. von. 2013. Polypodiopsida. In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. https://euromed.org/cdm_dataportal/taxon/472b04e2-a1a3-48f5-a584-74ae94a87640 [accessed 27 April 2023].
- Cope, T.A. 1994. Gramineae (Poaceae). In: Press, J.R. & Short, M.J. (eds.), Flora of Madeira: 406-453. The Natural History Museum, HMSO. London.
- Francisco-Ortega, J., Santos-Guerra, A., Carine, M.A. & Jarvis, C.E. 2008. Plant hunting in Macaronesia by Francis Masson: the plants sent to Linnaeus and Linnaeus filius. *Bot. J. Linn. Soc.* 157: 393–428. <https://doi.org/10.1111/j.1095-8339.2008.00822.x>
- Franco, J.A. 1971. Nova Flora de Portugal (Continente e Açores), Volume I, Lycopodiaceae – Umbelliferae. Edição do Autor. Lisboa.
- Geldmacher, J., Hoernle, K., Bogaard, P.V.d., Zanki, G. & Garbe-Schönberg, D. 2001. Earlier history of the ≥ 70-Ma-old Canary hotspot based on the temporal and geochemical evolution of the Selvagem Archipelago and the neighboring seamounts in the eastern Atlantic. *J. Volcanol. Geotherm. Res.* 111: 55-87. [https://doi.org/10.1016/S0377-0273\(01\)00220-7](https://doi.org/10.1016/S0377-0273(01)00220-7)
- Gibby, M., Ormonde, J. & Paul, A.M. 1994. *Asplenium* L. In: Press, J.R. & Short, M.J. (eds.), Flora of Madeira: 42-46. The Natural History Museum, HMSO. London.
- Henderson, S. & Schäfer, H. 2003. Synopsis of the genus *Rostraria* (Poaceae) in the Azores. *Bot. J. Linn. Soc.* 141(1): 125-131. <https://doi.org/10.1046/j.1095-8339.2003.00114.x>
- Jardim, R. & Menezes de Sequeira, M. 2008. The vascular plants (Pteridophyta and Spermatophyta) of the Madeira and Selvagens archipelagos. In: Borges, P.A.V., Abreu, C., Aguiar, A.M.F., Carvalho, P., Jardim, R., Melo, I., Oliveira, P., Sérgio, C., Serrano, A.R.M. & Vieira, P. (eds.), A list of the terrestrial fungi, flora and fauna of Madeira and Selvagens archipelagos: 13-25. Direção Regional do Ambiente da Madeira and Universidade dos Açores, Funchal and Angra do Heroísmo.
- Jonsell, B. 1980. *Trisetaria* Forssk. In: Tutin, T., Heywood, V., Burges, N., Valentine, D., Walters, S. & Webb, D. (eds.), Flora Europaea 5: 224-225. Cambridge University Press. Cambridge.
- Laínz, M. & Muñoz Garmendia, F. 1990. Caryophyllaceae. In: Castroviejo, S., Laínz, M., López González, G., Montserrat, P., Muñoz Garmendia, F., Paiva J. & Villar L. (eds.), Flora iberica. Plantas vasculares de la Península Ibérica e Islas Baleares. Vol. II. Platanaceae-Plumbaginaceae (partim): 98-464. Real Jardín Botánico, CSIC. Madrid.
- Lamarck, J.B.A.P.M. 1792. Sur le Nouveau genre Policarpea. *J. hist. nat.* 2: 3-9.
- Linnaeus, C. 1781. Supplementum plantarum Systematis vegetabilium editionis decimae tertiae, Generum plantarum editionis sextae, et Specierum plantarum editionis secundae. Brunsvigae: Impensis Orphanotrophei.
- Lowe, R.T. 1869. Florae salvagicae tentamen; or a list of plants collected in the Salvages or Salvage Islands by Sr. Constantino Cabral de Noronha and communicated by the Barão do Castello de Paiva. London: John Van Voorst.

- Mabberley, D.J. 2008. *The Plant-Book. A Portable Dictionary of the Vascular Plants*. Third Edition. Cambridge University Press, United Kingdom.
- Marhold, K. 2011. Caryophyllaceae. In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. https://europlusmed.org/cdm_dataportal/taxon/cd1c0817-a589-4730-acb8-545d100d64ea [accessed 27 April 2023].
- Mata, J., Fonseca P.E., Prada, S., Rodrigues D., Martins, S., Ramalho, R.A.S., Madeira, J., Cachão, M., da Silva, C. & Matias, M.J. 2013. O Arquipélago da Madeira. In: Dias, R., Araújo, A., Terrinha, P. & Kullberg J.C. (eds), *Geologia de Portugal, Geol. Meso-cenozóica*, vol. II, chap. III.8.2: 691–746, Escolar Editora. Lisboa.
- Menezes de Sequeira, M., Espírito-Santo, D., Aguiar, C., Capelo, J. & Honrado, J. 2012. Checklist da Flora de Portugal (Continental, Açores e Madeira). Associação Lusitana de Fitossociologia. Lisboa, 74 pp. ISBN: 978-989-20-2690-9.
- Menezes de Sequeira, M., Jardim, R., Gouveia, M., Góis-Marques, C.A., Eddie, W.M.M. 2021. Population decline in the critically endangered *Musschia isambertoi* (Campanulaceae) endemic to Desertas Islands (Madeira Archipelago) calls for urgent conservation management. *J. Nat. Conserv.* 60: 125955. <https://doi.org/10.1016/j.jnc.2021.125955>
- Monnier, P. & Ratter, J.A. 1964. *Spergularia* (Pers.) J. & C. Presl. In: Tutin, T.G., Heywood, V.H., Burges, N.A., Valentine, D.H., Walters, S.M. & Webb D.A. (eds.), *Lycopodiaceae to Platanaceae 1*: 154-156. Cambridge at the University Press. Cambridge.
- Monod, T. 1990. *Conspectus Florae Salvagicae*. Bol. Mus. Munic. Funchal, Suplemento nº1(8): 22-32.
- Nóbrega, M. 1955. Notas botânicas sobre a Selvagem Grande. Bol. Mus. Munic. Funchal 8(22): 22-32.
- Padrón-Mederos, M.A., Guma, I.G., Santos-Guerra, A. & Reyes-Betancort, J.A. 2009. Apuntes florísticos y taxonómicos para la flora de las islas Canarias. *Acta Bot. Malacit.* 34: 242-251.
- Paunero, E.R. 1950. Las especies españolas del género *Trisetaria* Forsk. *Anales Jard. Bot. Madrid*, 9(1): 503-582.
- POWO 2023. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet. <http://www.plantsoftheworldonline.org/> [Retrieved 02 May 2023].
- Press, J.R. & Short, M.J. 1994. *Flora of Madeira*. The Natural History Museum, HMSO, London.
- Press, J.R., Bischoito, M. & Zino, F. 1986. New plant records from the Salvage Islands. *Bocagiana*. 90: 1-4.
- Raab-Straube, E. von. 2018. Convolvulaceae. In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. [accessed 27 April 2023].
- Ratter, J.A. 1990. *Spergularia* J.Presl & C.Presl. In: Castroviejo, S., Laínz, M., López González, G., Montserrat, P., Muñoz Garmendia, F., Paiva J. & Villar L. (eds.), *Flora iberica. Plantas vasculares de la Península Ibérica e Islas Baleares*. Vol. II. Platanaceae-Plumbaginaceae (partim): 149-161. Real Jardín Botánico, CSIC. Madrid.
- Rivas-Martínez, S. 2009. Ensayo geobotánico sobre la Macaronesia. In: Beltnin Tejera, E., Afonso-Carrillo, A., García Gallo, A. & Rodríguez Delgado, O. (eds.), *Homenaje al Profesor D: Wolfredo Wildpret de la Torre*. Instituto de Estudios Canarios. La Laguna (Tenerife. Islas Canarias). Monografía, LXXVIII. pp. 255–296.
- Rocha, R., Sequeira, M.M., Douglas, L.R., Gouveia, M., Jardim, R., Jesus, J., Jones, H.P. & Russo, D. 2017. Extinctions of introduced game species on oceanic islands: curse for hunters or conservation opportunities? *Biodivers. Conserv.* 26: 2517-2520. DOI [10.1007/s10531-017-1363-3](https://doi.org/10.1007/s10531-017-1363-3)
- Romero Zarco, C. 1987. *Trisetaria* Forsskal. In: Valdés, B., Talavera, S. & Fernández-Galiano, E. (eds.), *Flora de la Andalucía Occidental 3*: 318-320. Ketres Editora S.A. Barcelona.
- Sánchez-Pinto, L., Leticia Rodríguez, M., Rodríguez, S., Martín, K., Cabrera, A. & Cármen Marrero, M. 2005. Pteridophyta, Spermatophyta. In: Arechavaleta, M., Zurita, N., Marreno, M.C., Martín-Esquivel, J.L. (eds.), *Lista preliminar de especies silvestres de Cabo Verde (hongos, plantas y animales terrestres)*: 38-57. Consejería de Medio Ambiente y Ordenación Territorial, Gobierno de Canarias.
- Scholz, H. & Böcker, R. 1996. Ergänzungen und Anmerkungen zur Grasflora (Poaceae) der Kanaren. *Willdenowia*, 25: 571-582.
- Short, M.J. 1994. Caryophyllaceae. In: Press, J.R. & Short, M.J. (eds.), *Flora of Madeira*: 83-95. The Natural History Museum, HMSO. London.
- Silva, L., Pinto, N., Press, B., Rumsay, F., Carine, M., Henderson, S. & Sjogren, E. 2005. Lista das plantas vasculares (Pteridophyta e Spermatophyta). In: Borges, P.A.V., Cunha, R., Gabriel, R., Martins, A.M.F., L. Silva, & Vieira V. (eds.), *A list of the terrestrial fauna (mollusca and arthropoda) and flora (bryophyta, pteridophyta and spermatophyta) from the Azores*: 131-156. Direcção Regional do Ambiente. Universidade dos Acores, Horta, Angra do Heroísmo-Ponta Delgada.
- Silvestre, S. 2012. *Convolvulus* L. In: Castroviejo, S., Aedo, C., Cirujano, S., Laínz, M., Montserrat, P., Morales, R., Muñoz Garmendia, F., Navarro, C., Paiva, J. & Soriano, C. (eds.), *Flora iberica 11*. Real Jardín Botánico, CSIC, Madrid.
- Sutton, D.A. 1988. A revision of the tribe Antirrhineae. *British Museum (Natural History) & Oxford University Press: London & Oxford*. 575 pp.
- Thulin, M. 1996. A New species of *Polycarphaea* (Caryophyllaceae) from Somalia. *Nord. J. Bot.* 16(3): 291-292.
- Turland, N.J. 1994. Convolvulaceae. In: Press, J.R. & Short, M.J. (eds.), *Flora of Madeira*: 226-271. The Natural History Museum, HMSO. London.
- Valdés, B. & Scholz, H. 2009. Poaceae (pro parte majore). In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. [cited 2018 Sep 4]. Available from <http://ww2.bgbm.org/europlusmed/>.

Table 1. List of Selvagens Caryophyllaceae, including *Polycarpaea divaricata*. First reference to the Selvagens Islands and native status (N, Native; MAC, Macaronesian Endemic).

<i>Taxa</i>	First reference	Status
<i>Arenaria leptoclados</i> (Rchb.) Guss.	Nóbrega (1955)	N
<i>Herniaria cinerea</i> DC.	Nóbrega (1955)	N
<i>Petrorhagia nanteuilii</i> (Burnat) P.W. Ball & Heywood	Short (1994)	N
<i>Polycarpon tetraphyllum</i> (L.) L. subsp. <i>tetraphyllum</i>	Lowe (1869)	N
<i>Silene gallica</i> L.	Lowe (1869)	N
<i>Silene nocturna</i> L.	Short (1969)	N
<i>Silene uniflora</i> Roth	Lowe (1869)	N
<i>Spergula fallax</i> (Lowe) E.H.L. Krause	Lowe (1869)	N
<i>Polycarpaea divaricata</i> (Aiton) Poir ex Steud.	Nobis hoc loco	MAC



Figure 1. Geographical location of Selvagens Archipelago and the Selvagem Grande Island. A) location of Selvagens archipelago in the Northeastern Atlantic Ocean; B) Location of Selvagens archipelago in relation to Madeira archipelago; C) Selvagem Grande Island.

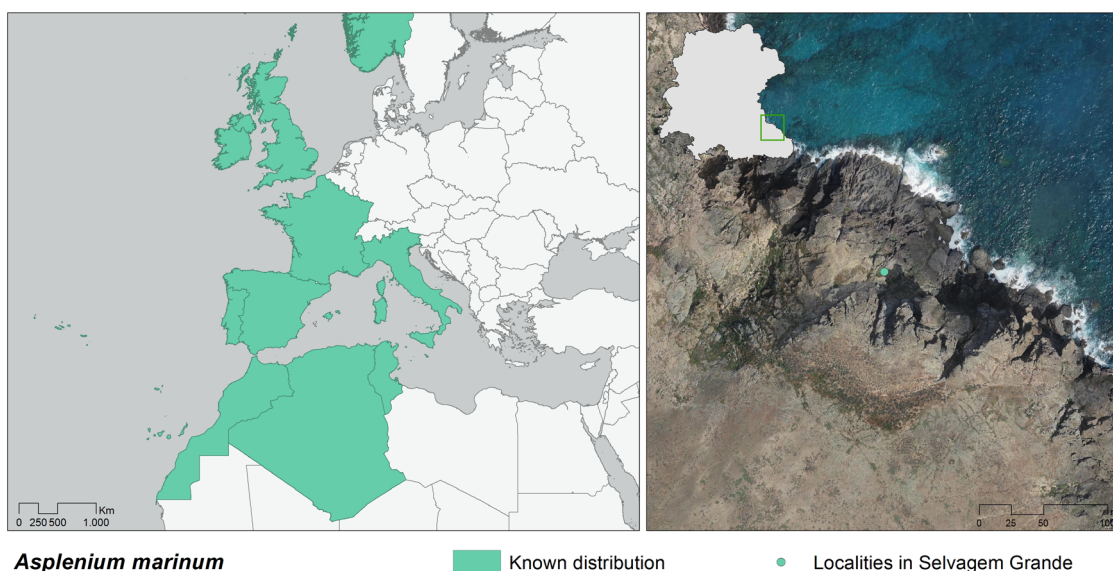


Figure 2. Distribution map of *Asplenium marinum* L.

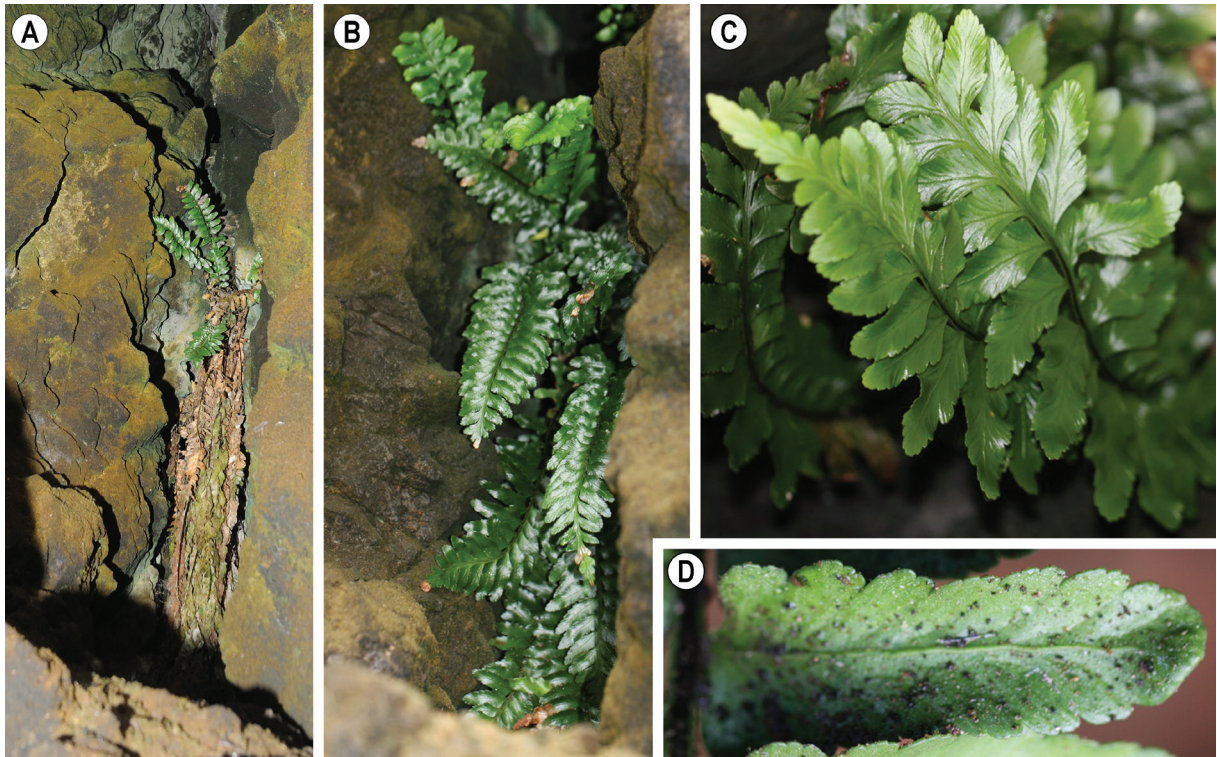


Figure 3. *Asplenium marinum* L. all images based on the same individual (Baía das Pardelas, 2016, Francis Zino [UMAD s/n]). A) General aspect of the plant (2021); B) detail of whole plant (2011); C) young fronds adaxial side (2011); D) detail of the abaxial side of an immature pinnule (2011). (Photos: B, C, D by F. Zino; A, M. Menezes de Sequeira).

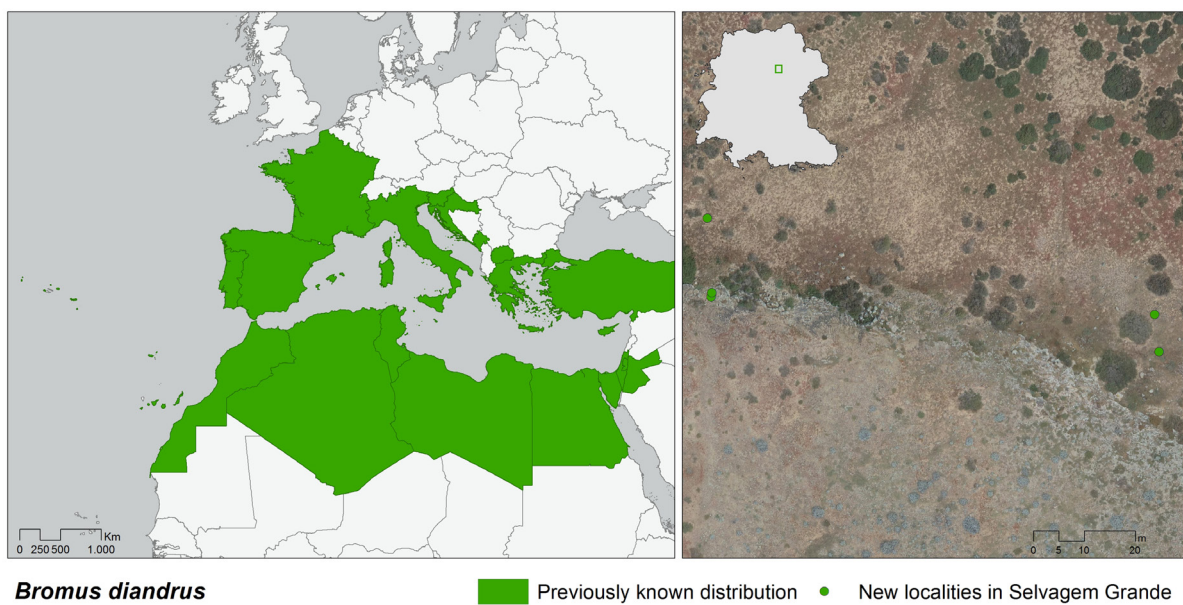


Figure 4. Distribution of *Bromus rigidus* Roth.

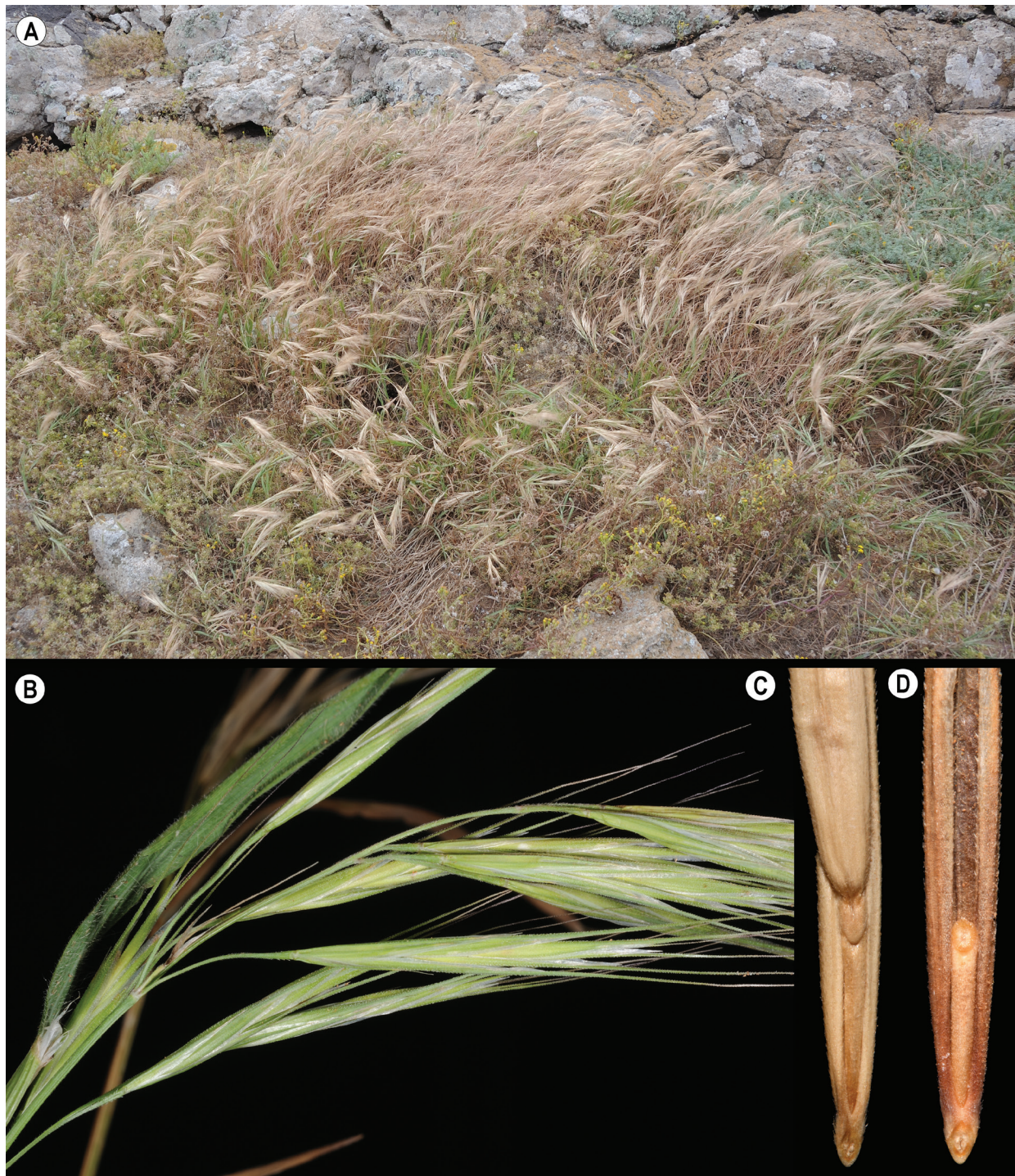


Figure 5. *Bromus rigidus* Roth., based on M. Sequeira, M. Gouveia & C. Góis Marques, MS10064 [UMAD 13987]. A) *B. rigidus* as found in the field; B) details of the spikelets; C) and D) details of the callus. (Photos: M. Menezes de Sequeira).

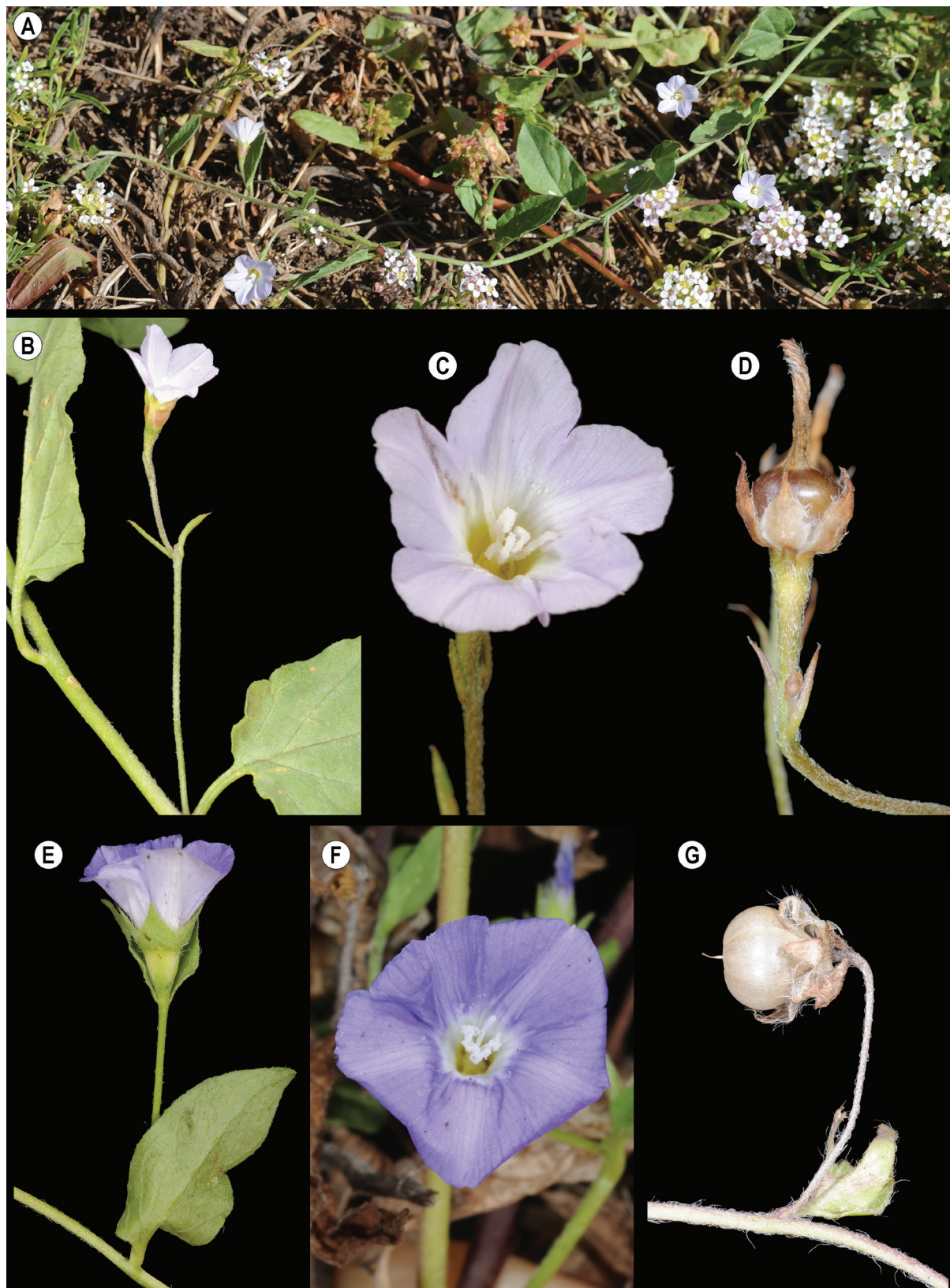


Figure 6. *Convolvulus siculus* subsp. *elongatus* Willd. ex Batt. Based on M. Sequeira, M. Gouveia & C. Góis Marques, MS10030 [UMAD 13993]. A) aspect of the ecology; B) detail of the flower and bracts, showing minute bracteoles not overlapping the sepals; C) detail of the light blue corolla; D) detail of capsule showing a long pedicel (see G, for the typical subspecies). *Convolvulus siculus* L. subsp. *siculus*, based on M. Sequeira & C. Bairos MS9649 [UMAD s/n]. E) detail of the flower and bracts, showing large bracteoles overlapping the sepals; F) detail of the darker blue corolla; G) detail of capsule showing a short pedicel subsessile capsule. (Photos: M. Menezes de Sequeira).

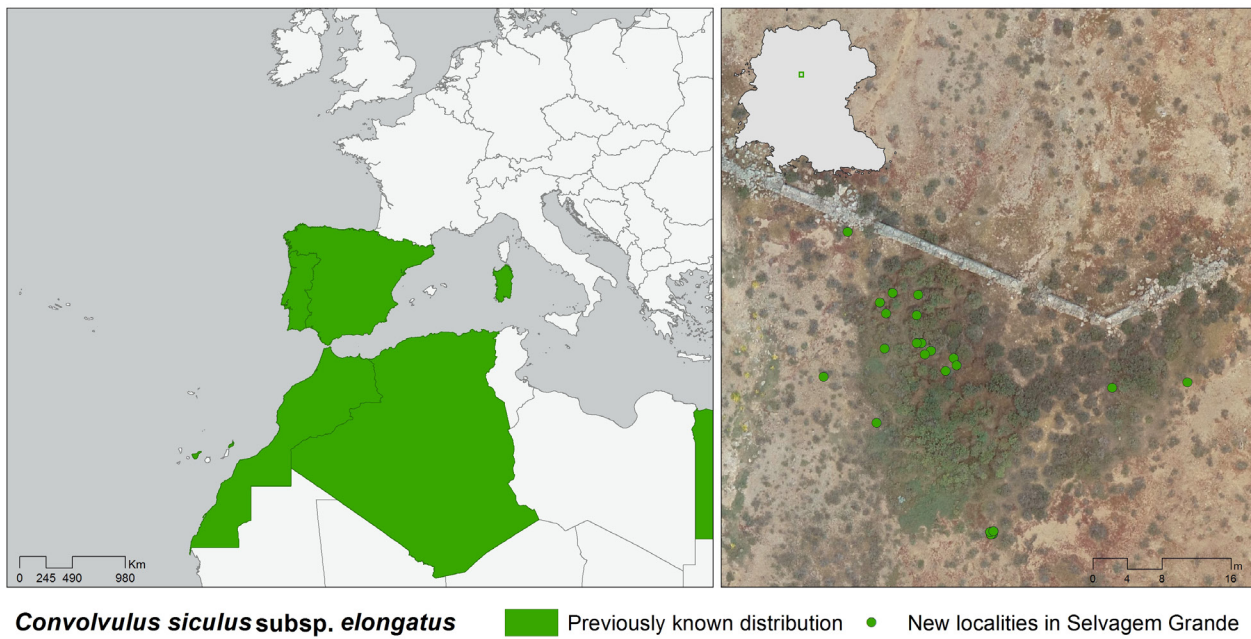


Figure 7. Distribution of *Convolvulus siculus* subsp. *elongatus* Willd. ex Batt.



Figure 8. Type specimen of *Misopates salvagensis* D.A.Sutton [BM00072139]. A) label and fruits; B) specimen with fruits, lacking leaves and flowers (<https://plants.jstor.org/stable/viewer/10.5555/al.ap.specimen.bm00072139>).



Figure 9. Specimen of *Misopates salvagensis* D.A. Sutton originally identified as *Misopates* sp. (MADM506); A) full specimen; B) detail of the original label; C) detail of the fruit; D, detail of the flower; E) original photo of the plant in 1985 taken by F. Zino.

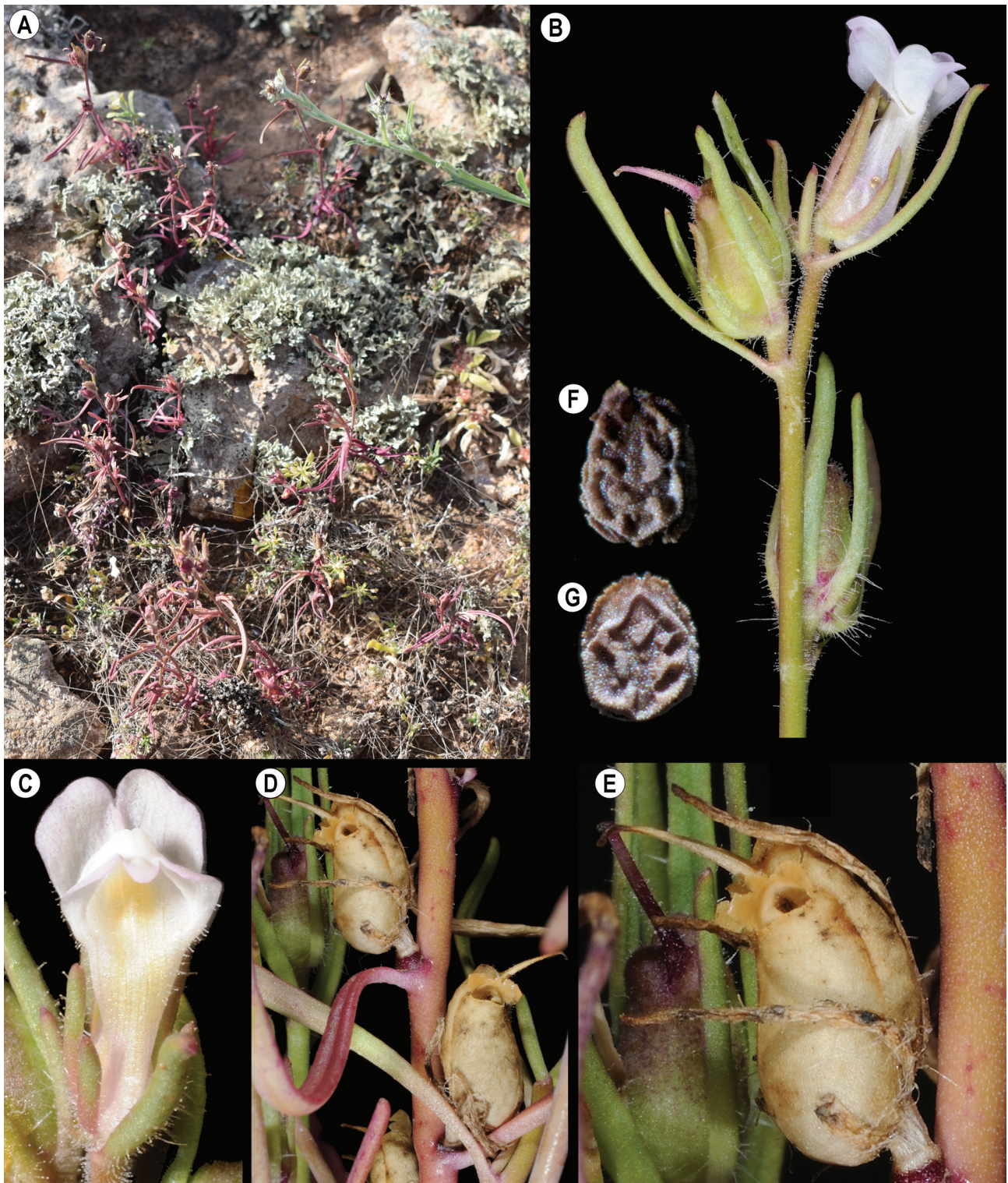


Figure 10. *Misopates salvagense* D.A.Sutton., based on *M. Sequeira, M. Gouveia & C. Góis Marques, MS10022* [UMAD 13940]. A) aspect of the plant community, showing several fructifying specimens, *Aizoon canariensis* and *Lobularia canariensis* subsp. *rosula-venti*. B) detail of the flower, fruit and leaves, lateral view; C) detail of the flower, abaxial view, sepals and corolla tube with glandular hairs; D) mature capsules; E) detail of a mature capsule showing the persistent style and open pores; F) and G) seeds with rugose-foveate appearance composed of anastomosed ridges as described by Sutton (1988). (Photos: A, C. A. Góis-Marques; B to G, M. Menezes de Sequeira).

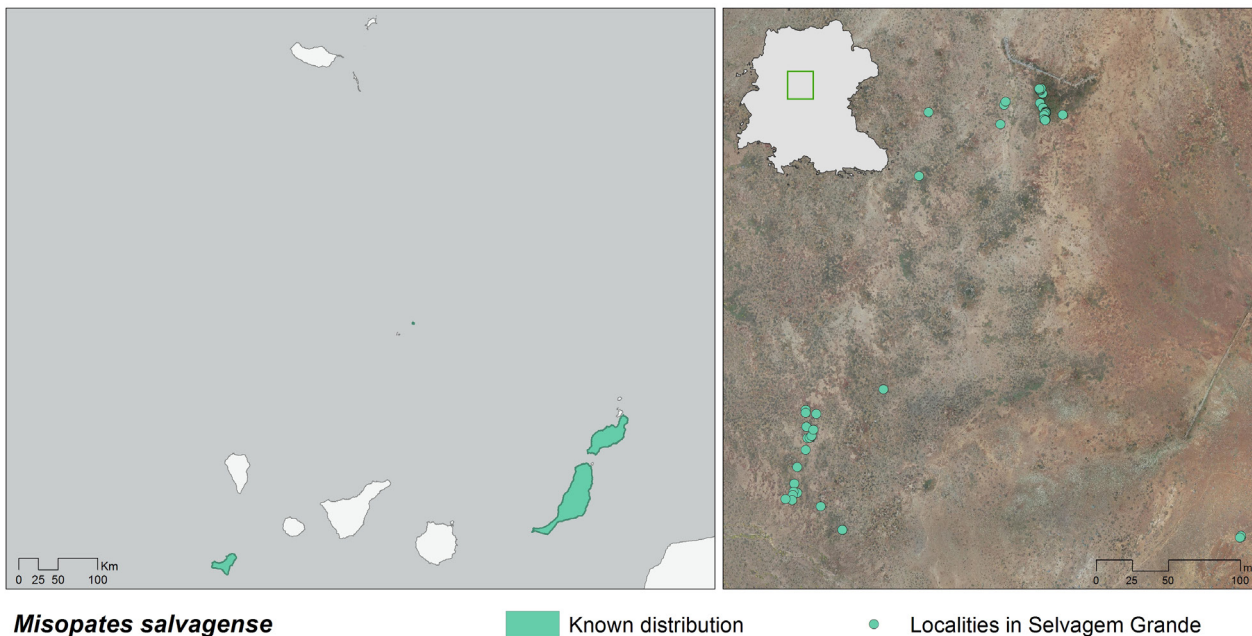


Figure 11. Distribution of *Misopates salvagense* D.A.Sutton.

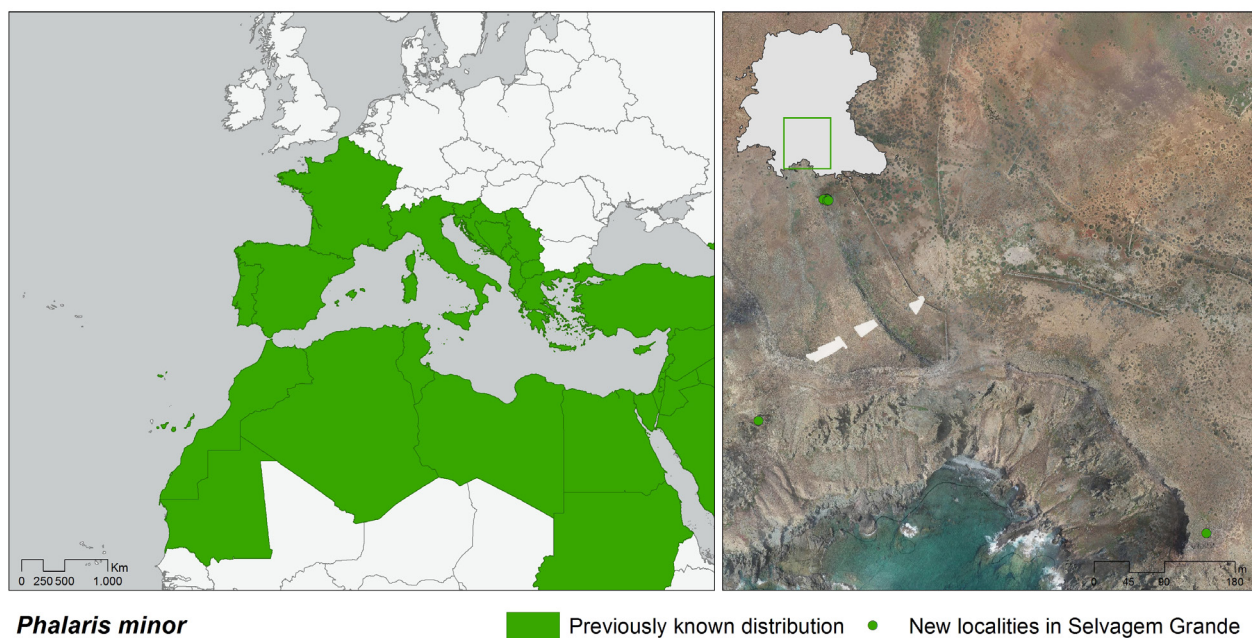


Figure 12. Distribution of *Phalaris minor* Retz in Selvagem Grande island according to studied material.

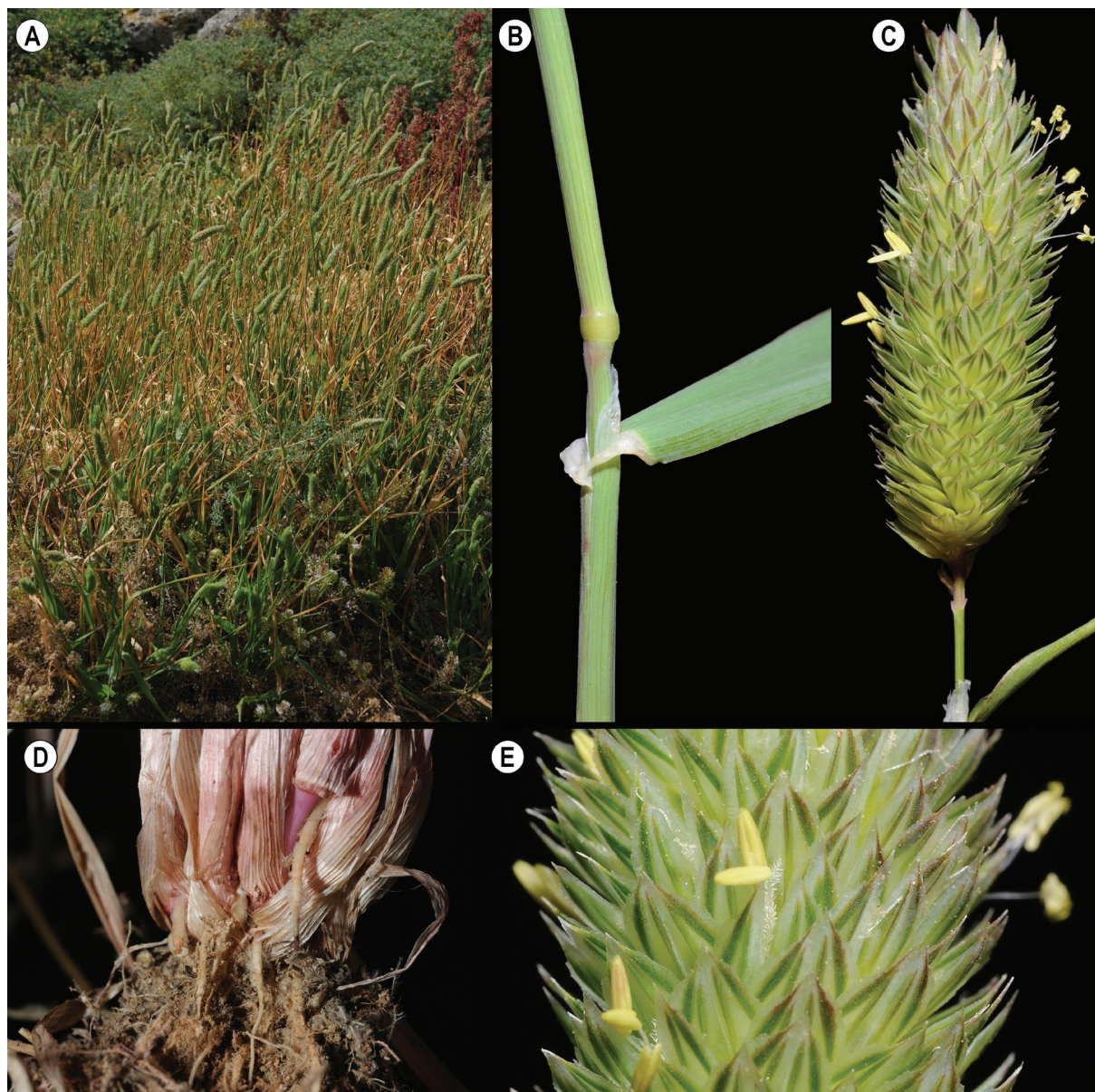


Figure 13. *Phalaris minor* Retz.. based on M. Sequeira, M. Gouveia & C. Góis Marques, MS10126 [UMAD 13928]. A) aspect of the habitat; B) pulvinus, node, ligula, and lamina; C) aspect of spike at anthesis; D) base of the stems (not bulbous); E) detail of the spike with glumes winged narrowed above (margin toothed). (Photos: M. Menezes de Sequeira).

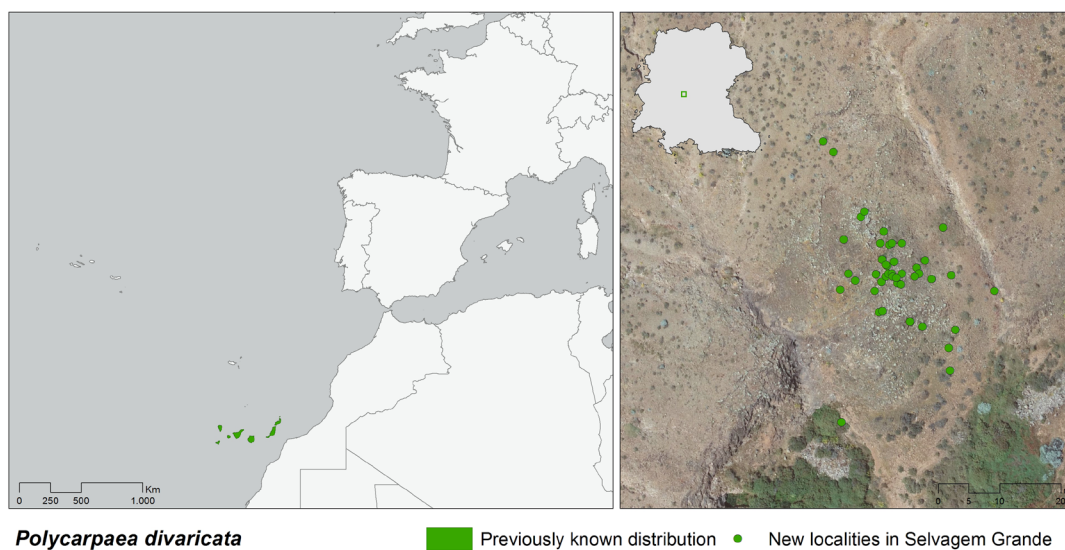


Figure 14. Distribution of *Polycarpaea divaricata* (Aiton) Poir. ex Steud.

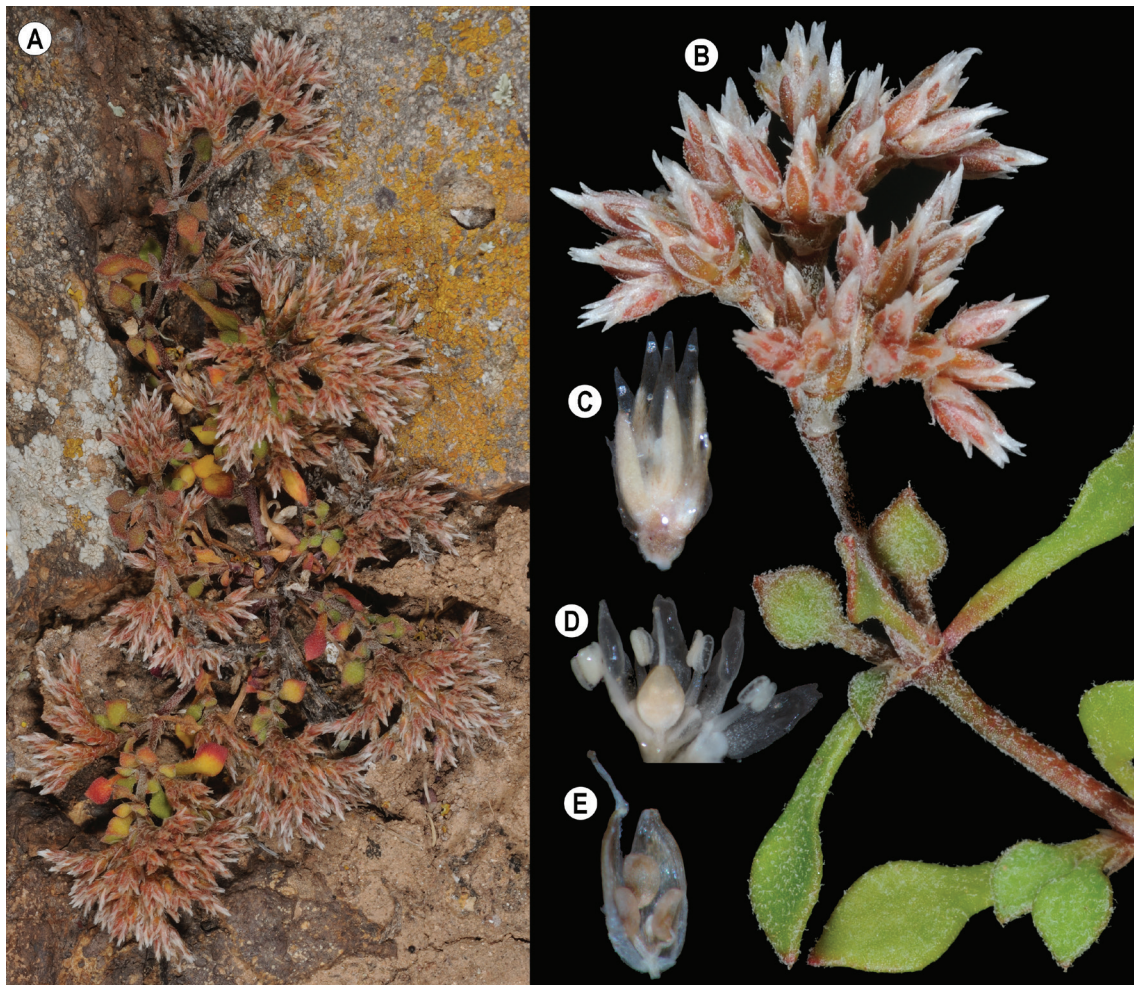


Figure 15. *Polycarpaea divaricata* (Aiton) Poir ex Steud. Based on M. Sequeira, M. Gouveia & C. Góis Marques MS10151 [UMAD 13892]. A) aspect of the habitat; B) flowering plant; C) detail of the flower, showing the sepals with broad whitish scarious margins and brown midrib; D) details of the flower showing the oblong-ovate hyaline petals, with emarginate apex, stamens, and pistil; E) capsule with seeds. (Photos: M. Menezes de Sequeira)



Figure 16. *Spargularia diandra* (Guss.) Boiss., based on M. Sequeira, M. Gouveia & C. Góis Marques, MS10156 [UMAD 13929]. A) aspect of a full plant; B) detail of a capsule; C) inflorescence with fructifying flowers; D) detail of leaves and stipules. (Photos: M. Menezes de Sequeira).

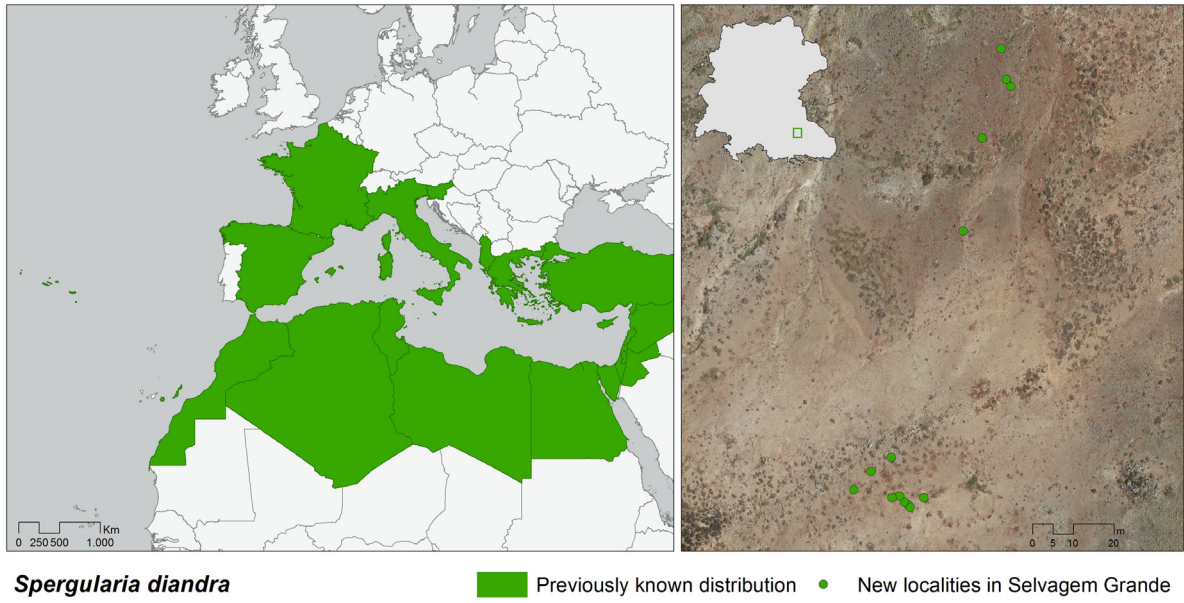


Figure 17. Distribution of *Spergularia diandra* (Guss.) Boiss.

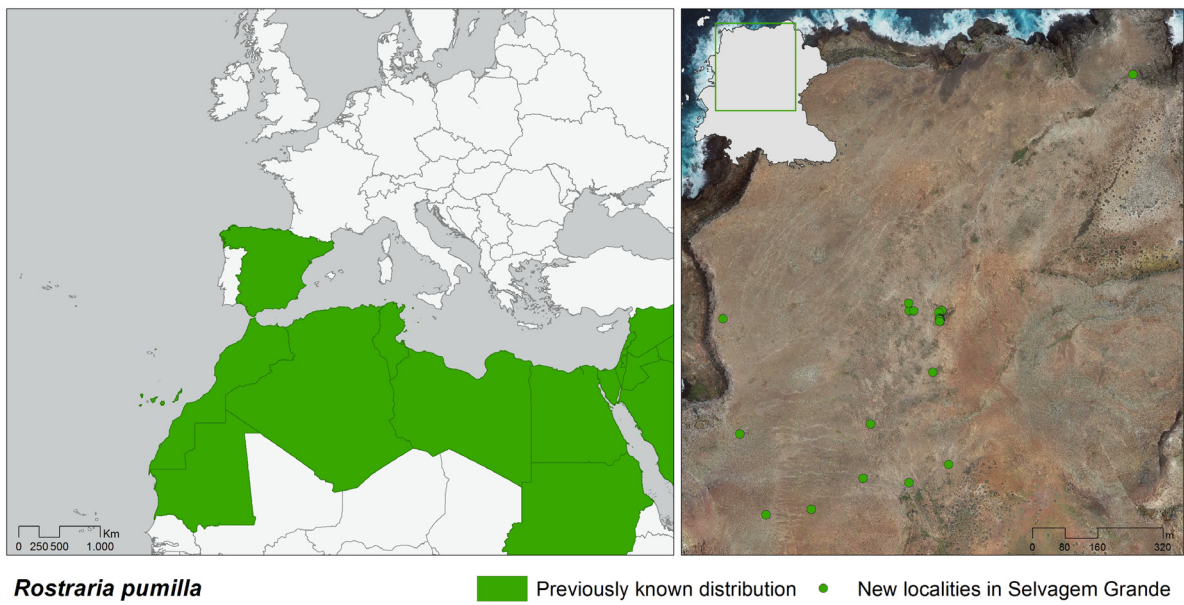


Figure 18. Distribution of *Rostraria pumila* (Desf.) Tzvelev.



Figure 19. *Rostraria pumila* (Desf.) Tzvelev., based on *M. Sequeira, M. Gouveia & C. Góis Marques, MS10016* [UMAD 13910]. A) habitat; B) aspect of the full plant, short panicles; C) panicle; D) detail of the panicle, hairiness of the glumes and aristate lemmas; E) and F) detail of a spikelet, acute densely hairy glumes non aristulate lemmas. (Photos: M. Menezes de Sequeira).

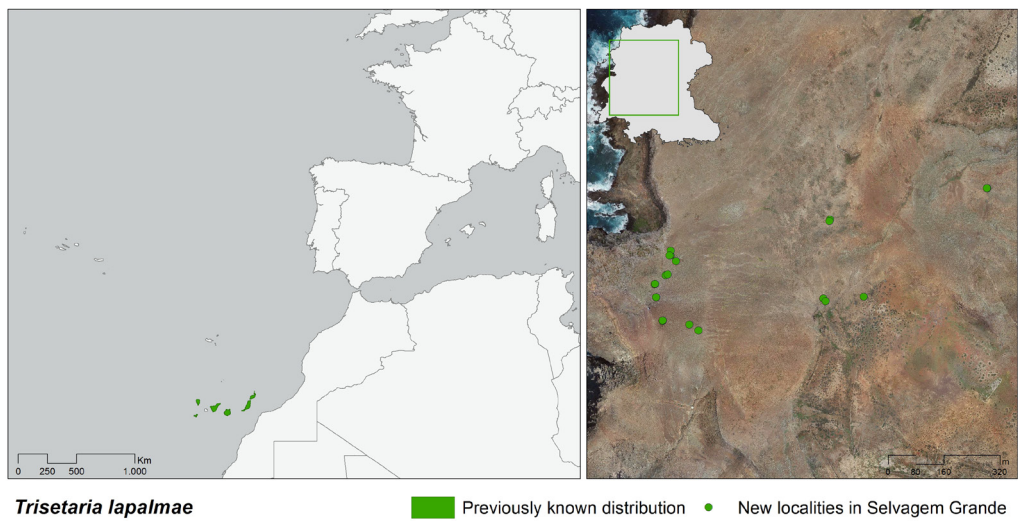


Figure 20. *Trisetaria lapalmae* H.Scholz, distribution.

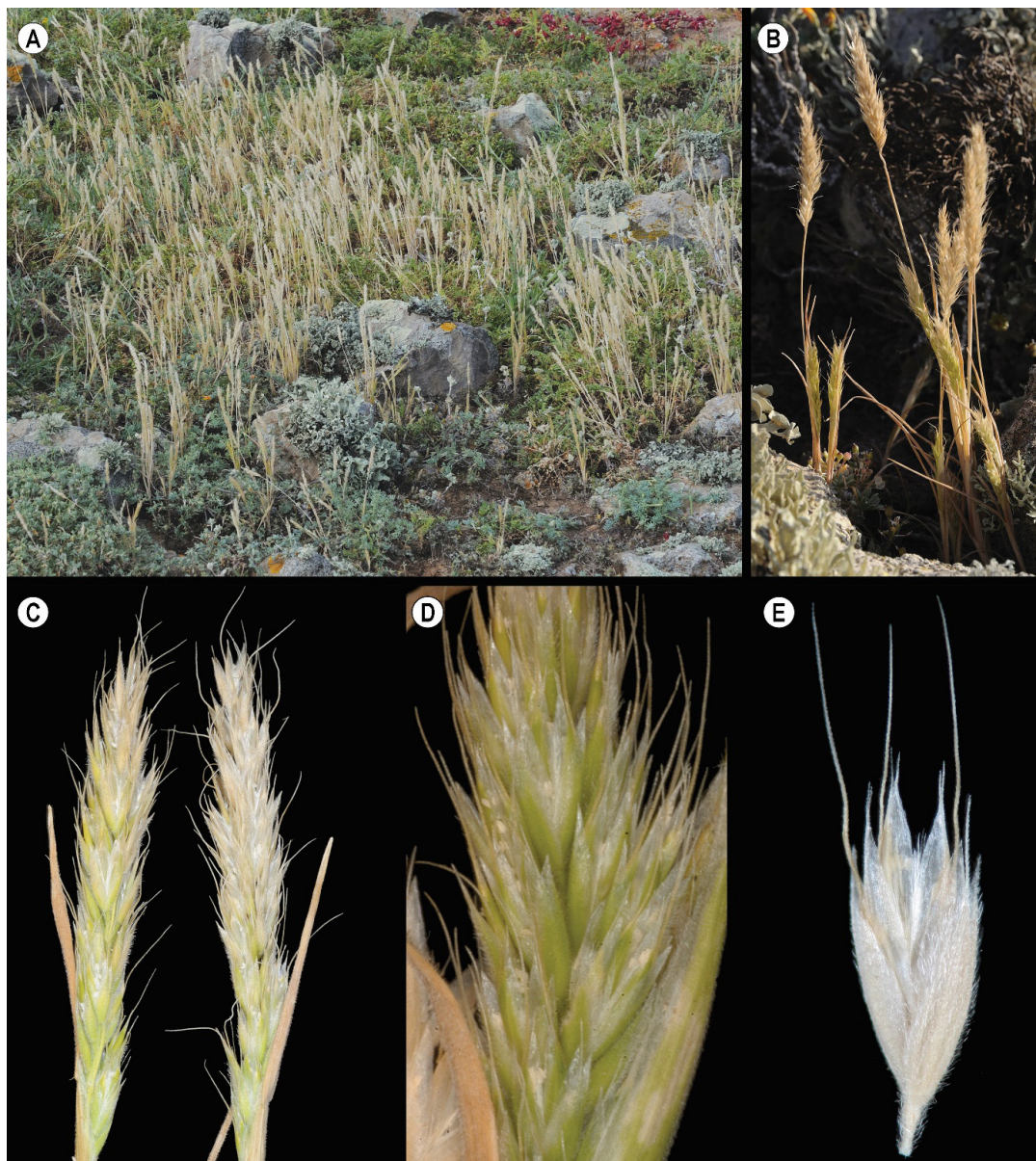


Figure 21. *Trisetaria lapalmae* H.Scholz, based on M. Sequeira, M. Gouveia & C. Góis Marques, MS10083 [UMAD 13904]. A) habitat; B) aspect of the full plant, showing the typical inflate upper leaf involving the panicle; C) panicle showing the reduced lamina of the upper leaf, and long aristate spikelets; D) detail of the panicle; E) detail of a spikelet, acuminate glumes, lema aristulate with long geniculate aristae. (Photos: M. Menezes de Sequeira).

