

# Contribution to the knowledge of the natural hybrids of the genera *Aeonium* and *Greenovia* (Crassulaceae) in La Gomera, Canary Islands

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## Abstract

CONTRIBUTION TO THE KNOWLEDGE OF THE NATURAL HYBRIDS OF THE GENERA *AEONIUM* AND *GREENOVIA* (CRASSULACEAE) IN LA GOMERA, CANARY ISLANDS.— As part of a chorological and eco-biological study carried out in La Gomera with the nine species, two subspecies, and two varieties that make up the genera *Aeonium* and *Greenovia*, seven new hybrids were discovered. These add to the ten hybrids previously described by other authors on the island. The botanical descriptions of five new hybrids are provided. Since we only know the vegetative parts in the remaining two, some chorological, morphological, and taxonomic data are disclosed and photographically illustrated. A differential diagnosis of the new hybrids with other previously described nothotaxa on the island is made, especially with those that share one of the parents. The nomenclatural types were deposited in the LPA and TFC Canary herbaria.

Key words: *Aeonium*; Canary Islands; chorology; ecology; *Greenovia*; La Gomera; new hybrids; taxonomy.

## Resumen

CONTRIBUCIÓN AL CONOCIMIENTO DE LOS HÍBRIDOS NATURALES DE LOS GÉNEROS *AEONIUM* Y *GREENOVIA* (CRASSULACEAE) EN LA GOMERA, ISLAS CANARIAS.— Como parte del estudio fitocorológico y eco-biológico realizado en La Gomera con las nueve especies, dos subespecies y dos variedades que componen los géneros *Aeonium* y *Greenovia*, fueron descubiertos siete híbridos nuevos, que se suman a los 10 híbridos anteriormente descritos por otros autores en la isla. Se aportan las descripciones botánicas completas en cinco de los nuevos híbridos descubiertos, y en los dos restantes, puesto que solo conocemos la parte vegetativa, se dan a conocer algunos datos corológicos, morfológicos y taxonómicos, y se ilustran fotográficamente las plantas. Se hace el diagnóstico diferencial de los nuevos híbridos con otros nototaxones descritos anteriormente en la isla, especialmente con los que compartían alguno de los parentales. Los tipos nomenclaturales fueron depositados en los herbarios canarios LPA y TFC.

Palabras clave: *Aeonium*; corología; ecología; *Greenovia*; Islas Canarias; La Gomera; nuevos híbridos; taxonomía.

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## INTRODUCTION

Of all the genera that make up the rich and varied flora of the Canary Islands, *Aeonium* Webb & Berthel. has the largest number of species (Bramwell & Bramwell, 2001; Acebes-Ginovés *et al.*, 2010; Schönfelder & Schönfelder, 2018; BIOTA, 2021; Sauerbier *et al.*, 2023) and has undoubtedly generated the largest number of natural hybrids in the entire archipelago, with about 80 known nothotaxa. Although hybrids of the genus *Aeonium* usually disappear from nature in the first filial generation, they can produce gene dilution in the pure species with which they coexist since pollen viability in some hybrids is 80–90% (Liu, 1989), which compromises their reproduction and makes them more vulnerable to various threats in the wild (Levin *et al.*, 1996; Francisco-Ortega *et al.*, 2000; Brilhante *et al.*, 2021). Therefore, it is important to recognize them in nature, describe them, and deposit material well-preserved in the herbarium collections since these can contribute to understanding the phylogeny and evolution of this group of plants.

The rugged orography, the wide altitudinal range, the enormous variety of habitats, and the rich diversity of vegetation make La Gomera an optimal natural laboratory for chorological and eco-biological studies, such as the one we have carried out with the genera *Aeonium* Webb & Berthel. and *Greenovia* Webb & Berthel. As can be seen in the work of Voggenreiter (1999), the genus *Aeonium* is widely represented on La Gomera and has 12 taxa distributed throughout the island. While the genus *Greenovia* is only represented by *G. diplocycla* Webb ex Bolle, which is distributed over a large part of the island.

So far, ten natural hybrids previously described by other authors were known, and in this work, seven new hybrids discovered on the island have been added, four between species of *Aeonium* and three intergeneric hybrids between *Aeonium* and *Greenovia* (Table 1). We do not agree with the fusion of the genera *Aeonium* and *Greenovia* based solely on molecular parameters without considering the outstanding morphological and functional characters that differentiate the two genera (Arango, 2021a, 2023b). Therefore, the crosses between *Aeonium*

**Table 1.** List of hybrids of the genus *Aeonium* discovered so far in La Gomera. (1), only the vegetative part is known.

	Parental 1	Parental 2	Year
<b>Hybrids previously described</b>			
<i>A.</i> × <i>aguajilvense</i> Bañares	<i>A. castello-paivae</i>	<i>A. gomerense</i>	1996
<i>A.</i> × <i>beltranii</i> Bañares	<i>A. decorum</i> var. <i>decorum</i>	<i>A. canariense</i> subsp. <i>latifolium</i>	1986
<i>A.</i> × <i>bravoamum</i> Bramwell & Rowley ex Heath.	<i>A. castello-paivae</i>	<i>A. lindleyi</i> subsp. <i>viscatum</i>	1992
<i>A.</i> × <i>castellodecorum</i> Bañares	<i>A. castello-paivae</i>	<i>A. decorum</i> var. <i>decorum</i>	1986
<i>A.</i> × <i>castelloplanum</i> Bramwell & Rowley ex Heath.	<i>A. castello-paivae</i>	<i>A. canariense</i> subsp. <i>latifolium</i>	1992
<i>A.</i> × <i>holospathulatum</i> nothovar. <i>sanchezii</i> Bañares	<i>A. arboreum</i> var. <i>rubrolineatum</i>	<i>A. spathulatum</i>	1996
<i>A.</i> × <i>perezii</i> Bañares	<i>A. appendiculatum</i>	<i>A. decorum</i> var. <i>decorum</i>	1990
<i>A.</i> × <i>vegamorae</i> Bramwell & Rowley ex Heath.	<i>A. canariense</i> subsp. <i>latifolium</i>	<i>A. lindleyi</i> subsp. <i>viscatum</i>	1992
<i>A.</i> × <i>sancti-sebastianii</i> Bramw. & Rowl. ex Heath.	<i>A. canariense</i> subsp. <i>latifolium</i>	<i>A. saundersii</i>	1992
× <i>Greenonium laxiflorum</i> J. M. Macarrón & Bañares	<i>A. decorum</i> var. <i>decorum</i>	<i>G. diplocycla</i>	2007
<b>Hybrids provided in this work</b>			
<i>A.</i> × <i>dendroides</i> Arango nothosp. nov.	<i>A. decorum</i> var. <i>decorum</i>	<i>A. saundersii</i>	2023
<i>A.</i> × <i>praedictum</i> Arango nothosp. nov.	<i>A. decorum</i> var. <i>decorum</i>	<i>A. gomerense</i>	2023
<i>A.</i> × <i>pendulum</i> Arango nothosp. nov.	<i>A. saundersii</i>	<i>A. spathulatum</i>	2023
<i>A.</i> × <i>rhubifolium</i> Arango nothosp. nov. <sup>(1)</sup>	<i>A. decorum</i> var. <i>decorum</i>	<i>A. lindleyi</i> subsp. <i>viscatum</i>	2023
× <i>Greenonium haeckelii</i> Arango nothosp. nov.	<i>A. castello-paivae</i>	<i>G. diplocycla</i>	2023
× <i>Greenonium lajense</i> Arango nothosp. nov.	<i>A. saundersii</i>	<i>G. diplocycla</i>	2023
× <i>Greenonium cabreræ</i> Santos nothovar. <i>ojilense</i> Arango nothovar. nov. <sup>(1)</sup>	<i>A. spathulatum</i>	<i>G. diplocycla</i>	2023

and *Greenovia* in this work have been treated as intergeneric hybrids, according to the ICNB regulations (Turland *et al.*, 2018).

An inductive analysis of the data obtained in this research project, and in the study of many natural hybrids in the other mountainous islands of the archipelago (T, P, GC, H), show that the only two effective reproductive barriers in the genus *Aeonium* are the allopatry of the species and the different flowering time (Arango 2015, 2016a, b, 2017, 2019a, b, c, 2021a, b, c, 2023a). This is because the transfer of pollen through biotic and abiotic pollinators does not work between disjunct geographic areas. These observations are part of a series of fundamental and constant rules governing F1 hybridization in the genus *Aeonium*, which have been synthesized and will be published separately.

The overall results of this research have been divided into two articles for publication. The first article includes the results related to the natural history and the rules governing F1 hybridization in the genus *Aeonium* (O. Arango, unpubl. data). This second article presents the taxonomic results of the work, and whose main objective is to describe and illustrate seven new nothotaxa discovered in the genus *Aeonium* in La Gomera.

## MATERIALS AND METHODS

Based on the areal distribution of the species that compose the genera *Aeonium* and *Greenovia* in La Gomera provided by Voggenreiter (1999), fieldwork was carried out at numerous points of the island to collect chorological, ecological, and reproductive biology data of the taxa of both lineages and their hybrids. Special attention was paid to the identification of new nothotaxa not known to science.

The search for new hybrids was carried out according to the targeted search method developed previously (Arango, 2021c). The method consists of three steps: (1) the distribution of all the species in the island was taken from Voggenreiter (1999) and later authors; (2) for each pair of species with overlaps in their areas of distribution, the literature was searched to check whether hybrids between them had been described; (3) for those species pairs that did not have hybrids described, the areas of overlap were extensively searched for potential

hybrids. The new nothotaxa were recognized by having been found living *inter parentes* and by the morphological characteristics they presented, according to those characters with taxonomic value used by Praeger (1929, 1932) and Liu (1989) in the genus *Aeonium*. When plants were not flowering at the time of discovery, they were monitored *in situ* or grown until flowering. A differential diagnosis of the new hybrids was made by comparing them with the protologues of hybrids published by other authors in La Gomera, and with their herbarium types, especially when there was a coincidence between any of the parents. The study of fresh specimens and herbarium sheets was carried out using a stereoscopic microscope of 4–8X magnification. Metric data were obtained with an electronic digital caliper (Digital Caliper BV001, Ireland CE) and small structures were measured on millimeter paper under the stereoscopic magnifier. The exact color of the flowers was established by comparison with the Pantone® color palette (<http://www.pantone-colours.com/>). All new hybrids were photographed in digital format and the iconography is available to those interested in *Aeonium* hybrids. The types were deposited at LPA and TFC.

## RESULTS AND DISCUSSION

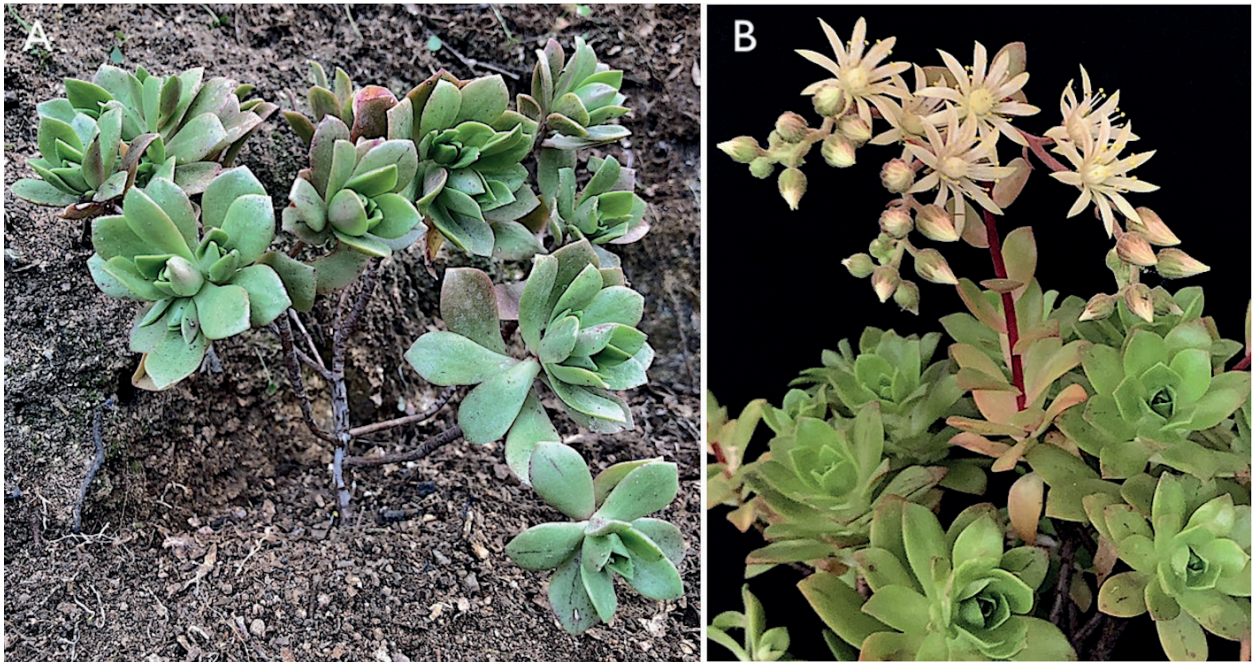
### *Aeonium* × *dendroides* Arango **nothosp. nov.**

[*Aeonium decorum* var. *decorum* Webb ex Bolle × *Aeonium saundersii* Bolle]. Fig. 1.

Holotype: Spain, Canary Islands: La Gomera, El Atajo, near Embalse de Chegelpes, 320 m, 28° 07' 05" N, 17° 10' 07" W, 02.I.2015, O. Arango (TFC 53260). Isotype: *ibid.*, El Atajo, near Embalse de Chegelpes, 02.I.2015, O. Arango (LPA 40744–40745).

**Diagnosis:** *Aeonium* × *dendroides* differs from *A. ×praedictum* Arango by the miniature tree-like plant habit, 20 cm tall, smaller rosettes (7–10 cm), fully pubescent obovate-cuneate leaves like those of *A. saundersii* Bolle; smaller inflorescence (8–10 cm long), lax, with creamy-yellow flowers, and all floral structures provided with glandular pubescence. Likewise, it differs from ×*Greenonium lajense* Arango, another hybrid of the area with the participation of *A. saundersii*, since the plants have





**Figure 1.** *Aeonium*  $\times$ *dendroides* Arango nothosp. nov.: (A), aspect of the plant in its habitat; (B), inflorescence (photographs: O. Arango).

a greater number of branches arranged in the form of a miniature tree; the flowers are 8 parted, cream yellow, and all the floral structures are pubescent. Finally, it differs from *A. ×beltranii* Bañares (TFC 19946!), a hybrid present in the area in which *A. decorum* Webb ex Bolle participates, by the branched habit of the plants, by the shape and size of the leaves, because the inflorescence is much smaller, with few flowers and these are creamy yellow.

**Description:** perennial subshrub plant, intermediate in size between the parents, 15–20 cm tall, consisting of a basal stem that divides mid-height into 3–5 branches, which divide progressively, giving the appearance of a miniature tree. Leaf rosette flattened, 7–10 cm in diameter, lax. Phyllotaxy: 3/8. Leaves ovate-cuneate, pubescent, light green,  $5 \times 2 \times 0.4$  cm, acute apex and cuneate base, margin provided in the distal half with short conical cilia and glandular hairs interspersed. Inflorescence in lax panicle, 8–10 cm high, pubescent, with bracts as a smaller leaf in the lower part and 2–3 floriferous branches, each with 8–10 flowers. Calyx with elongated triangular sepals,  $3.5 \times 1.5$  mm, densely pubescent. Flowers with 8 (7–9) parted, radial flat corolla, 2.2 cm in diameter; petals linear-lanceolate, cream-yellow and greenish on the underside,  $9 \times 2.5$  mm, pubescent. Stamens white with cylindrical glabrescent filaments and rounded gold yellow

anthers. Carpels white, glabrescent, with ovaries  $3 \times 1$  mm; styles 3 mm long, moderately divergent. Nectariferous scales absent. Fig. 2.

**Phenology:** Flowering April to June.

**Etymology:** The infraspecific epithet derives from the Greek *déndron*: tree, and *eidés*: form, alluding to the small tree-like appearance of the plants.

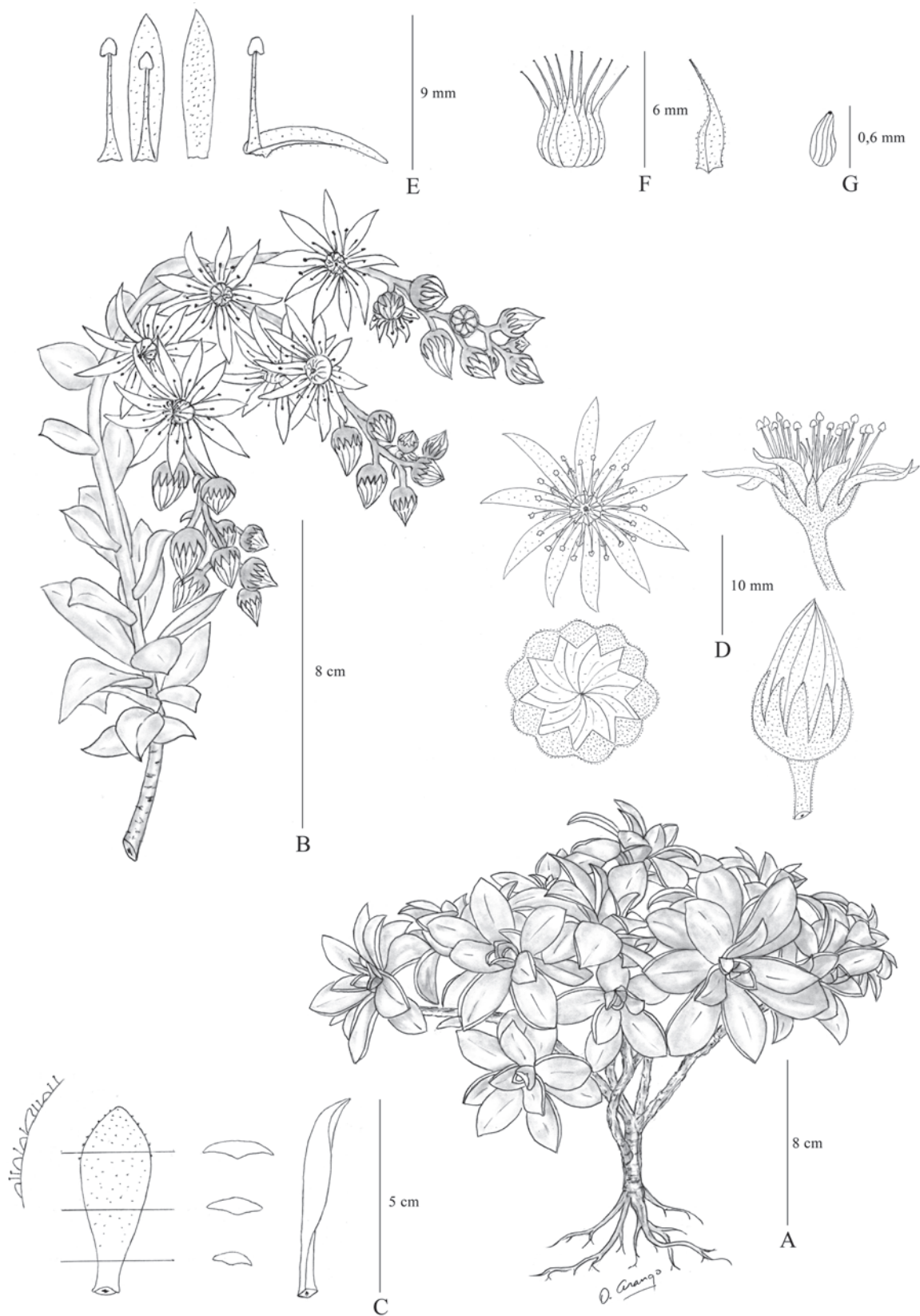
**Habitat:** It is a sporadic natural hybrid that was found living among parentals in rocky slopes, dry, and sunny habitats, on the Canary vegetation belt of the thermosclerophyllous forest, 200–800 m.

***Aeonium*  $\times$ *praedictum* Arango nothosp. nov.**

[*Aeonium decorum* var. *decorum* Webb ex Bolle  $\times$  *Aeonium gomerense* (Praeger) Praeger]. Fig. 3.

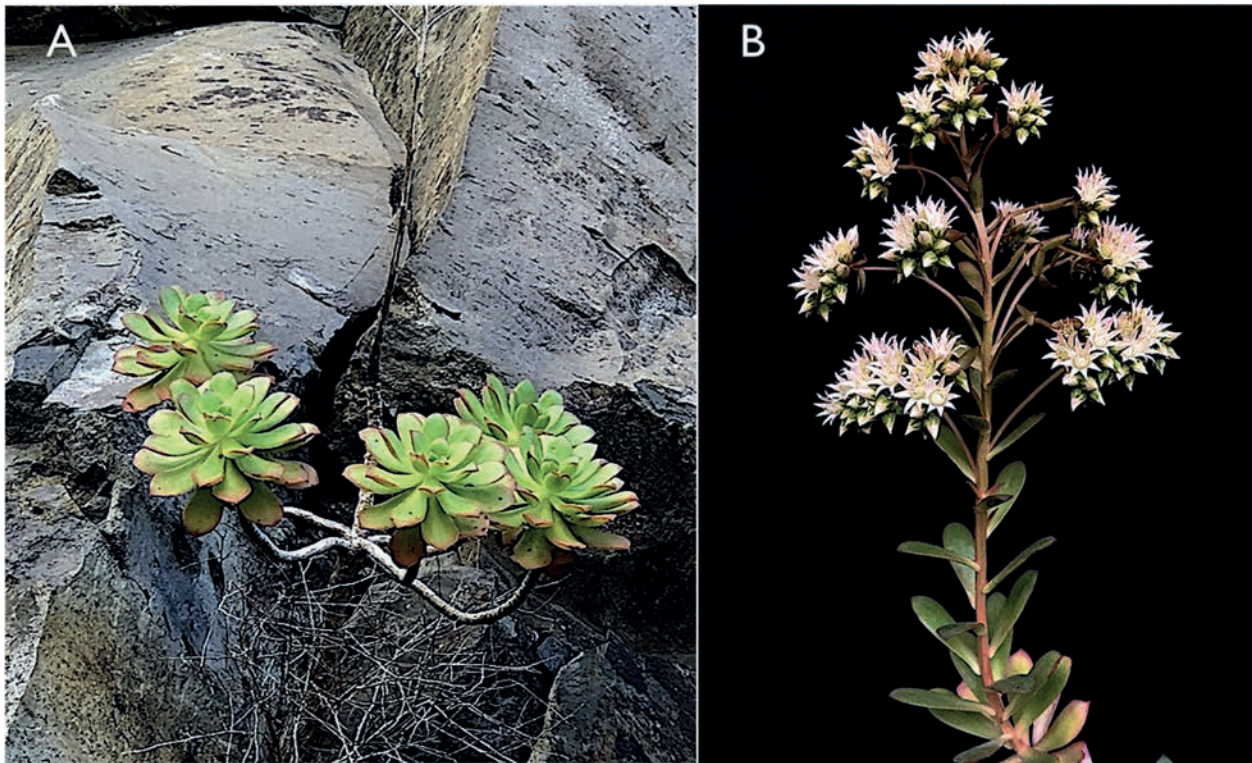
**Holotype:** Spain, Canary Islands: La Gomera, road GM-1 (old part TF-711), near Degollada de San Sebastian, 572 m,  $28^{\circ} 07' 45''$  N,  $17^{\circ} 10' 32''$  W, 08.I.2015, O. Arango (LPA 40746). **Paratype:** ibid., road GM-1, near Degollada de San Sebastian, 580 m, O. Arango (TFC 54562).

**Diagnosis:** The differential diagnosis of *A. ×praedictum* includes *A. ×aguajilvense* Bañares (TFC 37963!), an extremely rare hybrid that we have never seen in nature; however, an analysis of the



**Figure 2.** *Aeonium* × *dendroides* Arango nothosp. nov.: (A), plant habit; (B), inflorescence; (C), leaves and leaf margin detail; (D), flowers and flower buds; (E), petals on both sides and stamens; (F), carpels; (G), seeds (drawing: O. Arango).





**Figure 3.** *Aeonium* *xpraedictum* Arango nothosp. nov.: (A), aspect of the plant growing in its habitat; (B), inflorescence (photographs: O. Arango).

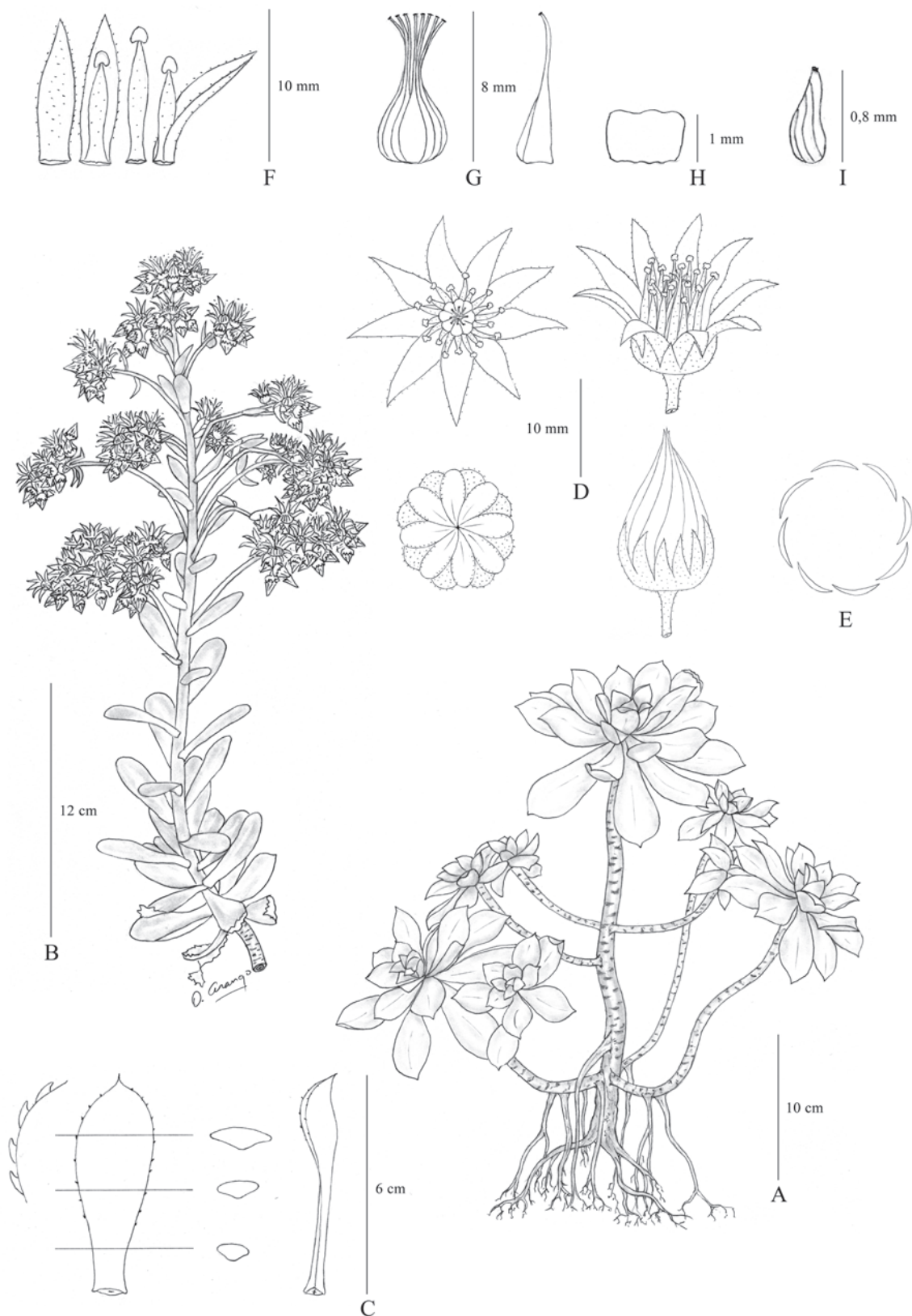
protologue and the study of the holotype, confirms that these are two different nothotaxa. The new hybrid differs from *A. xaguajlvense* because the plants consist of a central stem ending in a dominant rosette of larger size (10–12 cm) and 4 to 6 shaped-chandelier branches ending in smaller rosettes. The leaves are yellowish-green similar to those of *A. decorum*; the inflorescence is a conical panicle, glabrous, with bell-shaped flowers, broad petals in a left-contorted arrangement with the margin provided with glandular hairs, the filaments of the stamens are flat tapering. Likewise, *A. xpraedictum* differs from *A. xcastellodecorum* Bañares (TFC 19944!), another hybrid of the area with the participation of *A. decorum*, because the plants of the new hybrid are much less branched and the rosettes are larger (10–12 cm), the leaves are oblanceolate-cuneate, glabrescent, yellowish-green with a red border and the margin is provided in the distal half with conical cilia; the flowers have broad petals and are not laterally twisted as is usual in *A. castello-paivae* Bolle hybrids.

**Description:** Perennial subshrub plant, intermediate in size between the parents, 25–35 cm tall, formed by a central stem ending in a main rosette, which at mid-height divides into 4–6 shaped-chandelier

branches. Leaf rosette flattened, 10–12 cm in diameter, lax. Phyllotaxy: 5/13. Leaves oblanceolate-cuneate, glabrate, dark green with a red border,  $7 \times 2.2 \times 0.5$  cm, apiculate obtuse apex, cuneate base, margin provided on distal half with conical cilia 0.5 mm long. Inflorescence in conical panicle,  $18 \times 20$  cm, glabrous central axis provided with bracts similar to smaller leaves, and 12–15 dichotomous floral branches in the distal in two floriferous branches, each with 8–10 flowers. Calyx with elongated triangular sepals,  $6 \times 2$  mm, glabrate. Flowers with 8 (7–9) parted, bell-shaped corolla, 2.0–2.2 cm in diameter; petals lanceolate, acuminate,  $10 \times 3$  mm, glabrescent on the margin and abaxially, white with pink hues on the underside, in a left-contorted arrangement. Stamens white with flattened glabrescent filaments and yellow pale rounded anthers. Carpels with white ovaries, glabrous,  $4.0 \times 1.2$  mm; styles 4.0 mm long, white, glabrous, divergent in the distal part and capitate stigmas. Nectariferous scales white, quadrangular in shape,  $1.0 \times 0.8$  mm apically undulate. Fig. 4.

**Phenology:** Flowering April to June.

**Etymology:** The epithet infraspecific refers to botanist Volker Voggenreiter's prediction that human action would make this hybrid possible in nature.



**Figure 4.** *Aeonium*  $\times$  *praedictum* Arango nothosp. nov.: (A), plant habit; (B) inflorescence; (C) leaves and leaf margin detail; (D), flowers and flower buds; (E), levo-contorta arrangement of petals in the corolla; (F), petals on both sides and stamens; (G), carpels; (H), nectariferous scales; (I), seeds (drawings: O. Arango).



*Habitat:* It is a sporadic natural hybrid that was found living in a rocky and sunny area, on the Canary vegetation belt of the thermosclerophyllous forest, 200–800 m.

The distribution areas of *A. gomerense* (Praeger) Praeger and *A. decorum* var. *decorum* Webb ex Bolle, which previously did not coincide spatially, came into contact due the effect that Voggenreiter (1999) called “anthropogenic translocation following roads” which favored the progressive colonization of roadsides by *A. decorum* bringing the populations of both parents closer together and as predicted by the German botanist, hybridization between.

***Aeonium* × *pendulum* Arango nothosp. nov.**

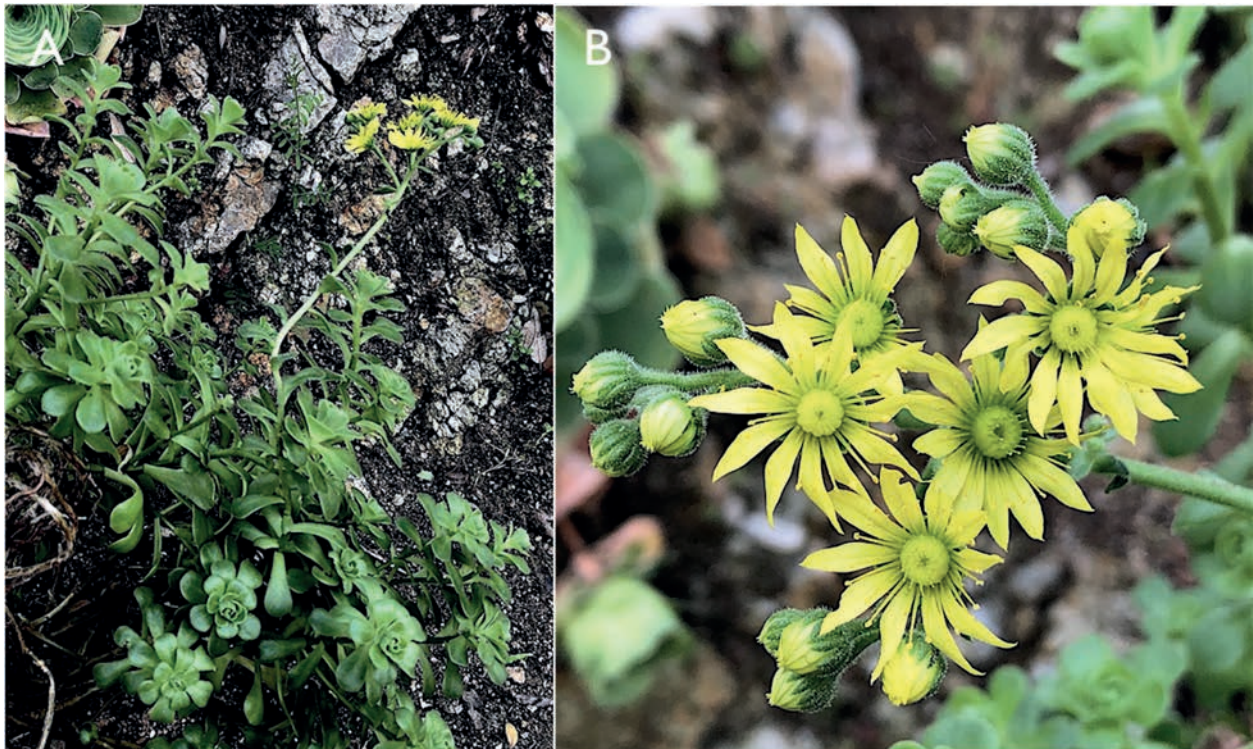
[*Aeonium saundersii* Bolle × *Aeonium spathulatum* (Hornemann) Praeger]. Fig. 5.

Holotype: Spain, Canary Islands: La Gomera, near Roque de Agando, 1050 m., 05.V.2012, O. Arango (TFC 53312).

*Diagnosis:* *Aeonium* × *pendulum* differs from *A. ×holospathulatum* nothovar. *sanchezii* Bañares, (TFC 19945!) the other hybrid from La Gomera

with the participation of *A. spathulatum* (Hornemann) Praeger, by the pendulous habit of the plants, formed by numerous thin intertwined stems ending in a single small (5–8 cm), flat rosettes that become globose in the dry season; the inflorescence is ostensibly smaller (5–6 cm high), with only 3 to 5 non-dichotomous floral branches, each with 5–7 large greenish-yellow pubescent flowers.

*Description:* Perennial subshrub plant, pendulous habit, intermediate in size between the parents, 40–50 cm long, consisting of a short basal stem that divides successively into numerous intertwined thin stems. Leaf rosette flattened, 5–8 cm in diameter, lax. Phyllotaxy: 3/8. Leaves spatulate-cuneate, pubescent, light green, 3 × 2 × 0.3 cm, rounded apex, cuneate base, margin with rounded cilia and glandular hairs interspersed. Inflorescence small, lax, 6 × 5 cm long, densely glandular-pubescent, provided with bracts like smaller leaves, and 3–5 dichotomous floral branches each with 5–7 flowers in progressive anthesis. Calyx with elongated ensiform-linear sepals, 5 × 1 mm, densely pubescent. Flowers with 11 (10–12) parted, radial flat corolla, 1.8–2.0 cm in diameter, petals lanceolate, acute apex apiculate, 8 × 2 mm, glabrous, greenish-yellow. Stamens are yellow with cylindrical



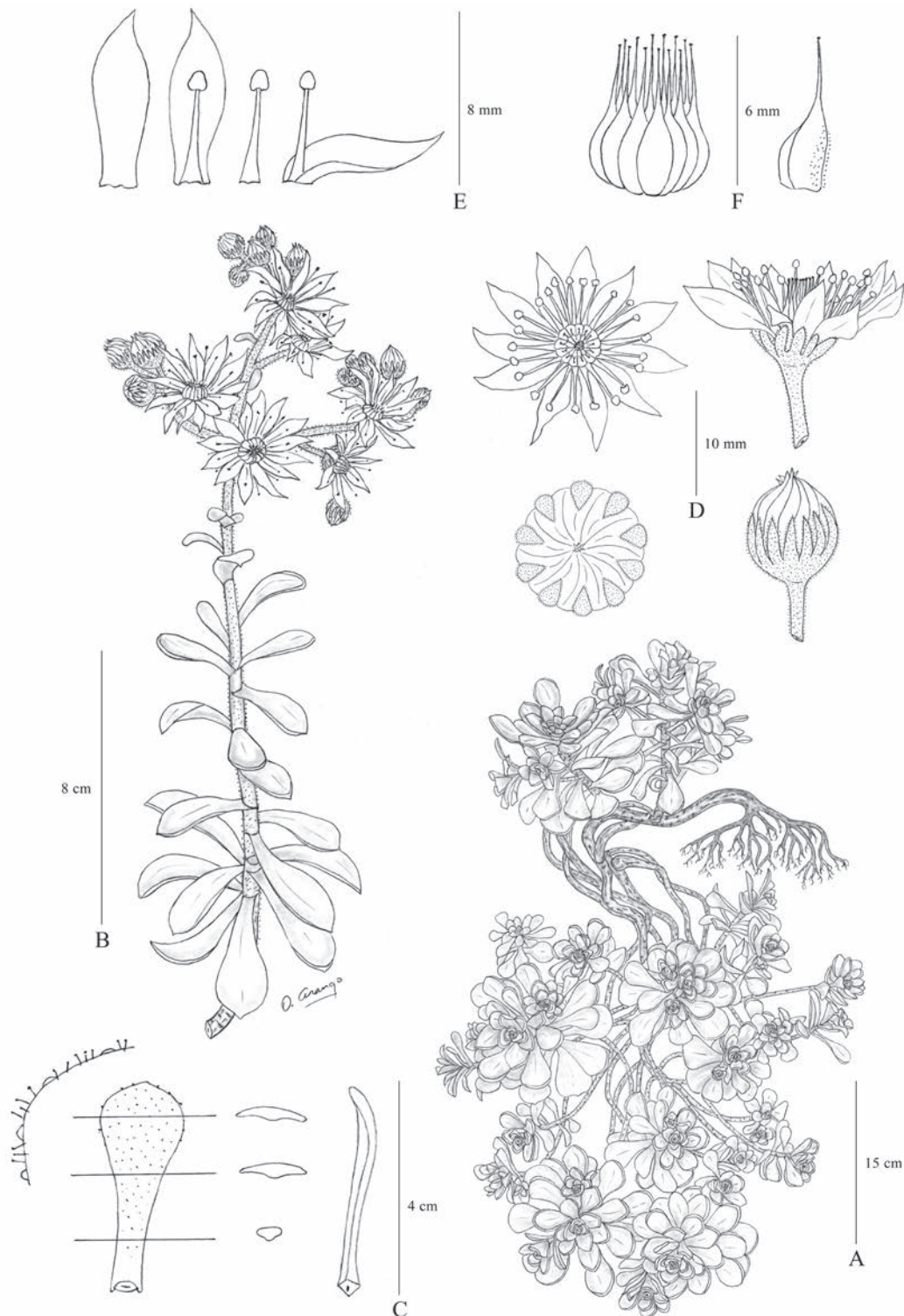
**Figure 5.** *Aeonium* × *pendulum* Arango nothosp. nov.: (A), aspect of the plant growing in its habitat; (B), inflorescence (photographs: O. Arango).



glabrous filaments and rounded pale yellow anthers. Carpels with barrel-shaped, greenish-yellow ovaries, glabrescent,  $3 \times 2$  mm; styles 3 mm long, glabrous, not divergent. Nectariferous scales absent. Fig. 6.

*Phenology*: Flowering April to June.

*Etymology*: The infraspecific epithet refers to the pendulous habit of plants.



**Figure 6.** *Aeonium*  $\times$  *pendulum* Arango nothosp. nov.: (A), plant habit; (B), inflorescence; (C), leaves and leaf margin detail; (D), flowers and flower buds; (E), petals on both sides and stamens; (F), carpels (drawing: O. Arango).

*Habitat*: It was found growing among the parents in a rocky habitat with little exposure to the sun, on the Canary vegetation belt of the humid forest of *Pinus canariensis* Chr. Sm. ex DC., 800–1200 m.

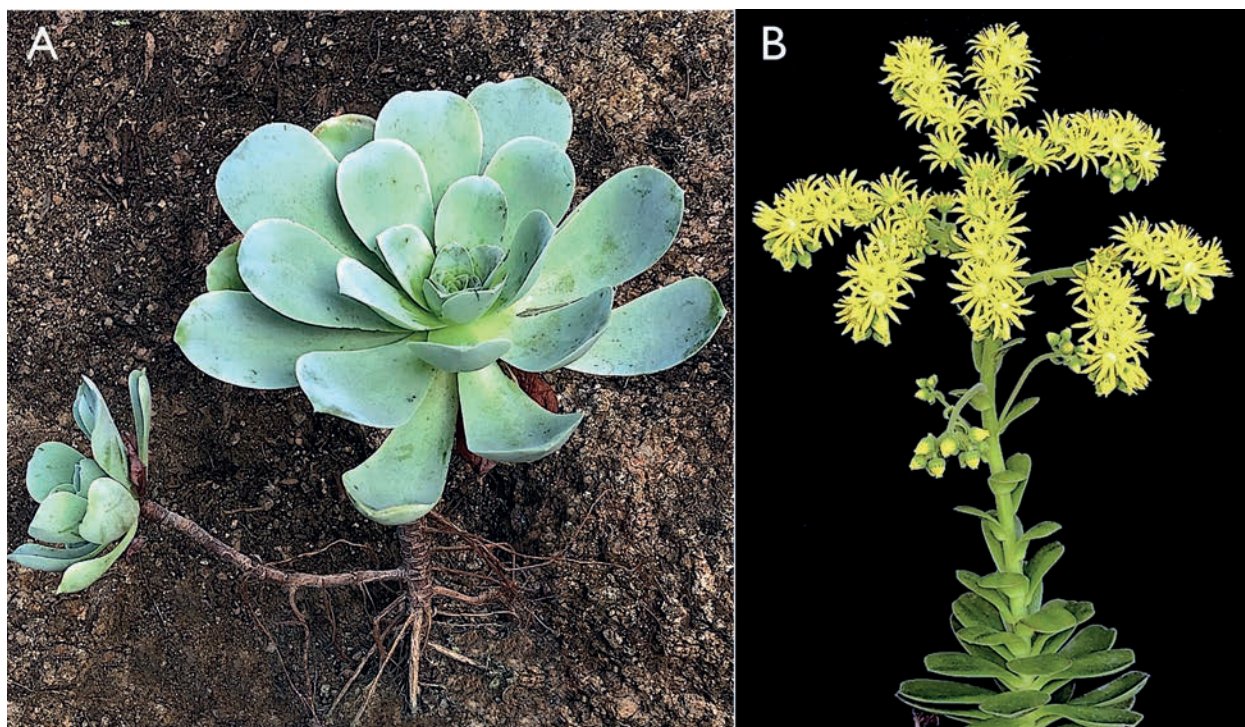
×*Greenonium haeckelii* Arango **nothosp. nov.**  
[*Greenovia diplocycla* Webb ex Bolle × *Aeonium castello-paivae* Bolle]. Fig. 7.

Holotype: Spain, Canary Islands: La Gomera, Hermigua, Barranco de Monteforte, near Embalse de Mulagua, 260 m, 08.V.2014, O. Arango, (TFC 53309). Paratype: *ibid.*, Barranco de Monteforte, near Embalse de Mulagua, O. Arango (LPA 40742–40743).

*Diagnosis*: ×*Greenonium haeckelii* differs from ×*G. lajense*, another intergeneric hybrid described in this article, in that the plants of ×*G. haeckelii* are sparsely or not branched (0–2). The central stem ends in a larger dominant rosette (12–15 cm); the leaves are spatulate-cuneate, glaucous green like the parents; the inflorescence is larger and with a greater number of floral branches (6–8), the flowers have 10 parted, the petals are linear-lanceolate distinctively glandular pubescence on the margin and abaxially. Likewise, ×*G. haeckelii* differs from ×*G. laxiflorum* J. M.

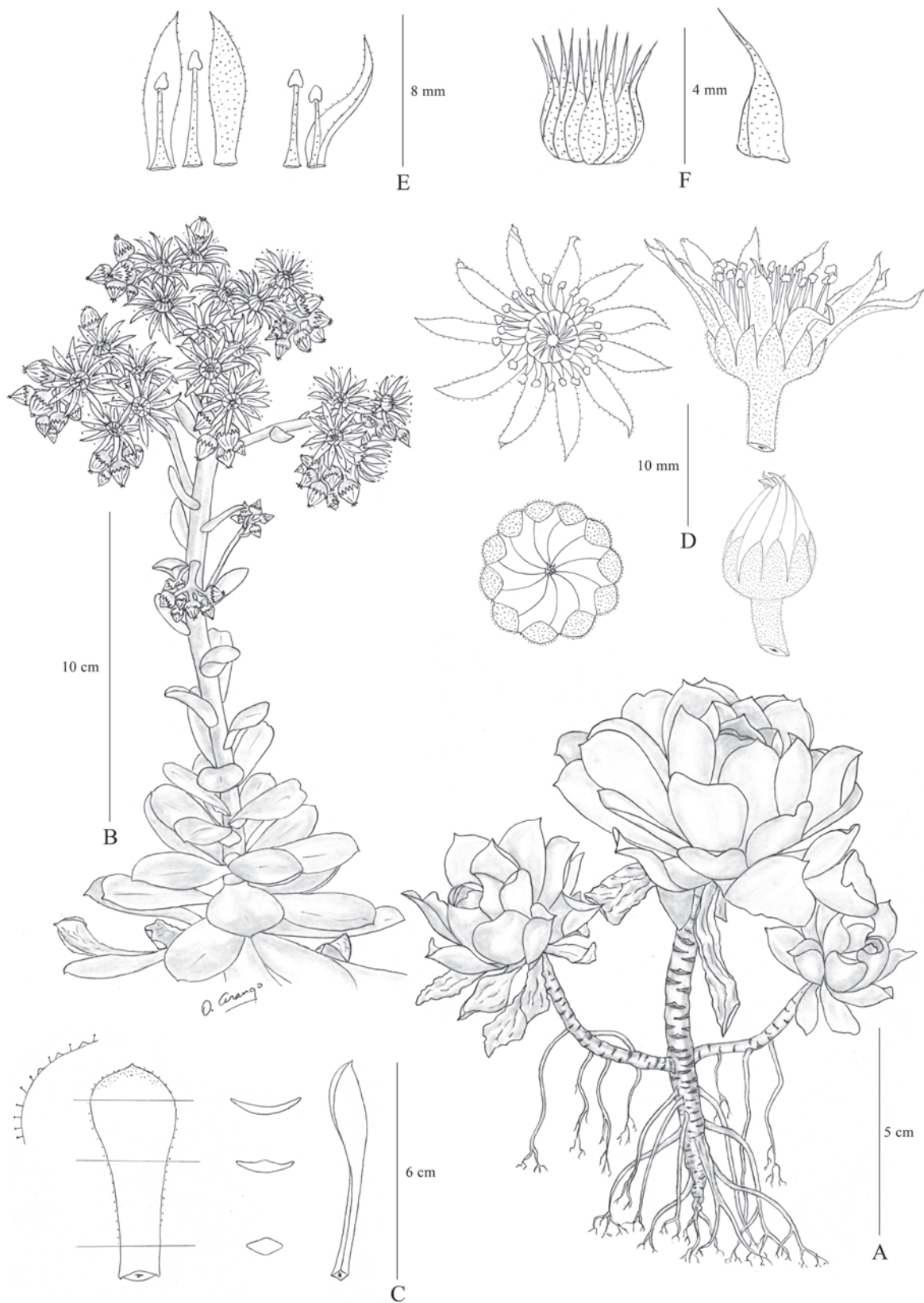
Macarrón & Bañares (TFC 25003!), another intergeneric hybrid of *G. diplocycla*, because the plants of the new hybrid are sparsely branched, generally consisting of a single large rosette, the leaves are glaucous green; the inflorescence is distinctly a cymose anthela, provided with leaf-like bracts that do not imbricate each other and, only 4–5 floral branches; the flowers are pale yellow, the petals are slender and exhibit glandular pubescence at the margin and abaxially. Fig. 8.

*Description*: perennial subshrub plant, intermediate size between the parents, 10–12 cm tall, formed by a single basal woody stem which is sometimes divided into 1 or 2 branches ending in a single rosette. Main leaf rosette cup-shaped, 12–15 cm in diameter. Phyllotaxy: 5/13. Leaves spatulate-cuneate, concave, glabrescent, 6.0 × 3.0 × 0.3 cm, glaucous green color and multiple tannic lines on the underside; leaf margin subtly hyaline, provided with short conical cilia in the distal part and glandular hairs interspersed. Inflorescence in a cymose anthela, with the main axis ending in a larger central flower, glandular-pubescent, 15 × 20 cm long, provided with obovate-cuneate bracts, and 6–8 dichotomous floral branches. Calyx dialysepal, glandular-pubescent, elongated triangular sepals 4 × 2 mm. Flowers



**Figure 7.** ×*Greenonium haeckelii* Arango nothosp. nov.: (A), aspect of the plant growing in its habitat; (B), inflorescence (photographs: O. Arango).





**Figure 8.** *×Greenonium haeckelii* Arango nothosp. nov.: (A), plant habit; (B), inflorescence; (C), leaves and leaf margin detail; (D), flowers and flower buds; (E), petals on both sides and stamens; (F), carpels (drawings: O. Arango).

with 9–12 parted, radial flat corolla, 1.8–2.0 cm in diameter; petals linear-lanceolate, acuminate, pale yellow,  $8 \times 2$  mm, pubescent abaxially and distinctively provided with glandular hairs on the margin; stamens with cylindrical filaments, glabrescent, anthers deltoid-rounded, pale yellow. Carpels with yellowish-white ovaries, entirely pubescent,  $2.0 \times 1.5$  mm; styles glabrescent, 2.0 mm long, divergent. Nectariferous scales absent. Fig. 8.

*Phenology*: Flowering April to May.

*Etymology*: The infraspecific epithet was named in honor of the German naturalist Ernst Haeckel, who conducted Ecology and Marine Biology studies on Canary Island in the 19th century (Sarmiento, 2011).

*Habitat*: It was found living between the parents in sunny, stony soil, on the Canary vegetation belt of the thermosclerophyllous forest, 200–800 m.

×*Greenonium lajense* Arango nothosp. nov.

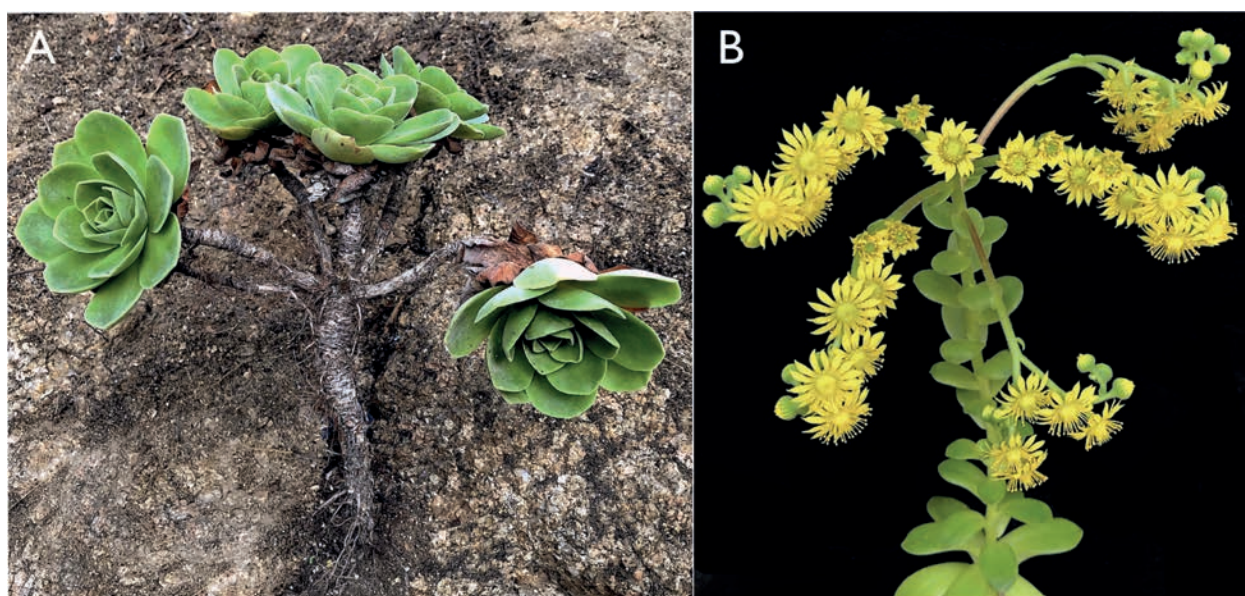
[*Greenovia diplocycla* Webb ex Bolle × *Aeonium saundersii* Bolle]. Fig. 9.

Holotype: Spain, Canary Islands: La Gomera, La Laja, Route 29 towards El Bailadero, 780 m,  $28^{\circ} 06' 59''$  N,  $17^{\circ} 11' 53''$  W, 18.V.2014, O. Arango (TFC 53309).

*Diagnosis*: ×*Greenonium lajense* differs from ×*G. laxiflorum*, another intergeneric hybrid involving *A. decorum* because the plants of the new hybrid

consisting of a main stem that at the top divides into 5 or 6 branches in verticillate arrangement, ending in smaller rosettes (6–8 cm), with olive-green, orbicular-cuneate leaves, densely pubescent like those of *A. saundersii* and the margin devoid of cilia; the inflorescence is a cymose anther (6–8 cm tall), with the central axis provided with non-imbricate bracts and 4 or 5 floral branches, each with 6–10 larger flowers (2.4 cm), with 17–18 parted and glabrous petals. For differential diagnosis with ×*G. haeckelii*, another intergeneric hybrid described in this article, see the *diagnosis* of this nothotaxon.

*Description*: Perennial subshrub plant, intermediate size between the parents, 18–20 cm tall, formed by a main woody stem dividing at the top into 4–6 verticillate branches. Leaf rosette cup-shaped, lax, 6–8 cm in diameter. Phyllotaxy: 5/13. Leaves orbicular-cuneate in mature plants,  $4.0 \times 3.0 \times 0.2$  cm, densely pubescent glandular, light green color, and leaf margin slightly hyaline, provided only with glandular hairs. Inflorescence in a cymose anthela with the main axis ending in a larger central flower,  $8 \times 16$  cm height, glandular-pubescent, provided by leaf-like bracts, and 4–5 arcuate floral branches dichotomous in the distal third in two floriferous branches each with 6–10 flowers. Calix densely glandular-pubescent, with  $3 \times 1$  mm linear-ensiform sepals. Flowers with 18 parted, radial flat corolla, 2.2–2.4 cm in diameter; petals oblanceolate, apiculate, apex acute,  $8 \times 3$  mm, glabrous, dark yellow; stamens with cylindrical,



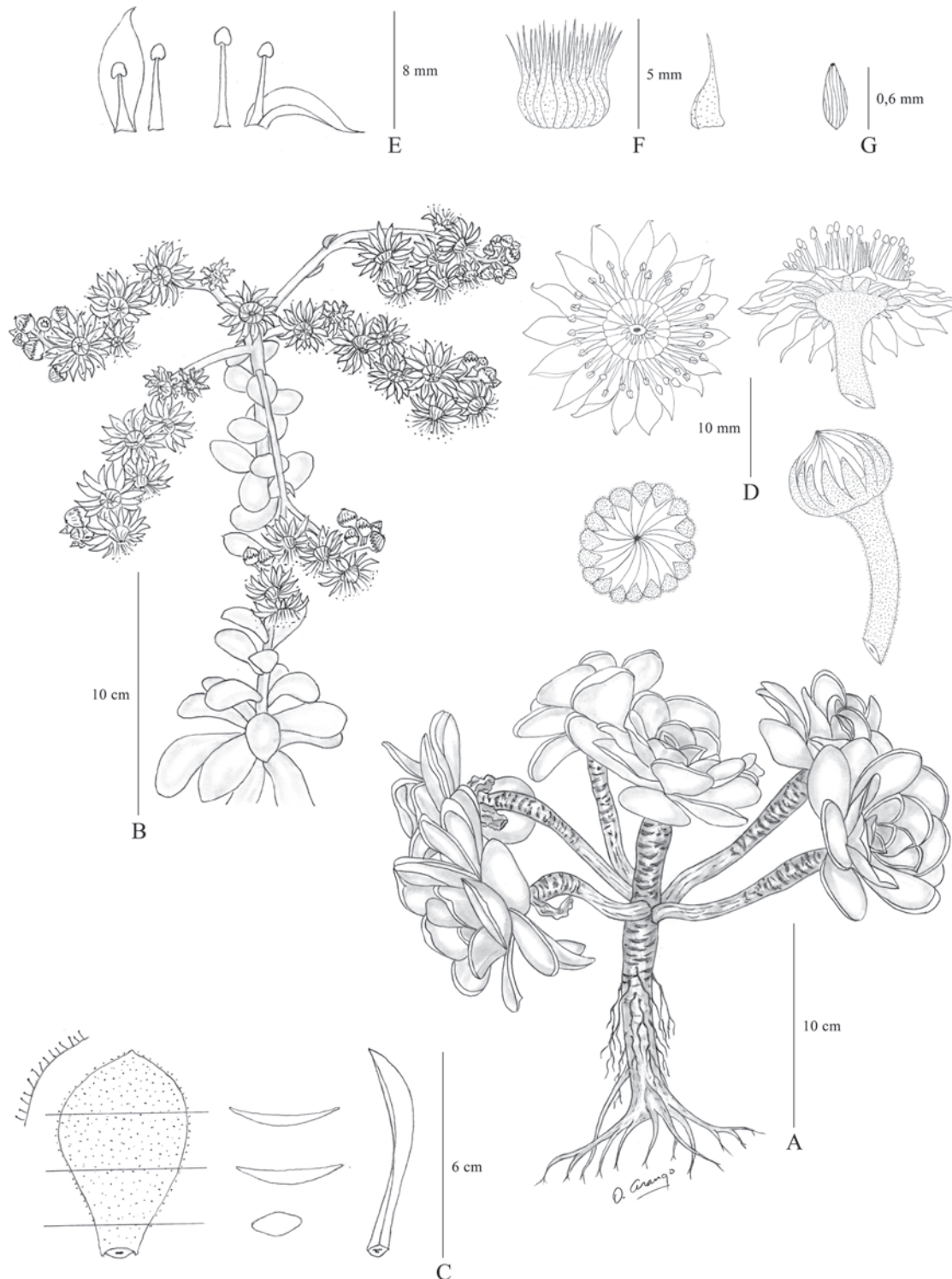
**Figure 9.** ×*Greenonium lajense* Arango nothosp. nov.: (A), appearance of the plant growing in its habitat; (B), inflorescence (photographs: O. Arango).



glabrous, yellow-green filaments, anthers ovoid, bright yellow. Carpels with yellow-green ovaries,  $2.8 \times 2.0$  mm, entirely pubescent; glabrescent styles, 2.5

mm long, slightly divergent. Nectariferous scales absent. Fig. 10.

*Phenology*: Flowering April to May.



**Figure 10.** *Greenonium lajense* Arango nothosp. nov.: (A), plant habit; (B), inflorescence; (C), leaves and leaf margin detail; (D), flowers and flower buds; (E), petals on both sides and stamens; (F), carpels; (G), seeds (drawings: O. Arango)

*Etymology*: The infraspecific epithet refers to La Laja, the locality where it was discovered.

*Habitat*: It was found living between the parentals in a shady habitat on the Canary vegetation belt of the humid forest, 700–1000 m.

Finally, we provide some data and illustrations of two other natural hybrids from La Gomera, *A. ×rhombifolium* Arango and *×Greenonium cabreræ* A. Santos nothovar. *ojilense*, of which we only know the vegetative part of the plant. Therefore, we will postpone the complete description until we have the flowers.

***Aeonium ×rhombifolium* Arango nothosp. nov.**

[*Aeonium decorum* var. *decorum* Webb ex Bolle  $\times$  *Aeonium lindleyi* Webb & Berthel. subsp. *viscatum* (Bolle) Bañares]. Fig. 11.

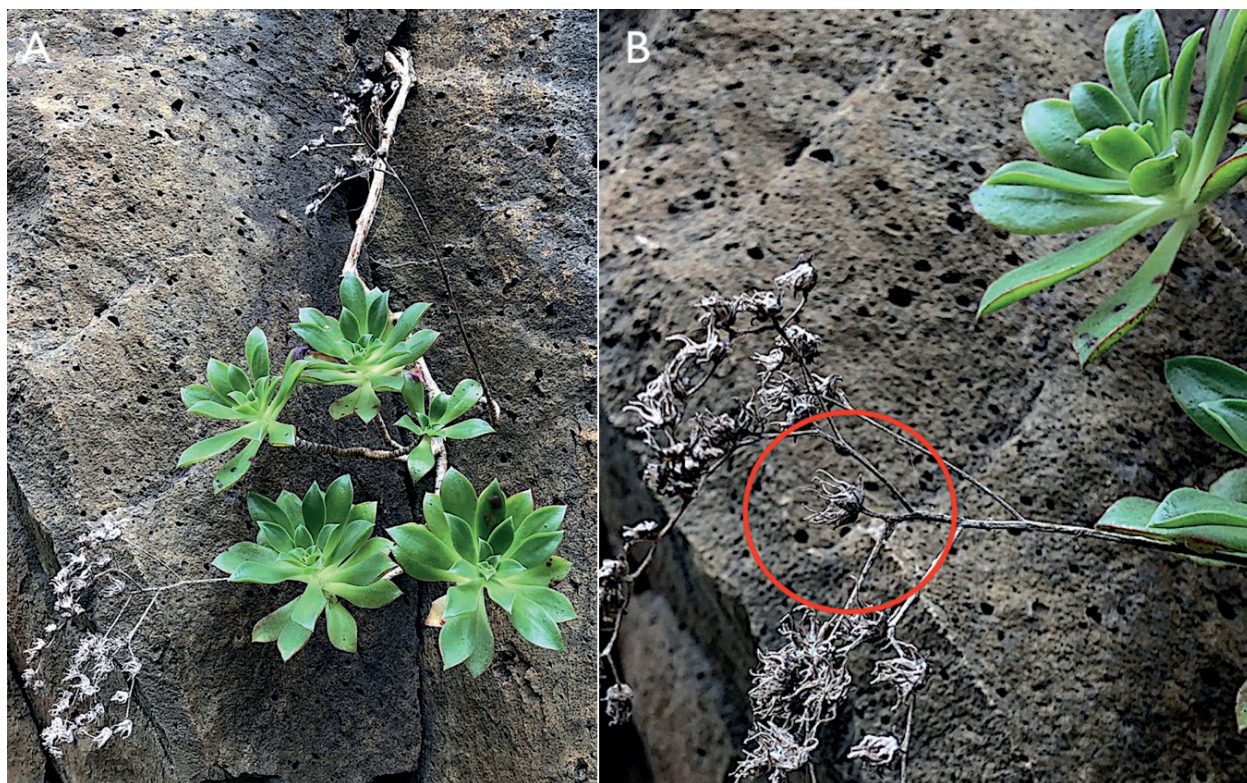
*Location*: Spain, Canary Islands: La Gomera, near the village of El Atajo, 167 m, 04.II.2020, O. Arango.

*Etymology*: The infraspecific epithet refers to rhombus-shaped leaves.

*Habitat*: *Aeonium ×rhombifolium* is a sporadic natural hybrid that was found living between the

parents in the fissure of a compact basaltic rock, in the transition zone between the Canary vegetation floors of xerophytic scrub and thermosclerophyllous forest, 100–400 m.

*Discussion*: This is a rare hybrid in nature despite being a cross between two very common species that share extensive areas on the island's western side. Possibly its rarity is because the floral phenology of the parents does not coincide in time, or that the specimens are not recognizable in the nature due to the morphological convergence generated by backcrossing with the parents. We finally recognized this hybrid in its habitat thanks to a specimen that conserved its floral remains, in which the central axis of the inflorescence ended in a single central flower of larger size (Fig. 11B). This is a character undoubtedly inherited from *A. lindleyi* Webb & Berthel. subsp. *viscatum* (Bolle) Bañares, whose inflorescence is described as a cymose panicle (Liu, 1989). In addition, the leaves were rhomboid-spatulate, the lamina finely puberulent and the leaf margin devoid of cilia. These characters also link it to *A. lindleyi* subsp. *viscatum*, although the plant habit was reminiscent of *A. decorum*.



**Figure 11.** *Aeonium ×rhombifolium* Arango nothosp. nov.: (A), the appearance of the plant growing in a basaltic rock fissure in its habitat; (B), red circle: remains of an inflorescence showing how the central axis ends in a single flower forming a cymose panicle (photographs: O. Arango).



In the literature reviewed, we found only one mention of this hybrid, and that was in a book for succulent plant amateurs (Carbonell, 2007), which succinctly stated: “*A. ×selentenus* (*A. decorum* × *A. viscatum*)”, without providing any information on the hybrid or the source of the reference. Nor is this name mentioned in the portal *Especies Vegetales en Canarias* (2022) the only Canarian biodiversity database that provides information on natural hybrids; nor in the POWO (2017) the world’s largest portal of published plants. For all these reasons, we consider that it is a *nomen nudum*, Art. 41.7, Note 3, Ex. 23, of the ICNB (Turland *et al.*, 2018).

×*Greenonium cabrerae* A. Santos nothovar. *ojilense* Arango nothovar. nov.

[*Greenovia diplocycla* Webb ex Bolle × *Aeonium spathulatum* (Hornemann) Praeger]. Fig. 12.

*Location:* Spain, Canary Islands: La Gomera, path PR-LG 17, near the Roque de Ojila, 1120 m, 24.I.2020, O. Arango. Fig. 12.

*Etymology:* The epithet that refers to Roque de Ojila, the site where it was discovered.

*Discussion:* The hybrid ×*Greenonium cabrerae* Santos (TFC 37964!), was described on the island of La Palma by Santos (1983), we recently found a vicariant nothovariety of this hybrid in an area of canary pine forest near the Roque de Ojila on La Gomera. The only morphological differences observed concerning the La Palma hybrid were that the plants have fewer branches, the rosettes are slightly smaller, and the leaves are wider with the apex rounded, but these differences may be due to the environmental conditions in which they grow and have no taxonomic value.

*Habitat:* ×*Greenonium cabrerae* nothovar. *ojilense* is a sporadic natural hybrid that was found growing



**Figure 12.** ×*Greenonium cabrerae* Santos nothovar. *ojilense* Arango nothovar. nov. The right side of the photo: the new hybrid growing in its habitat. The left side: *Greenovia diplocycla*, one of the parentals (photographs: O. Arango).



among the parentals in a wet soil with limited sunshine at the edge of the pine forest, on the Canary vegetation floor of the pine forest, of *Pinus canariensis*, 800–1200 m.

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**APPENDIX.** Additional specimens examined from Flora of the Canary Islands.

**Additional material studied**

Spain, Canary Islands, El Hierro: *Aeonium* × *holospathulatum* Á. Bañares. [*A. arboreum* (L.) Webb & Berthel. var. *holochrysum* Ho-Yih Liu × *A. spathulatum* (Hornemann) Praeger], near San Andrés, III.1989, Á. Bañares (TFC 3974). Ibidem, San Andrés, 1020 m, 29.V.2012, O. Arango (deposited in LPA). La Gomera: *Aeonium* × *aguajilvense* Á. Bañares, [*A. castello-paivae* Bolle × *A. gomerense* (Praeger) Praeger], Aguajilva, 700 m, V.1991, Á. Bañares (TFC 37963). *Aeonium* × *beltranii* Á. Bañares, [*A. decorum* Webb ex Bolle × *A. subplanum* Praeger], El Bailadero, 950 m, III.1981, Á. Bañares (TFC 19946). *Aeonium* × *bravonianum* Bramw. & Rowl. [*A. castello-paivae* Bolle × *A. decorum* Webb ex Bolle], El Bailadero, 950 m, V.1983, Á. Bañares (TFC 19944). Tamargada, 350 m, VI.1983, C. Rios Jordana (TFC 9951). *Aeonium* × *castellodecorum* Á. Bañares [*A. castello-paivae* Bolle × *A. decorum* Webb ex Bolle], El Bailadero,

950 m, V.1983, Á. Bañares (TFC 19944). *Aeonium decorum* Webb mss, Barranco del Agua, Valle de San Sebastian, IV.1845, Bourgeau, (FI 000088). *Aeonium gomerense* (Praeger) Praeger, without locality, 8.V.1951, E. R. Sventenius (ORT 5621). Ibidem, Cumbre Carbonera, 950m, VI.1996, Á. Bañares, E. Carqué & M. Marrero (TFC 38718). *Aeonium perezerii* Á. Bañares, [*A. decorum* Webb ex Bolle × *A. urbicum* subsp. *urbicum* (Chr. Sm. ex Buch) Webb & Berth.], Barranco de Benchejigua, 600 m, IV.1985, Á. Bañares (TFC 25024). *Aeonium sedifolium* Webb Pit. & Pr., Masca, E. R. Sventenius (ORT 12400). × *Greenonium laxiflora* J. M. Macarón & Á. Bañares, [*Greenovia diplocycla* Webb ex Bolle × *A. decorum* Webb ex Bolle], Barranco de La Laja, 550 m, III.1987, Á. Bañares (TFC 25003). La Palma: *Aeonium* × *cabrerae* Santos ex Á. Bañares, [*Greenovia diplocycla* Webb ex Bolle × *A. spathulatum* (Hornemann) Praeger], Las Manchas (supra Jedey), 1000 m, VII.1990, Á. Bañares (TFC 37964). Tenerife: *Aeonium* × *holospathulatum* Á. Bañares. [*A. holochrysum* Webb & Berthel. × *A. spathulatum* (Hornemann) Praeger var. *spathulatum*], Arafo, 950 m, III. 1981, Á. Bañares (TFC 19949).